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Abstract

Private health insurance premiums in Australia are regulated by the Commonwealth Government. Premium increases often well exceed the national consumer price index, which suggests that consumers are not receiving value for money for health insurance products. The current regulatory framework does not encourage health insurers to minimise costs. Health fund management costs are assessed relative to an average industry benchmark instead of industry best practice. This paper examines the scope to reduce the premium increases under incentive regulation. This type of regulation is used to set utility and transport prices in Australia. Data envelopment analysis (DEA) methods are used to assess the potential efficiency and productivity gains for health funds. This information is used to help set premiums for individual funds. Our results suggest that incentive regulation could potentially reduce the average premium increase across all private health insurance products and health funds by about ½ per cent per annum.

Keywords: Private health insurance, incentive regulation, productivity growth

1. Introduction

The Commonwealth Government approves private health insurance premiums in Australia. Premium increases over recent years have been well above the national consumer price index (CPI), which raises community concerns that consumers are not receiving value for money for private health insurance products.

Frequent government policy changes (e.g., refinements to the private health insurance rebate and capping benefit payments for prostheses) and market initiatives to improve industry competitiveness and efficiency have belatedly helped to stem the growth in health insurance premiums. Since 2001, the average premium increase for the various private health insurance products offered by the health insurers has been above 6 per cent in most years (PHIAC 2006a). Over the last three years average premium increases have been lower but remain high relative to the CPI. For example, the most recent average premium increase was 4.99 per cent (Roxon 2008a). By comparison, the average annual CPI increase over 2000-01 to 2006-07 was 2.5 per cent (ABS 2008). To some extent, the decline in premium increases was underpinned by the stronger returns from the health insurers' investment portfolios. Nevertheless, recent premium increases easily exceed the Reserve Bank of Australia's inflation target of 2 to 3 per cent per annum for the economy.

Containing future premium increases is a challenging exercise given the increased use of costly technology in medical procedures that often produce marginal improvements in patient health, the greater utilisation of health services by an ageing population, the incentives in the healthcare system that encourage doctors to prescribe additional treatments for patients, and the increased cost of pharmaceuticals (PHIAC 2007a; IC 1997). Furthermore, to achieve further efficiency gains in the provision of health insurance products and services the private health insurance industry must address a highly fragmented market structure.

The previous Commonwealth Government introduced policies to encourage people to purchase health insurance and to improve industry efficiency and profits. For example, health funds are able to provide broader financial and healthcare products to members like life insurance and funding treatments for out of hospital services (e.g., home dialysis). It also passed legislation to sell the Commonwealth-owned health fund, Medibank Private. However, the recently elected Rudd Government stated that it will not sell the fund. It also announced an increase in the income threshold for the Medicare Levy Surcharge in the recent Budget, which some commentators and private health insurers suggest will create a disincentive for healthy younger people to buy private health insurance. Recent industry initiatives to improve performance include nascent fund demutualisation and stock exchange listings, and merger proposals to achieve

economies of scale and scope, such as the provision non private health insurance products like travel and life insurance.[1]

Private health insurance premiums must enable health insurers to cover member claims (benefit payments), operating costs (management expenses), an acceptable return on capital, and regulatory solvency requirements. The weight the Minister for Health and Ageing places on the individual importance of these components when reviewing health fund premium applications is unclear.[2] The Act that governs the industry, the *Private Health Insurance Act 2007*, is silent on this matter.

However, the Minister recently released several criteria that were used to judge whether the latest premium proposal for a health fund is contrary to the public interest. The criteria included: size of premium increase sought by the insurer, the average industry premium increase, fund market share, membership forecasts, price of competitors' products, other insurers' premium proposals, the effect of the private health insurance rebates on premiums, and the financial circumstances of the insurer (Roxon 2008b). The Minister did not state whether individual criterion have an equal or different weight of importance in the assessment of premium proposals. Nevertheless, it is uncertain whether the criteria promote economic efficiency, product innovation and structural change within the industry or the welfare of the broader community.

Price regulation

The prudential industry regulator, the Private Health Insurance Advisory Council (PHIAC) and the Department of Health and Ageing review health insurers' premium applications for the forthcoming year before providing advice to the Minister on whether to approve the premiums (PHIAC 2007b).[3] It may request additional information from a health fund and consult with the Australian Government Actuary.

Little public information is available that describes the information submitted to PHIAC or the advice provided to the Minister. However, the industry regulatory that oversees consumer complaints, the Private Health Insurance Ombudsman (PHIO), stated that the insurers must provide 'detailed financial information and cost and benefit projections to justify any [premium] increases they seek' (PHIO 2006, p. 2). This information must be certified by an accredited actuary. However, there appears little scope for public comment on the health insurers' submissions.

[1] Economies of scale exist when the average cost of a single service or product declines as output is expanded. Economies of scope arise when it is cheaper to produce two or more goods or services together compared to producing them separately.

[2] Insights on the matter may arise when the Minister refuses to approve a premium application that seeks to increase premiums, which according to the *Private Health Insurance Act 2007* (section 66-10) is contrary to the public interest. The Act requires the Minister to provide Parliament with the reasons for disallowing the premium application.

[3] However, there are no formal provisions for this role in the *Private Health Insurance Act 2007* (PHIAC 2007a).

Managerial expenses as a proportion of contribution income compared to the industry average and compliance with solvency standards are important considerations in determining health fund premium increases (PHIAC 2006b, p. 23; Abbot 2007a).[4] PHIAC publishes certain information on health fund efficiency (e.g., management expenses per contribution income) and monitors funds that have unit costs higher than the industry average (PHIAC 2005, pp. 92-3).[5]

No information is available on the timelines that funds are required to meet to improve performance. Consequently, the current regulatory regime provides reduced incentives for health funds to restrict cost increases, compared with regulatory price controls for utility and transport services, which are open to public scrutiny (see for example, IPART 2004).

The existing pricing regime suggests that premiums are largely set according to a cost plus regulation regime. This approach may hinder PHIAC's ability to balance the following objectives when performing its regulatory duties: fostering an efficient and competitive health insurance industry; protecting the interests of consumers; and ensuring the prudential safety of individual private health insurers.[6]

Greater transparency in the premium approval process, which includes the use of rigorous performance assessment techniques, would help staunch the growth in premiums. For example, assessments on benefits paid by insurers could involve greater use of cost benefit analysis to support the effectiveness of medical treatments and benchmarking private hospitals to improve the quality and cost of patient care.[7] Benefit payments comprise about 90 per cent of total industry costs (PHIAC 2006b). A more sophisticated approach to benchmark health fund management expenses would further assist in capping premium increases. Management expenses include the costs of providing health insurance products such as fund labour costs, rent, marketing, information technology, etc and are about 10 per cent of total industry costs.

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[4] PHIAC has completed the first round of fund reviews to gain a better understanding of their operations compared to regulatory views formed from analysing financial statements. It jointly reviews the larger funds with the Australia Prudential Regulation Authority. Among other things, the reviews assessed the funds' monitoring and control systems. PHIAC considers sound business systems are a necessary component to improve industry corporate governance (PHIAC 2007b).

[5] A private health insurer can own more than one fund. However, the insurers must ensure that the funds have separate financial accounts.

[6] Under the previous legislation that regulated the private health insurance industry, the *National Health Act 1953*, PHIAC was also required to minimise health insurance premiums.

[7] The Australian Health Insurance Association (AHIA) (2006a) cited research that about 20 per cent of surgery in Australian hospitals requires revision or is subject to infection. It also urged the Commonwealth to implement appropriate clinical testing for prostheses because about 20 to 25 per cent of all knee and hip replacements fail which require affected patients to undergo additional surgery. By contrast, Sweden had a revision rate of 10 per cent for knee and hip surgery (AHIA 2006b). The Australian Orthopaedic Association (AOA) has established a National Joint Replacement Registry, which, among other things, aims to evaluate the effectiveness of different types of prostheses and surgical techniques (AOA 2007). Prostheses benefit payments accounted for 14 per cent of total hospital benefit payments, which was about $858 million in 2005-06. Information is not available on benefits paid for specific prostheses (PHIAC 2006b).

This paper focuses on the potential application of incentive regulation, similar to that used in setting utility and transport prices, and superior benchmarking techniques to establish efficient management expenses for health insurers. Utility and transport regulators often set prices for utility and transport services for several years that reflect efficient costs of service delivery. In Australia, regulators use a building block approach to assess efficient capital and operating (non capital) costs. The price reviews are open to public comment and the regulators publish their analysis and reasons in determining prices.

Regulators use frontier measurement techniques like data envelopment analysis (DEA) and econometric methods, such as stochastic frontier analysis (SFA) and corrected ordinary least squares (COLS), to compliment other regulatory information on utility and transport performance to determine the relative efficiency of non capital costs and productivity growth trends for the sectors (IPART 1999a; IPART 1999b; Carrington, Coelli and Groom 2002; Ofgem 2004; Ofwat 2004; Netherlands Competition Authority 2006).[8] This performance information is subsequently used to help determine the productivity offset in the price cap for the regulated services. Frontier measurement techniques usually assess the relative performance of service providers against sample best practice. By contrast, partial productivity measures (e.g., unit cost) assess utility and transport performance against an industry average.

Various government agencies and regulators have used or advocate the use of these techniques to assess the performance of government funded services like health, aged care, and law and order (SCRCSSP 1997; IPART 1998; Carrington, R., P. Connelly, and N. Puthucheary 1997; Carrington et al 1997; Spottiswoode 2000; NSW Treasury 2001; Hogan 2004; SCRGSP 2007).

In this paper our principle objective is to conduct a rigorous analysis of efficiency and productivity growth in the Australian private health insurance industry. This analysis should provide useful input if the government chooses to introduce incentive regulation in the Australian private health insurance industry. Furthermore, more specific contributions include:

- The provision (to our knowledge) of the first productivity growth estimates for the private health insurance industry using frontiers techniques like DEA.
- The development of more rigorous input and output measures and price deflators to assess industry performance.
- An assessment of whether the presence of scale economies support government and market initiatives to improve the performance of the industry through privatisation and mergers.
- An investigation of the influence of service quality on health fund efficiency.
- An illustration of how these performance measures can be used in price regulation.

[8] Regulators also often use partial productivity measures like unit revenue and unit cost, financial ratios and financial accounts to assess utility performance.

The remainder of this paper is divided into sections. In section 2 the current industry structure and regulatory arrangements are described and discussed. Section 3 provides a review of empirical studies of the efficiency of health insurance providers, along with a brief discussion of analyses in the closely related areas of general insurance and financial services. Section 4 contains a discussion of the production technology in this industry, while Section 5 describes the DEA methods used to estimate this technology. In section 6 the sample data and price deflators are described, and the empirical results of the study are presented and discussed in section 7. Finally, some concluding comments and areas of future work are provided in Section 8.

2. Private Health Insurance in Australia

Australia has a universal healthcare system with public and private health services providers (e.g., hospitals and medical practitioners) and several funding arrangements. The Commonwealth health scheme, Medicare, is the main feature of the Australian healthcare system. It is available to all Australians and provides free or subsidised access to public hospitals and medical practitioners. Medicare is funded by general taxation and a levy on taxpayer income. Other Commonwealth funded healthcare schemes include subsidised prescribed pharmaceuticals (i.e., the Pharmaceutical Benefits Scheme) and the private health insurance rebate. Private providers charge people for services. Fees are usually paid by either private health funds or Medicare or by the individuals themselves. In many instances all three contribute to the payment of fees for a particular service.

Private health insurance is voluntary but moderate to high-income earners incur an additional tax surcharge if they do not have private health insurance[9], and people that join a health fund after 30 years of age pay more for cover.[10] Unlike other insurance products, health funds cannot discriminate among people and charge premiums according to potential health risks. The funds are required to charge people the same premium for similar health cover notwithstanding differences in age (except if people join a fund after 30 years of age), sex, history of illness, claims history and health. This arrangement, which is known as community rating, aims to increase access to private health insurance. Consequently, a fund can, in some cases, have a higher proportion of elderly or chronically ill members.

A risk equalisation scheme ensures the cost of hospital care is spread evenly among the health funds. The scheme transfers money from health funds with a higher proportion of younger and healthier members to those funds with a higher proportion of elderly and chronically ill members, who lodge more claims.

[9] The Commonwealth announced in the Federal Budget that the income threshold for the Medicare surcharge levy will increase from $50,000 to $100,000 for individuals and from $100,000 to $150,000 for families. However, the changes are yet to be approved by the Senate.
[10] The additional premium incurred by these people is cancelled after 10 years of continual membership.

Expenditure on health services was $87 billion in 2005-06, which is about 9 per cent of GDP (AIHW 2007).[11] The average rate of growth in real total health expenditure was 5.1 per cent per annum over the 1995-96 to 2005-06 period. Health expenditure is funded two thirds by government and one third by individuals, private health insurance and other non government sources (e.g., workers compensation insurers) (AIHW 2007). Most funding from non government sources is funded by individuals. Private health insurance contribution to health funding declined over the last decade from 11 to 7 per cent. This is largely due to the private health insurance rebate (AIHW 2007).

States are responsible for the provision of public health services such as public hospitals, mental health programmes, the registration of medical professionals, etc. Public hospital services provided by the States are free of charge and are mainly funded by governments. In 2005-06, the States provided 51 per cent of the funding and the Commonwealth provided 41 per cent of the funds, with the remainder coming from private health insurance insurers, patient out-of-pocket payments, workers compensation and third party motor vehicle insurers and other revenue sources (AIHW 2007). The Commonwealth's share of funding declined over the decade to 2005-06 from 45 to 41 per cent. By contrast, the States share of funding increased from 45 to 51 per cent. Private hospitals are mainly funded by private health insurance.

Private health insurance allows people to decrease the uncertainty, and the associated costs, of ill health (risk aversion) by sharing the risk of illness among people (risk pooling). The role of private health insurance is to complement Medicare (Abbot 2007b; Medibank Private 2006). It also offsets costs of services not covered by Medicare (e.g., dental, optical and physiotherapy).

The Commonwealth has several motives to encourage people to purchase private health insurance. For example, to relieve pressure on public funded healthcare; to encourage product innovation; and to promote greater choice in the delivery of public and private healthcare. There are two broad categories of health insurance: hospital insurance covers all or some of the costs of hospital admission, such as accommodation, doctors' fees and operating theatre fees according to the cover bought by consumers,[12] while ancillary cover reimburses people some costs for certain health services like dental, optical, physiotherapy and natural therapies, and in some States the use of an ambulance.[13]

[11] The Australian Institute of Health and Welfare (AIHW) defines health expenditure as total expenditure on 'hospitals, medical, dental, patient transport services, other health practitioner, community and public health services, medications, aids and appliances, health research and administrative systems that support these services' (AIHW 2007, p. xvi).

[12] People can elect to pay lower hospital cover premiums by incurring an up-front excess fee for a hospital stay, paying a daily co-payment for hospital accommodation or receiving lower benefits for certain medical procedures such as obstetrics related services or joint replacement.

[13] PHIAC (2007a) recently reclassified the ancillary policy as a general treatment policy. A general treatment policy covers the same services covered by the ancillary policy, but it also includes the recent services covered by health funds. These services include hospital substitute treatment and chronic disease management programs treatment.

In 2005-06, $6.3 billion of private health insurance funding for recurrent health expenditure was mainly used to pay private hospitals (49%), dental services (12%), administration (10%) and medical services (10%) (AIHW 2007).[14] Private health insurance accounted for about 70 per cent of private hospital funding (AIHW 2007) – 46 per cent funded by premiums and the remainder by the health insurance rebate.

About half of the Australian population aged 15 and over had private health insurance in 2004-05 (ABS 2006). The most common reason people gave for having private health insurance was it gave them 'protection, security and peace of mind' (ABS 2006, p.13). Other common reasons for purchasing health insurance was that it: reduced waiting time for treatment, provided benefits for ancillary treatments, allowed choice of doctor, and permitted treatment in a private hospital. Of those covered 75 per cent had hospital and ancillary cover, 17 per cent had hospital cover only and 7 per cent had ancillary cover only. The level of coverage and type of cover varies among age groups. 61 per cent of those aged 45-54 and 55 and 64 had cover while 41 per cent of those aged 15-24 and 75 and over had cover. People generally held hospital and ancillary cover across all age groups. However, those aged 75 and over held the highest proportion of hospital only cover and younger people 15-24 and 25-34 held the highest proportion of ancillary only cover.

The trend in people holding private health insurance declined slightly over recent years. The proportion of the total population with health hospital cover declined from 44.9 per cent in June 2001 to 43 per cent in June 2006 (PHIAC 2006b).

The most common reason for people not having private health insurance was either they were not able to afford health insurance products or that it was too expensive. Only 29 per cent of those in the lowest household income quintile had private health insurance. By comparison, 76 per cent of people in the highest household income quintile had private health insurance (ABS 2006). Other reasons people gave for not having private health insurance included: Medicare provided sufficient cover, people were in good health or had no dependents, private health insurance was not good value, and possessing a health concession card that entitled the holder to free medical and hospital treatment.

Industry structure

In 2005-06, there were 39 health funds in Australia.[15] Most funds are not for profit organisations – only five funds were for profit entities. The majority of health funds are open to the public, which include local residents, international students and foreigners with working visas. However, 14 funds restrict membership according to union affiliation (e.g., teachers unions) or participation in certain activities (e.g., defence forces).

The industry is quite fragmented but highly concentrated. The six largest insurers account for about 76 per cent of the market (as measured by premium income). Of the

[14] Most medical services are provided by registered medical practitioners on a fee-for-service basis.
[15] There are currently 37 health funds.

remainder, 25 funds have a combined market share of about 8 per cent (PHIAC 2006b). As at 30 June 2006, there were about 4.8 million contributors (policy holders) and about 10 million people were covered by private health insurance. The remaining population rely on Medicare for health cover. Summary statistics for the industry and the six largest health insurers are presented in table 1.

Medibank Private, which is owned by the Commonwealth, was the only health insurer with a national business.[16] It is the largest private health insurer and has about 28 per cent of the market. The other larger funds have significant markets in certain States only. For example, MBF, which was recently purchased by BUPA, has significant markets in New South Wales, Queensland and Tasmania. By contrast, HBF operates in Western Australia only where it is the largest insurer in that State.

Table 1: Summary statistics: industry and large health funds, 2005-06

Health fund	Contributors (no. of policy holders)	Coverage (no. of people)	Total revenue ($m)	Benefit payments ($m)	MER (%)	Net margin (%)	Solvency multiple (%)
Medibank Private	1 375 178	2 812 667	2 901	2 393	10.2	2.4	1.61
MBF	795 502	1 670 374	1 865	1 488	9.3	2.1	1.52
BUPA Aus†	472 490	975 278	1 108	900	8.3	5.8	1.68
Hospitals Contribution Fund	423 713	964 848	929	759	8.3	0.7	1.93
HBF	373 524	789 269	749	605	9.2	1.0	1.58
NIB	302 299	640 178	616	484	9.2	1.7	2.08
Industry	*4 806 754*	*10 189 552*	*10 706*	*8 640*	*9.4*	*2.7*	*1.74*

Source: PHIAC (2006b)
Notes:
1. Benefit payments excludes State levies on contributors paid to the NSW and ACT governments for ambulance cover
2. MER denotes managerial expense ratio which is defined as managerial expenses as a percentage of contribution income. Management expenses are defined as the operating expenses incurred operating a fund such as salaries, commission, rent, etc
3. Net margin is defined as contribution income less benefits paid to members and management expenses expressed as a percentage of contribution income
4. Solvency multiple measures health fund compliance with the solvency standard for the industry. It is calculated by dividing total assets by the solvency requirement. See PHIAC 2006(b) for further information
5. † denotes a for profit fund. NIB became a for profit fund and listed on the Australian Stock Exchange in 2007.

Member premiums provide the vast majority (96%) of the health funds' total revenue. Investment and other revenue provided the remainder. The sector struggled to remain viable over recent years and was dependent on investment income to produce surpluses. Several smaller funds were merged with other insurers after incurring unsustainable

[16] BUPA Australia and MBF merged in June 2008 to create a fund with a national business and similar market share to Medibank Private.

losses. And the Commonwealth provided an additional $85 million to Medibank Private in 2004-05 to bolster its finances.

Industry profits improved in 2005-06. It reported a surplus of $926 million before tax and extraordinary items. Investment and other revenue contributed $446 million towards the surplus. But the associated net margin for the industry remained a relatively thin 2.7 per cent. Still, all funds meet the prudential requirements required by the industry regulator (PHIAC 2006b).

Medibank Private was the only large fund to have efficiency less than the industry average. It said the management expense ratio (MER) was higher than previous years because an investment programme to upgrade client services and business processes was underway. The fund's efficiency is better than the industry average if these costs were removed from management expenses (Medibank Private 2006).

Government regulation

The *Private Health Insurance Act 2007* is a complex web of rules and regulations that governs the private health insurance industry. The Act defines:

- Health insurance
- Organisations that can provide health insurance
- Insurer obligations
- Ministerial powers
- The role of industry regulators
- Life time health cover
- Community rating
- Health insurance levies
- The tax rebate for private health insurance

The Act also regulates certain business activities and behaviour such as:

- Health insurance is the major activity of a fund
- Product and member definitions
- Premium discounts on products
- Waiting periods before members receive benefit payments
- Prudential standards
- Risk equalisation
- Ministerial price controls
- Takeovers and mergers.

The Act stipulates that regulators publish information to allow consumers to make more informed choices in purchasing private health insurance. For example, the PHIAC annual reports provide information on fund financial performance. PHIO annual reports and state of the health fund reports provide key performance indicators for health funds.

This information includes service quality measures. See PHIAC (2007a) for further information on the regulatory framework for health funds.

Governments use several approaches to improve the supply, quality of service and product innovation in regulated markets. Two approaches often used are (i) liberalising markets and deregulating prices, and (ii) incentive regulation. The potential application of these approaches to the private health insurance industry is discussed below.

Price deregulation

The Industry Commission (1997) challenged whether price control is necessary for health insurance products in its inquiry into private health insurance. It stated that price control would not achieve fund solvency, prevent anticompetitive behaviour among funds or protect consumers from excessive premium increases for the following reasons. Prudential standards are a more direct means to ensure funds are solvent. Regulating premiums would not deter anticompetitive behaviour among funds because the private health insurance market had 'few barriers to new entrants other than low expectations of profitability and the impregnability of mutual funds to 'hostile' takeovers (IC 1997, p. xxxiv)'.[17] Indeed, price controls could deter new entrants, which limits product innovation and competitive pressures to minimise costs – 'thus keeping average premiums higher than necessary (IC 1997. p. 327)'.

The Commission noted that health insurance premiums largely reflect benefit payments. Consequently, examining proposals such as improved contractual arrangements between health funds and hospitals to reduce the cost and increase the quality of patient care is a more efficient way to reduce the growth in premium increases.

A recent editorial in the Australian Financial Review also advocated price deregulation for private health insurance products. It said:

> … micromanaging health funds is not going to help them consolidate and grow stronger, more competitive and better able to deal with the challenges of an ageing population and client base, soaring costs of medical technology and doctors' increasing willingness to order costly treatments. As in other industries, capped prices are a recipe for stifling innovation, rewarding mediocrity and penalising success…
>
> If the government allowed market forces to take their course, and consumers to choose, the Health Minster and her bureaucrats would not have to waste valuable time trying to set premium rates fund by fund and could save on the costly health insurance debate. They could then devote more effort to solving bigger challenges – reform state-run hospitals, increasing spending on prevention and making someone responsible for getting the best health-care outcomes for the taxpayers and the public (AFR 2008a, p. 70).

Governments often introduce price caps to protect consumers from firms that can potentially exploit market power to charge excessive prices. However, market power

[17] Fund takeovers are now permissible under the current Act that governs the industry.

declines as markets become more contestable.[18] Thus, the need for consumer protection declines. Economic theory suggests that contestable markets with clearly defined property rights, low bargaining costs of buying and selling goods and services, and deregulated prices provide better price and service quality outcomes for consumers than regulating markets that are not subject to market failure - natural monopoly, information asymmetries and externalities, for example (Coase 1994; North 1990). Australian consumer legislation and competition policy and law (among other things) prohibits anticompetitive behaviour further protects consumers from excessive prices.

Regulators often possess imperfect information to set prices that mirror contestable market outcomes. Furthermore, unlike market prices, regulated prices do not respond quickly to sudden changes in the supply and demand for goods and services. Consequently, there is considerable risk that regulated prices are set too low which restricts investment, product innovation and the supply of goods and services or are set too high which reduces consumer welfare. Yarrow (2008) suggests that a regulated price cap that is set above the market clearing price provides a focal point that can potentially encourage collusion among firms to reduce the diversity of goods and services offered to consumers. Community welfare is subsequently reduced because consumers have less knowledge about these 'standardised' goods and services and firms charge higher prices than would otherwise prevail in a deregulated market. Moreover, further reductions in consumer welfare are possible because the regulated price cap is approved by a regulatory authority which conveys the misleading impression the standard product or service is a good deal. This reduces the incentive for consumers to search for better deals.

Over the last two decades, consumers and businesses in Australia and overseas have benefited from deregulated prices in diverse activities like infrastructure services, such as airport services and power generation, wholesale and retail energy markets for electricity and gas, and telecommunications (see for example, Yarrow 2008, Australian Energy Markets Commission [AEMC] 2008 and Productivity Commission 2007). The benefits included the additional supply of innovative services, improved reliability of service and lower prices. In Australia, consumers experienced similar benefits in deregulating the prices of certain agriculture products (e.g., dairy, wool and wheat) and financial services like home mortgages. This experience suggests that contestable markets deliver innovative goods and services demanded by customers at least cost compared to price regulation of competitively supplied goods and services.

The recent AEMC[19] review of the effectiveness of competition in the retail electricity and gas markets in Victoria[20], which was commissioned by the Ministerial Energy Council,[21] found effective competition existed among retailers, and that:

[18] A contestable market has low barriers to entry and exit. Thus, it may have one or a few firms but the potential threat of new entrants restricts the ability of the incumbents to charge excessive prices or provide poor quality of service.

[19] Under the Australian Energy Market Agreement, AEMC is responsible for developing national energy markets for electricity and gas and associated market rules. It is also responsible for evaluating the competitiveness of State and Territory retail energy markets to decide whether price regulation be removed,

> The removal of price regulation in Victoria can further extend the benefits of competition to consumers by enabling them to choose from a wider range of energy products and options (including tariff innovation) than is currently the case. Where competition is facilitating the delivery of efficient outcomes there is no need for retail price regulation. Indeed, price regulation in an effectively competitive market is costly in terms of administration, compliance and the distortions it imposes on effective functioning of the market to the detriment of consumers (AMEC 2008, p. vii).

Established prudential and consumer protection legislation for the retail market that address potential market failures such as the inability of consumers to obtain the necessary information to compare and assess the value of competing retail products further lessens the need for price regulation. Other regulatory requirements such as the obligation of retailers to supply electricity and gas to less profitable customers, official price monitoring and a consumer awareness and education campaign of the proposed changes to the retail market provide further support for price deregulation (AMEC 2008). However, the Victorian Government still retains the option to reintroduce price regulation if retail energy prices become excessive or market behaviour impedes competition

The lack of public awareness and information of the influence of the political and regulatory complexities (e.g., Commonwealth commitment to community rating) on the price of private health insurance products and productivity of health funds potentially erects high barriers to the immediate deregulation of premiums. However, these barriers are not insurmountable as Scandinavian countries like Norway successfully deregulated electricity retail markets without price controls.

One approach to raise community awareness about the effects of the regulating the price of private health insurance on individuals, the funds and the economy is for the Commonwealth to publicly release a regulatory impact statement (RIS) on the matter. An RIS is required for Commonwealth regulation that has a significant impact on businesses, individuals or the economy (Australian Government 2007). This exercise would set out the objectives of the current price controls for private health insurance and assess the net benefits of the approach on individuals, the funds and the economy (Commonwealth 2007). Alternative approaches that potentially deliver more efficient

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retained or reintroduced. Victoria was the first jurisdiction to have its retail energy markets reviewed by the AMEC.

[20] There are 21 energy retailers in Victoria. Initially, retail energy products in Victoria and other states were provided by government monopolies. But over time, the competitive behaviour in retail energy markets was nurtured through several public policy initiatives like the restructure of the government monopolies into separate public and private generation, transmission and retail assets, the development of a national energy market and retail price caps. .

[21] The Ministerial Energy Council was established by the Council of Australian Governments under the Australian Energy Market Agreement as the national and governance body for the Australian energy market. The agreement requires, among other things, that the States and Territories remove retail price regulation if there is effective competition in their respective retail electricity and gas markets. Social welfare and equity objectives are to be funded through transparent community service obligations that do not restrict competitive retail markets.

and effective means to achieve the objectives of price regulation such as price deregulation are also required to be considered in the RIS.

Otherwise, the Commonwealth could immediately deregulate premium prices and have the Australian Consumer and Competition Council (ACCC) officially monitor and report to it on premium prices. Similar arrangements apply to airport charges, medical indemnity insurance premiums and petrol prices. An alternative and less intrusive approach is to deregulate private health insurance premiums without ACCC price oversight. Community concerns over premiums could be referred to the ACCC by the Commonwealth for a public investigation and report. The ACCC recently completed a similar exercise into grocery retail prices.

To sum up, premium deregulation will encourage health funds to provide a greater diversity of health insurance products, including cheaper private health insurance options. This outcome provides the Commonwealth with an opportunity to review the merits of maintaining current industry assistance, especially subsidising premiums for all policy holders. However, the review must consider the current (or potential changes to) public funding for Medicare to assess the net benefits to the community of altering industry assistance. An evaluation of healthcare financing is beyond the scope of this paper. However, the National Health and Hospitals Reform Commission is conducting a review of the Australian healthcare system, and healthcare finance is included in the review (Rudd and Roxon 2008).

That said, a more modest proposal - the introduction of incentive regulation for management expenses – would still improve health fund performance and community welfare. Over time, this approach will allow the industry to transition to more effective competition in the provision of private health insurance products. A similar staged approach to liberalise retail electricity and gas markets was undertaken by UK energy regulators (Yarrow 2008). The local national energy regulator is recommending a similar approach be adopted for the Victorian energy retail market.

Incentive regulation

Incentive regulation is widely used in Australia and oversees to help set prices in utility and transport industries such as electricity, gas, water and rail, which traditionally have natural monopoly characteristics. Utility and transport price determinations reflect efficient costs and expected productivity gains for the industry . Thus, incentive regulation tries to establish competitive prices for natural monopolies.

In Australia, setting utility and transport prices is a transparent process. Utilities and transport providers submit information on future demand, non capital and capital costs, and quality of service to the relevant regulator to help it form a view on efficient costs. This information is released for public comment. Utility and transport regulators also use several benchmarking techniques like partial productivity measures, and more sophisticated approaches such as DEA and SFA, to develop views on efficient costs and previous trends in industry productivity growth (see for example, IPART 1999b and

Carrington, Coelli and Groom 2002). The techniques combine multiple inputs and outputs to produce single measures of productivity. Benchmarking is one approach used by regulators to mitigate information asymmetries on utility performance (Carrington, Coelli and Groom 2002; Coelli et al 2003).

Regulators are often required to determine the total revenue requirement for a utility or transport provider, which must reflect the efficient cost of services provided (see for example, IPART 2004). The cost components (or the *building blocks*) used to assess efficient costs are non capital (operating) costs and capital costs (i.e., depreciation and a risk-adjusted return on capital). Once efficient costs and judgments on future productivity growth for the industry are determined the regulator sets the prices for the period of the determination, which is usually five years. Prices are capped according to a CPI-X regime, where X is the annual productivity offset that reflects the regulator's views on further productivity gains for the industry and additional incentives for the service providers to catch-up with more efficient peers.

European regulators have extended incentive regulation to include service quality targets within the utility price caps to encourage improvements in customer service (e.g., Ofgem 2004; Netherlands Competition Authority 2006). Utilities that exceed their targets can charge customers more for services. Conversely, utilities that do not meet service quality targets are required to charge customers less for services. Advocates of incentive regulation argue that it provides greater incentives for utilities to improve performance and reduces regulatory costs compared to cost-of-service regulation (Crew and Kleindorfer 1996). This form of regulation allows utilities to recover the costs of providing services to customers, which includes a reasonable rate of return on assets. Consequently, cost-of-service regulation encourages utilities to inflate costs to receive higher prices for services. Excessive costs result from over-investing in infrastructure assets to increase the return on assets and weaken incentives to improve operating costs.

The use of sophisticated benchmarking techniques improves the information available to regulators to set price caps. If X is set too high then the utility profits may deteriorate. If it is set too low then the utility may earn excessive profits. Techniques like DEA and SFA allow regulators to better assess the trade-offs in management proposals to improve utility performance through different input or output mixes or through achieving economies of scale or scope compared to partial productivity measures and financial ratios. Judgments about dynamic efficiency, which measures how organisations alter production processes over time in response to changes in consumption patterns or technology, are also possible. The techniques can identify factors beyond management control, like customer incomes, which may constrain future productivity growth (Coelli, et al 2003). Finally, DEA has an added benefit. It provides information on efficient peers for the less efficient funds, which allows regulators to better frame questions about variations in performance. In this study, DEA is used to estimate the productivity growth of health funds.

3. Literature Review

The first step in measuring the productivity growth of the health funds is to define their production frontier, which is a technical relationship that specifies how physical inputs like labour and capital are converted into outputs such as policies sold.

Health fund annual reports suggest that the major objectives of the funds are to sell health risk protection products to members, improve insurance products and the quality of customer service, act as an intermediary between health providers and fund members to help members stay healthy, improve prudential reserves, maximise the return on equity, which allows for profit funds to pay dividends to shareholders, and foster corporate relationships with the broader community.

The *Private Health Insurance Act 2007* essentially determines the outputs of the funds because it stipulates the services health funds must provide members. However, measuring the quality of service is a challenging exercise because people have different expectations of service quality, given previous experience of customer service, expectations and cultural background. Assessing the performance of health funds requires information on both quality of service and productivity. Otherwise, a health fund could improve productivity growth by sacrificing the quality of service.

The main functions of health funds are:

- Collecting premiums
- Processing and payment of claims (benefits)
- Providing information to members so that they can make more informed decisions to prevent illness, select appropriate cover and to reduce health costs
- Investing premiums
- Increasing services, product innovation, quality of service, and membership.

The major inputs of health funds are:

- Labour
- Capital (physical)
- Other inputs (e.g., materials).

The operating environment and other fund characteristics could influence health fund productivity. The operating environment is, to a large extent, beyond management control. Potential environmental variables and other fund characteristics include:

- Corporate governance – health funds are either for profit or not for profit organisations
- Membership restricted or open to the public
- National or regional operations
- Whether a fund has a higher proportion of sicker or elderly members

However, data limitations, the unknown extent of cross subsidies between health insurance products and other insurance products (e.g., travel and life insurance), and difficulties in accurately defining the quality of the outputs and the inputs of health funds place restrictions on defining the production frontier used in the study and subsequent judgments on performance. Previous health insurance studies, and studies of similar financial organisations, provide insights into how these restrictions might influence assessments of performance. The various approaches used to assess performance in these studies are discussed below.

Australian private health insurance studies

To our knowledge there are no productivity growth studies on the local health funds. Two studies by the Industry Commission (1997) and CRA International (2006) conduct analyses of relative efficiency for the industry. The studies also examine the presence of scale economies for the industry. The CRA International study is of particular interest because the Senate Finance and Public Administration Committee (2006) used it to help substantiate the view that Medibank Private be sold.

The Industry Commission studied the performance of the six major funds in 1995-96. The smaller funds were excluded from the study because it was assumed they use different technologies to provide member services. The Commission used ordinary least squares (OLS) to estimate a linear cost curve for the 27 State/Territory operations of the major funds.

Management costs per member were use to measure fund costs. The independent variables included members (both hospital and ancillary), claims per member – a composite variable which reflected the different costs in processing ancillary and hospital benefit payments per member - and a dummy variable that reflected the age of the fund (i.e., whether it was five years or older). The older funds had higher costs per member compared to the newer funds. The Commission suggested that this could reflect the lack of access to technology or weaker incentives to minimise costs.

All the independent variables were significant and the model explained nearly 75 per cent of the variation in management costs per member. Number of members had the expected negative influence on costs (implying economies of scale). The main determinant of cost variation was ancillary costs per member, as ancillary claims are more expensive to process. The cost function satisfied several (unreported) standard specification tests – including a test for the appropriate use of the simple linear functional form.

The large funds possessed scale economies. Doubling members reduced management costs per member by 20 per cent. The Commission remarked that the presence of scale economies disadvantaged entrants seeking similar market shares of the larger funds because the incumbents had lower unit costs. However, entrants could overcome this hurdle by purchasing an established fund.

The cost function residuals were used to calculate the efficiency of the health funds. The intercept was adjusted to form a cost frontier. 75 per cent of funds lay above the cost frontier. A potential 17 per cent savings ($65 million) in management costs (which was about 2 per cent of contribution income) was possible if all major funds were efficient.

The study has several limitations. First, the omission of input prices as an independent variable in an estimated cost function implicitly assumes that all funds face the same input prices for labour, capital, rent, etc. in all regions. However, cost variations are likely to include different regional input prices, which potentially hinder assessments on fund inefficiency.

Second, efficiency is assessed relative to average sample efficiency rather than best practice. Alternative measurement techniques such as DEA and SFA overcome this limitation. Third, no service quality variables were included in the analysis. Fourth, the analysis confined to one year. This precludes judgments on dynamic efficiency which may influence health fund efficiency in a particular year. Finally, sensitivity analysis was not presented to assess the influence of different output measures or choice of measurement technique on the results.

The CRA International (2006) study was commissioned by the Commonwealth Department of Finance and Administration to assist the Senate Committee investing the merits of selling Medibank Private. It used DEA to estimate the technical efficiency for 40 funds in 2004-05. The study used an input-orientated DEA model. The main focus of the study was to examine to the potential for further productivity gains for Medibank Private after it was sold, and the implications that this had for private health insurance premiums.

The outputs of the health funds were measured by coverage (i.e. the number of people covered by health insurance policies) and real investment returns. The input measures were real benefit payments, real management expenses and real assets (physical and financial). Benefit payments were included to assess fund initiatives to restrict benefit payments through demand side management initiatives and better service provider arrangements.

The CPI was used to deflate investment income, management expenses and assets, while the hospital and medical component of the CPI was used to deflate benefit payments.

The study suggested that funds were, on average, 91 per cent constant returns to scale (CRS) efficient and 95 per cent variable returns to scale (VRS) efficient.[22] In other words, funds could potentially reduce inputs by an average of 5 per cent. A further 4 per

[22]The CRS model is appropriate when funds are assumed to have optimal size (scale). However, the efficiency scores of funds that do no possess optimal size will be influenced by scale inefficiencies. The VRS model recognises that not all funds have optimal size because of government regulations, the operating environment, etc. Thus, the VRS specification allows the calculation of fund efficiency scores that exclude the influence of scale inefficiencies. Section 5 discusses this issue in more detail.

cent in input savings was possible if funds achieved optimal scale. Of the 40 funds, 13 were found to be CRS efficient and 24 funds were found to be VRS efficient. The major funds were CRS efficient or very close to CRS efficient, which suggests there is little scope of efficiency through mergers. This result is contrary to recent market initiatives that seek to merge the major funds into larger funds. Medibank Private was 99 per cent CRS efficient and 100 per cent VRS efficient.

Several environmental variables were used in a second stage regression to assess their influence on fund CRS efficiency. The variables included the number of policies, the number of people covered, benefit payments per person covered, funds that receive funding from the risk equalisation scheme, funds that are for profit organisations, and funds open to the public. The first three environmental variables were significant. The technical efficiency scores were adjusted to take account of the influence of the environmental variables using a second stage regression.[23] After adjusting for environmental differences Medibank Private could potentially increase efficiency by about 5 to 7 per cent.

CRA International concluded that Medibank Private's premiums would rise irrespective of government or private ownership given the ageing population and the increasing cost of medical care. However, it concluded that private ownership would provide Medibank with greater flexibility to achieve further efficiencies through tighter contracting arrangements with service providers, increased staff productivity, innovative products, and economies of scope. These initiatives would help offset premium increases.

The study has several limitations, which reduce the robustness of its findings. First, the behavioural assumptions that would justify the use of an input-orientated DEA model are not specified. Second, the production function is not adequately specified. Investment returns are a relatively unimportant output and something largely beyond the control of management. This variable could be excluded from the analysis, which would help reduce the dimensions of the DEA model. The output measure coverage assumes funds have similar mix of hospital table members and ancillary only members. And the unit costs of providing services to these member groups are similar.

Real benefit payments are also, to a large extent, beyond the control of management as they have little power to influence patient care provided by hospitals. If funds had greater control over benefit payments then they could improve profit margins by reducing benefits payments rather than relying on investment returns to help maintain profits.[24,25] Recent Commonwealth regulation to restrict the growth in prothesis benefit payments,

[23] See Coelli et al (2005) for further information on this method.

[24] Medibank Private recently introduced a programme that provides grants to hospitals to help improve patient health care outcomes. In 2006-07, about $2 million was allocated to 38 hospitals to improve patient care through the use of 'evidence-based practice, compliance with clinical guidelines and improved pain management' (Medibank Private 2007, p. 19).

[25] US private health insurers place greater reliance on market processes to achieve greater control in reducing the cost of health care services through the use of managed care. Managed care covers several contractual arrangements between the insurers and hospitals and physicians to deliver certain treatments and quality of care for specified costs.

which were about 13 per cent of hospital treatment benefit payments in 2006-07 (PHIAC 2007a), provides additional support that funds have little power to reduce benefit payments.[26] Furthermore, net margins appear considerably higher for private hospitals compared to private health funds (ABS 2007; PHIAC 2005). Thus, it is difficult to argue that benefit payments is an input measure for health funds. However, given the lack of management control over benefit payments, it could be used as an output measure in an efficiency study for funds to reflect the work involved in processing members claims. Indeed, the Industry Commission used member claims per member as an output measure in its health fund efficiency study.

The inclusion of relative benefits payments as input measure in the study provides an additional problem because the relatively high efficiency scores produced by the study are, to a large extent, the result of the high correlation between coverage and benefits paid. Thus, the inclusion of these two measures in the study could arguably provide a misleading impression of fund performance.

Real physical and financial assets are a measure of capital stock instead of the flow of capital services, which is the appropriate input measure. Further, measures of technical efficiency should exclude the financial assets. The use of the CPI to deflate management expenses may not accurately reflect input price changes for the industry.

Third, DEA is susceptible to outliers in the data, but efforts to screen the data for outliers are not mentioned. Fourth, the reasons for including certain environmental variables are not clear. For example, management would normally seek to influence variables such as policy holders and persons covered. Furthermore, the number of persons covered is used as an output measure in the DEA model. Including it in the second stage regression will bias the coefficient estimates because the residuals are linked to the dependent variable. And multicollinearity is likely to be present because the environmental variable is essentially regressed against itself.

Fifth, no service quality variables are included in the analysis. Sixth, the analysis is confined to one year. This precludes judgments on dynamic efficiency[27] which may influence health fund efficiency. Finally, sensitivity analysis on how different input and output measures and the choice of technique influence the technical efficiency of health funds was not presented.

Studies on other insurance products and financial services

The literature that conducts efficiency analyses of financial organisations like banks and insurance companies have generally adopted one of two approaches to specifying variables in the production technology: the transactions approach and the intermediation

[26] See Doyle (2007) for further information on the regulatory framework that covers the listing of approved prostheses products that are eligible for benefit payments, and the setting of the benefit payments for prostheses.

[27] Dynamic efficiency refers to the ability of funds to alter technologies or products in response to changes in demand or production opportunities over time.

approach (Berger and Humphrey 1997). Under the first approach institutions produce services for customers. For example, institutions complete transactions and process documents like paying insurance claims. Consequently, institutional output measures reflect the number and type of these activities. Only physical inputs to complete these activities are included in the transactions approach. However, information on this type of firm activities is often difficult to obtain from secondary sources.

The second approach views financial organisations as intermediaries that allow borrowers to use depositors' savings (e.g., Kirkwood and Nahm 2006; Ray 2007). Firm transactions and document processing are assumed to be proportional to the stock of financial assets held by an institution (Berger and Humphrey 1997).[28] Output measures reflect the value of financial assets such as reserves, loans and investments. Under this approach, financial assets are included along with the physical inputs because the institutions require the funds for their intermediary role. This information is readily obtained from the annual reports of financial institutions.

Controversy surrounds the classification of deposits as an input or an output measure. Deposits are part of the financial assets that are used to create the intermediary role for institutions. However, deposits also have output characteristics because they are associated with activities like interest payments to customers and safe deposit. Clearly, the approach used to measure performance potentially influences judgments about a firm's relative efficiency and productivity growth. The transaction approach appears better aligned with production theory compared to the intermediary approach. However, the choice of approach is largely dependent on the information available for the analysis.

Insurance studies often use the transactions approach (e.g., Greene and Segal 2004, Griffell-Tatjé, and Perelman 2001). Insurance companies predominately provide risk bearing/risk protection services for consumers rather than intermediary services. Output measures that reflect business lines or services provided during the year are used to approximate firm activities.

Premiums are often used to measure the risk protection services. As an output measure, premiums have attracted criticism because it is a combination of price and quantity. Studies that use panel data deflate premiums by a CPI to overcome this issue (e.g., Fuentes, Griffell-Tatjé, and Perelman 2001). However, the CPI may not adequately reflect premium changes.

Instead of premiums, Cummins and Zi (1997) used benefit payments for various life insurance products to measure the risk bearing and risk pooling services provided by life insurance companies. However, Greene and Segal (2004) argued that benefit payments represent past obligations rather than a measure of current output. However, as noted in the Industry Commission study, benefit payments can measure staff transactions - processing member claims, for example.

[28] An implicit assumption underpinning this approach is that transactions costs for various loans are similar. For example a bank that specialises in car loans has similar transactions costs to a bank that specialise in home loans.

Greene and Segal (2004) used number of new polices sold to approximate the risk bearing/risk pooling services provided by life insurance. Accident and health policies provide risk protection services only. Premiums were used to measure this output as they could not estimate the risk associated with each new policy.

Life insurance studies often use a combination of the transactions and intermediary approaches. For example, US life insurance companies' outputs are life policies, annuities, accident and health polices and investment income. The investment of premiums and annuity considerations is considered an intermediary service; consequently, it is included as an additional output. Cummins and Zi (1997) measured the investment of premiums and annuity considerations by additions to reserves. However, additions to reserves are also influenced by when policies mature. Greene and Segal used two measures to measure investment income: annuity considerations and the value of investments. The larger the annuities the larger the expected return on investing the annuity considerations. The value of investments measures the effort in investing premiums.

Fukuyama and Weber (2001) used the intermediary approach to assess the productivity growth of Japanese non-life insurance companies. The authors use reserves, loans and investments as an output measures to represent the financial services provided by these companies. The output measures were deflated by the Japanese CPI.

Input measures vary widely among the insurance studies because estimated production technologies differ and there are different data limitations. Fuentes, Griffell-Tatjé, and Perelman used two input measures: labour costs and other outlays. Labours costs include wages and commissions paid to intermediaries. Other outlays include capital consumption and purchases of supplies and equipment. The inputs were deflated by the Spanish CPI.

Cummins and Zi used three inputs: labour, financial capital and materials. The price of labour is measured by a premium weighted wages indexed. The average US weekly wages for each state is weighted by the proportion of premiums collected in each state. The price of capital is measured as a three year moving average of net income to equity. The price of materials is calculated by a Divisia index of the deflators of the major components of non labour inputs purchased by insurers.

The deflators used in this study have several limitations. First, premiums may not provide the appropriate weights to combine state wages as it has a price and a quantity component. Therefore, states of similar size could receive markedly different weights because insurance prices are higher in one state compared to the other. Second, wages could reflect differences in price and the compositions of labour rather than the price of labour. Even if wage rates were similar across states the price of labour could differ.

Third, the price of capital includes both debt and equity. An insurance company may have a higher return on equity because it has borrowed more than another company.

Furthermore, the current capital price deflator reflects the stock of capital and not the flow of capital services. The price of physical capital is not included in the study.

Greene and Segal used three inputs: labour, capital and materials. The price of labour is calculated as the total cost of employees and agents employed by the companies divided by total employees and agents. Capital consists of financial and physical capital. Financial capital is defined as the book value of equity plus the asset valuation reserve. Physical capital is the sum of capital expenses: rent, rental of equipment and depreciation. The price of capital is defined as the opportunity cost of holding financial capital and is measured as the ratio of 5 years' return on equity to return on investments over the same period. The limitations of this price deflator are discussed above. Materials are measured as operating expenses less labour and capital costs. The use of materials is principally related to the number of policies sold or terminated during the year. Thus, the price of materials is defined as the related expenses of selling and terminating policies during the year divided by the total number of policies sold or terminated. The approach used to define the price of materials could produce negative values for materials as it is often difficult to measure capital accurately.

Fukuyama and Weber (2001) use two inputs, which are labour and capital. Labour is measured by the number of full-time equivalent office workers and internal personnel. However, this measure does not account for differences in the composition and quality of staff. Furthermore, insurance companies that use contractors will appear relatively more productive compared to those that do not use contractors.

Capital is measured by the asset value of movable and immovable equipment and buildings and is deflated by the CPI. This measure has several limitations. First, the stock of assets does not measure the flow of capital services which is the correct input to be measured. Second, asset values can vary according to accounting methods used by the insurance companies to value assets, and the age of the assets. Older assets will have less value under historic accounting compared to, say, the replacement cost valuation method. Finally, deflating capital values by the CPI may not accurately reflect changes in the price of capital.

Several studies examined the influence of organisational form on firm efficiency. Cummins and Zi use parametric and non parametric tests to assess the influence of mutual and stock forms on the efficiency of US life insurance companies. By contrast, Greene and Segal included a dummy variable for similar organisational forms directly in the estimated stochastic cost function for US life insurance companies. The dummy variable had a value of one for mutual companies and zero for stock companies.

Assessment

The literature review suggests that there are several challenges to obtaining robust estimates of health fund performance. Few studies specify the ideal production function for insurance and other financial services. Consequently, it is difficult to judge the degree of bias in the efficiency or productivity growth results given the data limitations

faced by researchers, especially those that use the intermediary approach to measure performance. Specifying the theoretical production would assist whether input and output measures used in the analysis are correct – for example, is benefit payments an output or an input of health funds? And it would help clarify the limitations of the assumptions that underpin the intermediary approach, which are often not acknowledged. The influence of quality of outputs and inputs on performance was rarely considered in the studies.

Input and output measures vary in quality, especially capital measures. Developing appropriate input and output price deflators requires detailed knowledge of company operations and finances, which is often not available. Consequently, alternative deflators like the CPI are used which may inadequately reflect actual price changes. Finally, analysis of the sensitivity of performance to model specification, input or output measures or choice of benchmarking technique was rarely considered.

4. A Model of a Health Insurance Provider

The transactions approach is selected to assess the productivity growth of health funds because it is aligned with production theory, which provides the best description of how health funds convert inputs into outputs to achieve corporate objectives. Moreover, there is less controversy over specifying the input and output measures for health funds compared to the intermediary approach. The approach is consistent with previous Australian health insurance studies and several studies that assess the performance of broader financial services, especially the insurance industry.

The productivity growth model used in this study examines the potential for funds to increase outputs such as expanding market share through attracting new membership or selling additional insurance to existing members, or improving quality of service given existing management expenses, which include capital costs. Health fund annual reports suggest that insurers seek to maximise outputs but are conscious of reducing costs. We judge that maximising outputs is the dominant objective for the health funds, especially the larger funds. This observation is consistent with recent market proposals to merge health funds.

Our approach to measure productivity growth seeks to improve on the use of unit management expenses by PHIAC to assess the efficiency of health funds to meet industry average unit costs rather than best practice unit costs. Hence the incentives for health funds to minimise costs is arguably weakened. Unlike the CRA International study, total costs (i.e., benefit payments, management expenses and capital costs) are not used in the study for several reasons . First, PHIAC does not focus on total costs when assessing fund efficiency. Second, as discussed above, it is not clear whether funds can control benefit payments.

Proposed models

Table 2 presents the models developed for the study to assess individual fund and industry productivity growth and relative efficiency. Model 1 is the preferred model. Membership is separated according to members covered by different types of hospital policies which includes hospital only cover and hospital and ancillary coverage, and those covered by ancillary only private health insurance. The complexity and time to process claims for these types of members is assumed to differ. The findings of the Industry Commission study support this view. Regulators used a similar approach to recognise differences in resources used to deliver energy services to different customer groups (IPART 1999b).

Table 2: Health fund DEA models

Measure	Model 1	Model 2	Model 3	Model 4
Outputs				
Membership coverage		√		√
Membership coverage – hospital only and hospital and ancillary	√		√	
Membership coverage – ancillary only	√		√	
Real total revenue	√	√		
Inputs				
Real management expense	√	√	√	√

The preferred model allows for differences in the scope and quality of health insurance products offered by health funds. It also allows for differences in the mix of hospital insurance products and ancillary only insurance products.

Output measures reflect the services provided to members, which as mentioned above, is a proxy for firm activity. Output measures are members or types of member serviced and total revenue. Total revenue includes premiums and returns on investments. The ABS uses premiums to derive measures of private health insurance output in the National Accounts (ABS 2000).[29] Most insurance studies use premiums to measure demand for services.

[29] The ABS develops gross operating surplus (GOS) measures for non life insurance companies (which include health funds) in the following manner. Premiums are considered to have two components: a service charge and a payment to cover the risk on providing insurance. The service charge comprises premiums earned plus income earned on technical reserves less expected claims. Technical reserves are defined as unearned premiums (premiums are paid in advance) less claims incurred but not yet paid. Thus the GOS for non life insurance companies is calculated as the 'insurance service charge plus explicit service charges plus gross rental income from dwellings or commercial buildings plus non insurance business income plus subsidies less operating expenses (excluding the consumption of fixed capita) less consumption of imputed financial services plus the capitalised software adjustment' (ABS 2000, p. 305).

Cummins and Zi (1997) used benefit payments as output measure to proxy fund transactions undertaken to satisfy demand for services. Benefit payments and premiums are highly correlated because funds typically set premiums according to expected claims. Thus, excluding benefit payments in output will not significantly influence the results of the study. Including both premiums and benefits paid as outputs would introduce estimation bias in the analysis.

Investment income is a relatively small proportion of total revenue. Thus, it is a relatively unimportant output for health funds. Most health fund investments are held as cash or interest bearing assets (PHIAC 2006b), which limits the time and effort managing these investments compared to property or equity holdings. Moreover, investment returns are often volatile and beyond the control of management. Consequently, investment revenue is combined with premiums, to create a total revenue variable. Total revenue is subsequently deflated by an index of premium increases, to create a real total revenue variable. The premium deflator is discussed further in the section 6.

Financial information is only available for inputs. A single input measure managerial expense, which includes physical capital costs, is used to measure health fund inputs.[30] Managerial expenses are deflated by an index that measures input price increases. The deflator is discussed further in section 6.

The preferred model does not provide any incentives for health funds to improve commercial arrangements with health care providers to increase quality of care or reduce treatment costs or both. Accordingly, the model implicitly assumes a cost pass through mechanism similar to that used regulators to allow utilities to share foreseen but uncertain additional or decreased costs with consumers that occur during the regulatory period – changes in government taxation or regulatory policies such as compulsory changes in service standards, for example (IPART 2004). The additional costs or savings are not included in a utility's cost building block but are accounted for the in a pass through mechanism. Consumer prices are increased or decreased according to the incremental costs or savings.

The inclusion of benefit payments as an input could potentially introduce incentives for health funds to improve performance. However, as noted earlier, this approach has several limitations. First, health funds do not appear to have control over benefits paid. Consequently, the Commonwealth appears to allow the funds to pass on most hospital and medical practitioner costs through capped premium increases. Second, benefit payments is highly correlated to the output measures used in the study. Hence, the inclusion of this variable as an input in the preferred model would produce artificially high relative efficiencies for the health funds, which would distort judgments on individual fund and industry performance.

On average, ancillary-only members contribute about 10 per cent of total revenue. Therefore, Model 2 is used to assess the scope for further simplification of the production

[30] PHIAC includes depreciation but excludes a return on capital in management expenses. This is discussed further in section 6.

process for health funds. The model assumes that heterogeneity of insurance product offerings and members is not important in assessing performance.

Models 3 and 4 rank the funds' unit costs to assess performance. This approach is similar to that used by PHIAC to assess fund and industry performance. The study uses coverage per management expense whereas PHIAC uses member contribution income per management expense. The use of frontier techniques to estimate unit cost models permit assessments of fund and industry efficiency relative to observed best practice and scale inefficiency. PHIAC's benchmarking approach is silent on these matters.

5. Methodology

In this paper we use data envelopment analysis (DEA) methods to fit production frontiers over the sample data and then measure efficiency as the distance that each health insurance provider (HIP) lies below this frontier. We also use these DEA methods to calculate total factor productivity (TFP) growth over time for each HIP using the Malmquist index methods described in Fare et al (1994) and Coelli, et al (2005). A brief description of the methods we use is now provided.

Data Envelopment Analysis (DEA)

DEA is a linear-programming methodology, which uses data on the input and output quantities of a group of HIPs to construct a piece-wise linear surface over the data points. This frontier surface is constructed by the solution of a sequence of linear programming problems – one for each HIP in the sample. The degree of technical inefficiency of each HIP (the distance between the observed data point and the frontier) is produced as a by-product of the frontier construction method.

DEA can be either input-orientated or output-orientated. In the input-orientated case, the DEA method defines the frontier by seeking the maximum possible proportional reduction in input usage, with output levels held constant, for each HIP. Alternatively, in the output-orientated case, the DEA method seeks the maximum proportional increase in output production, with input levels held fixed. The two measures provide identical technical efficiency scores when a constant returns to scale (CRS) technology applies, but can provide different scores when variable returns to scale (VRS) is assumed. In this paper an output orientation has been selected because it would be fair to assume that these HIPs (in the short run) aim to maximise membership, given the resources they have available.

Given data for N HIPs, the linear programming (LP) problem that is solved for the i-th HIP in an output-orientated DEA model is as follows:

$$\max_{\phi,\lambda} \phi,$$

$$\text{st} \quad -\phi y_i + Y\lambda \geq 0,$$

$$x_i - X\lambda \geq 0,$$

$$\lambda \geq 0, \quad (1)$$

where y_i is a M×1 vector of output quantities for the i-th HIP; x_i is a K×1 vector of input quantities for the i-th HIP; Y is a N×M matrix of output quantities for all N HIPs; X is a N×K matrix of input quantities for all N HIPs; λ is a N×1 vector of weights; and ϕ is a scalar.

Observe that ϕ will take a value greater than or equal to one, and that ϕ-1 is the proportional increase in outputs that could be achieved by the i-th HIP, with input quantities held constant. Note also that $1/\phi$ defines a technical efficiency (TE) score which varies between zero and one (and that this is the output-orientated TE score reported in our results).

The above LP is solved N times – once for each HIP in the sample. Each LP produces a ϕ and a λ vector. The ϕ-parameter provides information on the technical efficiency score for the i-th country and the λ-vector provides information on the *peers* of the (inefficient) i-th HIP. The peers of the i-th HIP are those efficient HIPs that define the facet of the frontier against which the (inefficient) i-th HIP is projected.

The DEA problem can be illustrated using a simple example. Consider the case where there are a group of five HIPs producing two outputs (e.g., full insurance and ancillary-only insurance customers). Assume for simplicity that each HIP has identical input vectors. These five HIPs are depicted in Figure 1. HIPs A, B and C are efficient HIPs because they define the frontier, while D and E are inefficient HIPs. For HIP D the technical efficiency score is equal to

$$TE_D = 0D/0D', \quad (2)$$

and its peers are HIPs A and B. In the DEA output listing this HIP would have a technical efficiency score of approximately 0.6 (or 60 percent) and would have non-zero λ-weights associated with HIPs A and B.[31]

The LP in (1) is an example of a CRS DEA model. We also estimate a VRS DEA model by adding the constraint that the lambda weights must add to one. This VRS DEA model envelopes the data more tightly than the CRS DEA model and hence it produces TE scores that are less than or equal to the CRS DEA scores. The difference between the two sets of scores is interpreted as being due to scale inefficiency. For example, if TE_{CRS}=0.6 and TE_{VRS}=0.8, then scale efficiency (SE) will be:

$$SE = TE_{CRS}/TE_{VRS} = 0.6/0.8 = 0.75, \quad (3)$$

[31] Note that the DEA output listing for HIPs A, B and C would provide technical efficiency scores equal to one and each country would be its own peer.

which implies that productivity is 25 percent below potential because the HIP is not operating at optimal scale.

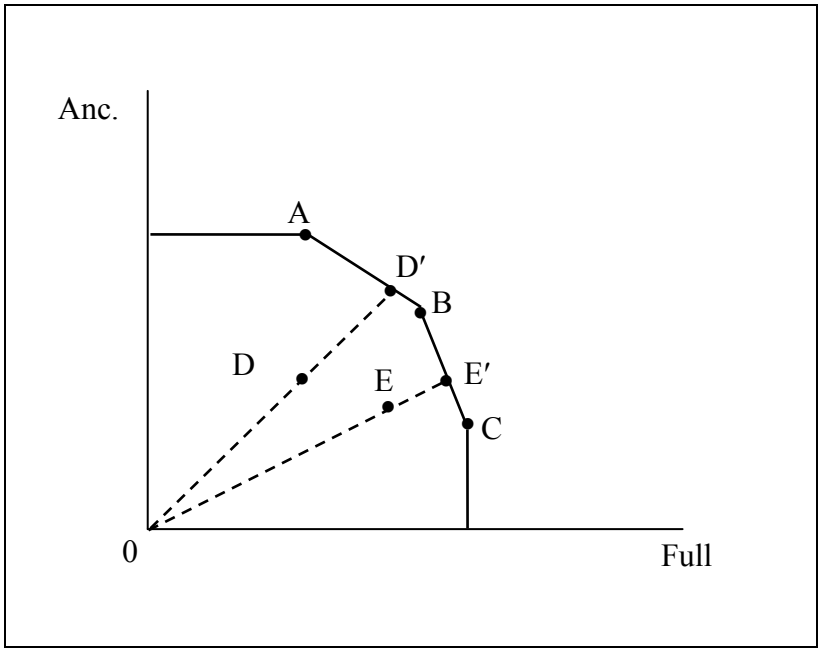

Figure 1: Output-Orientated DEA

The Malmquist TFP Index

The Malmquist TFP index measures the TFP change between two data points (e.g., those of a particular HIP in two adjacent time periods) by calculating the ratio of the distances of each data point relative to a common technology. Following Färe et al (1994), the Malmquist TFP change index between period s (the base period) and period t is given by

$$m_o(y_s, x_s, y_t, x_t) = \left[\frac{d_o^s(y_t, x_t)}{d_o^s(y_s, x_s)} \times \frac{d_o^t(y_t, x_t)}{d_o^t(y_s, x_s)} \right]^{1/2}, \qquad (4)$$

where the notation $d_o^s(x_t, y_t)$ represents the distance from the period t observation to the period s technology.[32] A value of m_o greater than one will indicate positive TFP growth from period s to period t while a value less than one indicates a TFP decline. Note that equation (4) is, in fact, the geometric mean of two TFP indices. The first is evaluated with respect to period s technology and the second with respect to period t technology.

An equivalent way of writing this productivity index is

[32] In this paper we measure these distances using DEA methods, as discussed below.

$$m_o(y_s, x_s, y_t, x_t) = \frac{d_o^t(y_t, x_t)}{d_o^s(y_s, x_s)}\left[\frac{d_o^s(y_t, x_t)}{d_o^t(y_t, x_t)} \times \frac{d_o^s(y_s, x_s)}{d_o^t(y_s, x_s)}\right]^{1/2}, \quad (5)$$

where the ratio outside the square brackets measures the change in the output-oriented measure of Farrell technical efficiency between periods s and t. That is, the efficiency change is equivalent to the ratio of the technical efficiency in period t to the technical efficiency in period s. The remaining part of the index in (5) is a measure of technical change. It is the geometric mean of the shift in technology between the two periods, evaluated at x_t and also at x_s.

Following Färe et al (1994), the required distance measures for the Malmquist TFP index are calculated using DEA-like linear programs. For the i-th HIP, four distance functions are calculated in order to measure the TFP change between two periods, s and t. This requires the solving of four linear programming (LP) problems. The required LPs are:

$$[d_o^t(y_t, x_t)]^{-1} = \max_{\phi,\lambda} \phi,$$
$$\text{st} \quad -\phi y_{it} + Y_t\lambda \geq 0,$$
$$x_{it} - X_t\lambda \geq 0,$$
$$\lambda \geq 0, \quad (6)$$

$$[d_o^s(y_s, x_s)]^{-1} = \max_{\phi,\lambda} \phi,$$
$$\text{st} \quad -\phi y_{is} + Y_s\lambda \geq 0,$$
$$x_{is} - X_s\lambda \geq 0,$$
$$\lambda \geq 0, \quad (7)$$

$$[d_o^t(y_s, x_s)]^{-1} = \max_{\phi,\lambda} \phi,$$
$$\text{st} \quad -\phi y_{is} + Y_t\lambda \geq 0,$$
$$x_{is} - X_t\lambda \geq 0,$$
$$\lambda \geq 0, \quad (8)$$

and

$$[d_o^s(y_t, x_t)]^{-1} = \max_{\phi,\lambda} \phi,$$
$$\text{st} \quad -\phi y_{it} + Y_s\lambda \geq 0,$$
$$x_{it} - X_s\lambda \geq 0,$$
$$\lambda \geq 0. \quad (9)$$

6. Data

PHIAC and PHIO regulatory statistics are used to measure health fund performance. Productivity growth estimates are produced for the period 2000-01 to 2004-05.[33] More recent data is excluded because we are uncertain how recent changes to the financial reporting framework for health funds influence costs and revenues compared to the data used in the study.[34]

Information on number of members, premiums, investment revenue and management expenses is used to create output and input measures. Consistent information on advice funds provide to members on health and policy matters was not available for individual health funds. Hence, this output was excluded from the analysis.[35]

PHIAC does not publish the components of individual health fund expenses. However, it published management expenses for 2002-03 by category for the industry (PHIAC 2003). The proportion of individual cost components to management expenses for the industry for 2002-03 was assumed to be similar over funds and the remainder of sample period. Some capital costs were not included in management expenses. Depreciation was included but a return on capital was excluded. Depreciation is assumed to be still included in the health funds' expenses in the latter years of the sample period. A return on physical capital is added to expenses for the whole sample period. The average 10-year government bond rate for the relevant year was used to calculate the annual nominal rate on return on property, plant and equipment. Capital costs are about 5 per cent of management expenses.

There were 40 health funds in 2004-05. Both small and large funds are included in the analysis because they essentially use the same labour, materials and technologies to provide similar services to members. There are some differences in capital used as the large funds possess office branch networks to provide services to members. However, capital costs for the large funds are less than 5 per cent of total management expenses. Some large funds may lease branch properties and incur additional rent compared to small funds. However, labour is the major expense incurred by funds. The industry average for labour costs is 65 per cent of management expenses. Most funds use technology advances such as websites to provide information to members and limited claims processing.

DEA results can be sensitive to outliers in the data. Descriptive statistics, ratio analysis and regression analysis were used to screen the data for outliers. The sample was

[33] The statistics are obtained from the regulators' websites – www.phiac.gov.au and www.phio.org.au.
[34] Health funds use the recently introduced Australian Equivalents to the International Financial Reporting Standards (AEIFRS) to report financial information. Under the new accounting framework there are different treatments in recognising certain revenues, asset valuations and liability valuations for health funds compared to the previous financial reporting framework (PHIAC 2006b).
[35] If providing advice to members was a constant proportion to the number of members then exclusion of this output would have little influence on the analysis.

reduced to 39 after the Reserve Bank of Australia's health fund, which is the smallest fund, was excluded because it had costs per member which were very low compared to other smaller funds. This suggests that certain management expenses are included in other bank overheads and cannot be separately identified to be reported to PHIAC.

Price deflators

Output and input price indexes were developed to deflate premiums and total expenses. The base year for the indexes is 2004-05. Premium increases were well above the CPI over the sample period. Therefore, deflating premiums by the CPI overstates real premium increases, which results in upward biased productivity growth measures if this is deflator is used.

Ideally, information on premium increases for individual fund health insurance products and associated revenue shares is required to construct the premium deflator. But this information is not publicly available. PHIAC (2007) published information for average premium increases for individual funds for 2002 to 2007, which could be weighted by fund members to create a premium deflator. However, information on fund premium increases for the earlier years of our data set is not available.

Consequently, an output price index is developed using the annual industry average premium increase to deflate premiums. However, the deflator overstates real premiums for funds that have premium increases greater than the average. For most funds premium increases occur in April each year.[36] Consequently, the average premium increase for a particular financial year is weighted by the months that the premium increase occurred in the financial year to produce the output price index.

Investment revenue was combined with premiums to create a total revenue variable, which was deflated by the premiums deflator discussed above. An alternative Tornqvist output deflator for total revenue was constructed which used the revenue shares of premiums and investment revenue as the index weights. The price series for investment revenue was approximated by the Australian Bureau of Statistics (ABS) weighted average eight capital cities - all groups CPI (ABS Cat. no. 6401.0). There was little difference in the two deflators as premiums are the major source of revenues for health funds.

A Tornqvist input price index was developed to deflate management expenses. The index had three expense categories: labour, capital costs and other costs. The weights for each category were based on the PHIAC management expense categories for 2002-03. The share weights are: labour 65 per cent, capital costs 5 per cent and other costs 30 per cent. ABS prices series are used to proxy input price changes for the expense categories. The prices series included the labour price index – finance and insurance (ABS Cat. no. 6345.0) for labour costs, private gross capital formation (ABS Cat. no. 5206) for capital costs and the CPI for other costs. See Coelli et al (2005) for further information on Tornqvist indexes.

[36] In 2000 and 2001, the average premium increase occurred in March.

Other issues

Service quality is measured by several measures of customer satisfaction, which are published by the PHIO (2005). The measures include the percentage of membership retention for two years or more, annual percentage growth in membership and the percentage of ancillary claims processed within five days.

Dummy variables are created for several fund characteristics. These include whether a fund: is a profit or non profit organisation; is an open or restricted fund; receives monies from the risk equalisation scheme; and has offices in more than one State. For profit funds are expected to have increased fund efficiency compared to not for profit funds as they have greater incentives to minimise costs or expand membership. Open funds are expected to have increased efficiency as they have a greater ability to expand membership through organic growth and mergers compared restricted funds.

Funds that receive monies from the risk equalisation fund tend to have a higher proportion of chronically ill or elderly members, which lodge relatively higher claims. The funds are required to spend greater resources servicing these members which leave less time and resources to implement strategies to minimise costs or expand membership. Thus, a higher proportion of chronically sick or elderly members within a fund are expected to decrease fund efficiency.

Funds that have offices in more than one State incur additional costs to provide services to members. However, the funds have more opportunities to achieve economies of scale, and diversify the regional risk of servicing members in particular States. Thus, the expected influence that this variable has on efficiency is unclear.

7. Empirical Results

Technical efficiency

The technical efficiency results for Model 1 (the preferred model) for 2004-05 are presented in table 3. The efficiency scores indicate the potential for health funds to increase outputs given existing inputs. An efficiency score of '1' indicates that the health fund is technically efficient. Efficiency measures were calculated for 2000-01 to 2004-05 as part of the process of estimating productivity growth for the industry. The pattern of technical efficiency change over time is presented below in the discussion of the productivity growth results for the health funds.

Table 3: Summary results: Efficiency of health funds, 2004-05

Health fund	CRS efficiency	VRS efficiency	Scale efficiency	Nature of scale inefficiency
ACA Health Benefits Fund*	0.896	1.000	0.896	irs
Aus. Health Management Groupˆ	0.468	0.598	0.783	drs
AMA Health Fund*	0.519	0.552	0.941	irs
Aus. Unity Health†	0.531	0.671	0.792	drs
BUPA Aust.†	0.742	1.000	0.742	drs
CBHS Friendly Society*	1.000	1.000	1.000	-
Cessnock District Health Benefits Fund	0.506	0.674	0.751	irs
Credicare Health Fundˆ	0.616	0.621	0.992	irs
Defence Health*ˆ	1.000	1.000	1.000	-
Druids NSWˆ	0.324	0.361	0.896	irs
Druids Vic	0.391	0.434	0.902	irs
Federation Health	0.275	0.275	0.999	-
GMHBA	0.836	0.902	0.927	drs
Grand United†ˆ	0.376	0.376	1.000	-
Grand United Corporate Health†ˆ	0.398	0.399	0.998	irs
HBF	0.907	1.000	0.907	drs
Hospitals Contribution Fund	0.703	1.000	0.703	drs
Health Care Insurance*ˆ	0.610	0.653	0.934	irs
Healthguard	0.558	0.559	0.999	irs
Health Partners	0.746	0.786	0.949	drs
Health Insurance Fund of WAˆ	0.558	0.562	0.992	irs
Latrobe Health Servicesˆ	0.446	0.447	0.997	irs
Lysaght Peoplecare*	0.830	0.845	0.982	irs
MBF	0.617	0.914	0.675	drs
MBF Health†	0.981	1.000	0.981	drs
Medibank Privateˆ	0.663	1.000	0.663	drs
Mildura District Hospital Fund	1.000	1.000	1.000	-
Manchester Unityˆ	0.376	0.483	0.780	drs
Navy Health*	0.539	0.544	0.989	irs
NIBˆ	0.499	0.758	0.657	drs
Phoenix Health Fund*ˆ	0.790	0.848	0.931	irs
SA Police Employees Health Fund*	0.718	0.745	0.964	irs
Qld Country Healthˆ	0.734	0.773	0.950	irs
Qld Teachers' Union Health Fund*ˆ	0.484	0.485	0.998	drs
Railway & Transport Health Fund*	0.481	0.485	0.991	irs
St Luke'sˆ	0.485	0.487	0.996	irs
Teachers Federation Health*ˆ	0.974	1.000	0.974	drs
Transport Health*	0.862	1.000	0.862	irs
Western District Health Fund	0.647	0.700	0.924	drs
Mean efficiency	**0.643**	**0.716**	**0.908**	
Standard deviation	**0.209**	**0.231**	**0.109**	
Minimum	**0.275**	**0.275**	**0.657**	
Maximum	**1.000**	**1.000**	**1.000**	
Efficient funds	**3**	**11**	**5**	

Notes: irs = 'increasing returns to scale and drs = 'decreasing returns to scale'.
† denotes a for profit fund.
***** denotes a restricted member fund.
^ denotes funds that had average premium increases greater than the industry average of 7.58%, which commenced in April or May 2004.

The CRS technical efficiency scores suggest, on average, that the funds are producing outputs that are 36 per cent below efficient levels, given existing inputs. There is a large diversity in performance. Three funds are technically efficient while the least efficient fund, Federation Health, is producing 72 per cent below its potential. There are no uniform features that categorise technically efficient funds. Two funds were restricted member funds. None of the larger funds were technically efficient.

Dropping the assumption that health funds are of optimal size allows for better comparisons. The resultant DEA model which, is known as the VRS model, is such that the health funds are benchmarked against funds of similar size. In this study, greater emphasis is placed on the VRS efficiency scores, because in our assessment (over the sample period) the size of a health fund was, to a large extent, beyond management control. However, PHIAC did merge a few funds in financial difficulties with funds which are financially sound. Market initiatives such as takeovers and mergers are now permissible under the new private health insurance legislation.

The VRS efficiency measure suggests that, on average, the funds are producing output levels that are 28 per cent below potential levels, given existing inputs. VRS efficiency ranges from 28 per cent to 100 per cent. Eleven funds are VRS efficient. The larger health funds' VRS efficiency is higher than the sample average because most are VRS efficient. NIB was the least VRS efficient of the larger funds. But its efficiency was still above the sample average. Medibank Private is VRS efficient which suggests there is little scope to improve operating performance by selling the fund.

Most for profit funds had VRS efficiency less than the sample average. This suggests that private ownership does not guarantee superior fund performance. Two of the poorer performing funds were transferred to other funds during 2005 and PHIAC cancelled their registration towards the end of the year. Grand United was transferred to Australian Unity and the least efficient fund, Federation Health, was transferred to Latrobe Health Services.

The results suggest that there is little incentive for funds to improve performance under the current regulatory regime. Eleven of the 18 funds that received above industry average premium increases in 2004-05 had VRS efficiency less than the sample average. Of the remainder, three funds were VRS efficient (PHIAC 2007). Under incentive regulation, the less efficient funds would receive smaller premium increases compared to relatively efficient funds to encourage improved performance.

After the funds achieve VRS efficiency there is, on average, another 9 per cent gain in scale efficiencies. The larger funds tend to be too large whereas the remaining funds tend to be too small.

Scale is a major source of efficiency gains for the larger funds. However, care is required in interpreting this result. These funds dominate the industry; consequently, they lie towards the fringe of the CRS frontier with few peers. Thus, scale inefficiency may be overstated. The larger funds are seeking to improve scale efficiency through mergers and

takeovers to establish funds to rival the size of Medibank Private. And Medibank Private is seeking to buy a smaller fund, the Australian Health Management Group, to maintain its position as largest health fund (AFR 2008b).

There is less potential for smaller funds to improve scale efficiencies through mergers. However, the funds could explore opportunities to introduce or expand shared services to mimic improvements in scale efficiencies. For example, combining back office functions like payroll, information technology and human resources.[37]

Table 4 summarises the information presented in table 3 according to fund size. The results clearly indicate that scale efficiency is the main issue for the large funds and VRS efficiency is the major issue for the smaller funds. The Wilcoxon sum rank test suggests there is no significant difference in the mean CRS efficiency scores for the large and small funds at the five per cent level of significance.[38] However, the test suggests that there are significant differences in the funds' mean VRS efficiency and scale efficiency.

Table 4: Summary results: Mean and median efficiency of large and smaller funds, 2004-05

	CRS efficiency	**VRS efficiency**	**Scale efficiency**
Large funds (n=6)			
Mean coverage (no.) 1,274,346.0			
Mean real total revenue $993,538,800			
Mean efficiency	0.689	0.945	0.725
(Std. dev.)	(0.136)	(0.098)	(0.095)
Median efficiency	0.683	1.000	0.689
Smaller funds (n=33)			
Mean coverage (no.) 64,794			
Mean real total revenue $53,525,290			
Mean efficiency	0.635	0.675	0.942
(Std. dev.)	(0.221)	(0.225)	(0.073)
Median efficiency	0.558	0.653	0.974

To sum up, there is considerable scope for health funds to improve efficiency. The potential large gains in efficiency underscore the urgency to revamp the regulatory

[37] One of the objectives of the Health Insurance Restricted Membership Association of Australia is to encourage the use of shared services among its members. Several regional funds that are open to the public are members of the association.

[38] The Wilcoxon sum rank test (also known as the Mann-Whitney test) determines whether two samples have the same probability distribution by examining the location of their medians. Thus, it is a non-parametric way of comparing the arithmetic means of two samples.

process to approve premiums. The introduction of incentive regulation for management expenses is the first step in overhauling the regulatory process. The PHIAC approach to improve fund efficiency through focusing only on fund MERs significantly higher than the industry average provides a less challenging benchmark for funds to improve performance compared to sample best practice. PHIAC does not define what significantly higher MER than the industry average is. Assuming that fund MERs greater than 20 per cent of the industry average is significantly higher than the industry average then only nine funds would be targeted by PHIAC to improve performance.[39]

MER ratio analysis limits judgments on scale efficiency because it implicitly assumes that the funds have optimal scale. By contrast, the efficiency results reveal the extent of scale inefficiency and can be used to benchmark fund efficiency to encourage mergers among the funds.

The study results differ substantially from the CRA International study, which suggested there was relatively little industry inefficiency. Indeed, 60 per cent of the funds were VRS efficient. Some differences in the results of the two studies are expected because different input and output measures are used. However, the main difference in the results occurs because the CRA International DEA model included benefits paid as an input and member coverage as an output measure. Thus, many funds are VRS efficient because these two variables are highly correlated. To test the proposition further, benefits paid was included as an input in the preferred model and the average VRS efficiency and CRS efficiency increased to 97.8 per cent and 95.3 per cent, respectively. About 60 per cent of the funds were VRS efficient.[40]

The CRA international study must be treated with caution and scepticism because it provides an artificially inflated view of performance. For example, Federation Health, which was the least efficient fund in this study, had an efficiency score of 95 per cent. Scale inefficiency, which was a major source of inefficiency for large funds in this study, was not a major issue in the CRA International study. Public inquires, such as the Senate Committee hearings on the sale of Medibank Private, that use mis-specified DEA models cannot adequately inform community debate or shape public policy.

Model specification is an art and not a science. A good understanding of the production process for health funds is necessary to develop robust models to assess performance. Like any model, the models used in this study present a simplified view of the real world. Models cannot reflect all the factors that influence health fund performance otherwise they lack explanatory power. Only those factors considered most important in the production process are included in the analysis.

A more rigorous approach to specifying the input and output measures for health funds produces DEA models with fewer dimensions compared to the CRA International study. Consequently, the models used in this study have better explanatory power because DEA

[39] The industry average MER was 9.5 per cent in 2004-05. A 20 per cent increase above this benchmark is 11.9 per cent. Thus, funds with a MER greater than 11.9 per cent would attract the regulator's attention.
[40] The results of this exercise are available from the authors.

has less trouble comparing funds with similar input and output mixes in our analysis, which results in a wider spread of efficiency scores.

One test of the robustness of a DEA model is to examine if it makes appropriate comparisons. A large health fund should not be compared to a small health fund. Examination of the peers and peer weights for less efficient funds in table 6 appears reasonable given the relatively small sample size. For example, MBF, which a large fund, is compared to large funds like Medibank Private and BUPA. Both peers have similar weights which suggest that MBF could benefit equally from examining the organisation structures and management practices of both funds to gain insights to improve performance. However, the greatest source of inefficiency for MBF is scale inefficiency. The MBF board and members recently agreed to merge with BUPA to form a fund similar in size to Medibank Private (MBF 2008). The enlarged BUPA fund expects to deliver a broader range of services to members with lower unit costs, which is commensurate with improvements in scale efficiency.[41]

Table 5: Peers and peer weights for less VRS efficient health funds

Health fund	Peer and peer weight		
Aus. Health Management Group	BUPA Aust.† (0.335)	Transport Health (0.665)	
AMA Health Fund*	CBHS Friendly Society* (0.106)	Transport Health* (0.504)	ACA Health Benefits Fund* (0.390)
Aus. Unity Health†	BUPA Aust.† (0.292)	Teachers Federation Health* (0.708)	
Cessnock District Health Benefits Fund	CBHS Friendly Society* (0.004)	Transport Health* (0.996)	
Credicare Health Fund	Defence Health* (0.479)	Transport Health* (0.477)	Mildura District Hospital Fund (0.044)
Druids NSW	CBHS Friendly Society* (0.001)	ACA Health Benefits Fund* (0.999)	
Druids Vic	CBHS Friendly Society* (0.136)	Teachers Federation Health* (0.864)	
Federation Health	MBF Health† (0.009)	Defence Health* (0.345)	Mildura District Hospital Fund (0.044)
GMHBA	MBF Health† (0.444)	Defence Health* (0.338)	Mildura District Hospital Fund (0.218)
Grand United†	Defence Health* (0.628)	CBHS Friendly Society* (0.337)	Transport Health* (0.035)
Grand United Corporate Health†	CBHS Friendly Society* (0.882)	ACA Health Benefits Fund* (0.178)	

[41] BUPA expects to reduce its MER to 7.3 per cent three years after the merger compared to its current MER of 8.4 per cent and MBF's current MER of 9 per cent (AFR 2008c).

Health Care Insurance*	Transport Health* (0.840)	Mildura District Hospital Fund (0.130)	Defence Health* (0.030)
Healthguard	Defence Health* (0.301)	CBHS Friendly Society* (0.564)	Transport Health* (0.134)
Health Partners	MBF Health† (0.306)	Mildura District Hospital Fund (0.694)	
Health Insurance Fund of WA	Defence Health* (0.507)	Transport Health* (0.483)	Mildura District Hospital Fund (0.010)
Latrobe Health Services	CBHS Friendly Society* (0.797)	ACA Health Benefits Fund* (0.203)	
Lysaght Peoplecare*	CBHS Friendly Society* (0.356)	ACA Health Benefits Fund* (0.476)	Transport Health* (0.168)
MBF	Medibank Private (0.518)	BUPA Aust.† (0.482)	
Manchester Unity	Teachers Federation Health* (0.825)	BUPA Aust.† (0.175)	
Navy Health*	Defence Health* (0.032)	CBHS Friendly Society* (0.412)	Transport Health* (0.556)
NIB	Hospitals Contribution Fund (0.242)	BUPA Aust.† (0.588)	Teachers Federation Health* (0.171)
Phoenix Health Fund*	Transport Health* (0.150)	CBHS Friendly Society* (0.061)	ACA Health Benefits Fund* (0.788)
SA Police Employees Health Fund*	CBHS Friendly Society* (0.172)	ACA Health Benefits Fund* (0.828)	
Qld Country Health	Transport Health* (0.728)	CBHS Friendly Society* (0.272)	
Qld Teachers' Union Health Fund*	CBHS Friendly Society* (0.956)	Teachers Federation Health* (0.044)	
Railway & Transport Health Fund*	CBHS Friendly Society* (0.540)	ACA Health Benefits Fund* (0.460)	
St Luke's	Defence Health* (0.290)	CBHS Friendly Society* (0.386)	Transport Health* (0.324)
Western District Health Fund	Mildura District Hospital Fund (0.528)	MBF Health† (0.344)	Defence Health* (0.128)

Notes: † denotes for profit fund. * denotes a restricted member fund.

The VRS efficiency scores are regressed against service quality and certain fund characteristic variables. Two funds were excluded from the analysis because PHIO did report statistics on their customer satisfaction. The analysis suggests that none of these variables were significant at the 5 per cent level of significance.[42] This result could be

[42] Similar results were obtained when the CRS efficiency scores are used as the dependent variable.

due to a degrees of freedom problem as seven explanatory variables are regressed against 37 fund efficiency scores or the measures used do not adequately measure customer satisfaction and other fund characteristics or both.[43] Further work is required to clarify these issues.

Sensitivity analysis

Sensitivity analysis involved comparing the VRS efficiency scores of the preferred model to alternative models (Models 2, 3 and 4). The alternative models produced broadly similar VRS efficiency results to the preferred model. The mean VRS efficiency scores for Models 2 and 3 were 0.683 and 0.684, respectively. The mean VRS efficiency score for Model 4 was the lowest at 0.644. The models produced similar rankings in VRS efficiency scores. The spearman rank correlation coefficient between the VRS efficiency scores for the preferred model and the alternative models varied between 0.97 and 0.95.

However, there are several important differences between the various models. The alterative models have less VRS efficient funds than the preferred model. The preferred model had 11 VRS efficient funds. By contrast, Models 2, 3 and 4 had 8, 10 and 5 VRS efficient funds, respectively. The exclusion of real total revenue from Models 2 and 4 produced a lower number of VRS efficient funds. This result is not unexpected as the preferred model has more variables than the other models. DEA models with relatively higher dimensions usually produce higher measures of efficiency because the potential number of peers for each fund has declined. Consequently, the mean efficiency scores for the alternative models are lower.

The funds that were VRS efficient in the alternative models were also efficient in the preferred model. Three of the six funds that were no longer efficient in some alternative models were close to being VRS efficient. These funds were only inefficient in Model 4. However, the VRS efficiency of the remaining funds, ACA Health Benefits Fund, MBF Health and Mildura District Hospital Fund, declined up to 82.6 per cent, 85 per cent and 79.5 per cent, respectively. These are relatively large declines in efficiency which require more investigation if the results were to be considered in setting the productivity offsets for these funds.

Model 4, which is similar to the PHIAC approach to assessing fund performance, had 23 funds with VRS efficiency less than average VRS efficiency. The average VRS efficiency for these funds was 0.408. Three funds had VRS efficiency less than 25 per cent. Sixteen funds had VRS efficiency less than 80 per cent of the sample average, and had an average VRS efficiency of 0.404. Most of these funds were also scale inefficient with an average scale efficiency of 0.939. Most funds were too small. Four funds were more than 20 per cent scale inefficient. Two of these funds were too large and two funds were too small.

The use of frontier techniques to benchmark fund performance against best practice suggests greater scope for funds to improve performance through better use of resources

[43] The results are available from the authors upon request.

and changes in size compared to PHIAC's approach to compare performance against an industry average, which does not account for scale inefficiency. As noted above, PHIAC's approach suggests that only nine funds had MERs 20 per cent above the industry average.[44]

Productivity growth measures

Table 6 presents the total factor productivity growth (TFPC) results for the private health insurance industry. The average annual TFP growth declined over the sample period by 1.3 per cent. The decline in productivity growth was principally due to an average annual decline in technical change (TC) of 3.6 per cent. This was partially offset by an average increase technical efficiency change (TEC) of 2.4 per cent per year.

Table 6: Annual average TFP results, 2000-01 to 2004-05

Year	TEC	TC	TFPC
2001-02	1.045	0.898	0.939
2002-03	1.017	0.999	1.015
2003-04	0.961	1.063	1.022
2004-05	1.075	0.906	0.974
Mean	**1.024**	**0.964**	**0.987**

Table 7 presents individual fund annual productivity growth and the components of productivity growth for the preferred model. 14 funds had positive annual productivity growth over the sample period, which was due to improved efficiency. The two funds with the best annual productivity growth were smaller for profit funds, which had annual productivity growth of 14.4 per cent and 13.7 per cent, respectively. Two large funds, MBF and Medibank Private, had the next best annual productivity growth of 5.3 per cent and 3.3 per cent, respectively.

Table 7: Annual average fund TFP results, 2000-01 to 2004-05

Health fund	TEC	TC	TFPC
ACA Health Benefits Fund*	0.993	0.979	0.972
Aus. Health Management Group	1.016	0.977	0.993
AMA Health Fund*	1.008	0.977	0.985
Aus. Unity Health†	1.168	0.980	1.144
BUPA Aust.†	1.049	0.978	1.026
CBHS Friendly Society*	1.000	0.943	0.943
Cessnock District Health Benefits Fund	0.993	0.983	0.976
Credicare Health Fund	1.043	0.963	1.005
Defence Health*	1.036	0.957	0.992
Druids NSW	0.990	0.979	0.969
Druids Vic	1.020	0.993	1.012

[44] The reader should recall that we are assessing the potential for funds to improve efficiency through the potential to expand outputs whereas PHIAC assessed the potential of funds to minimise costs to produce given outputs.

Federation Health	0.935	0.960	0.898
GMHBA	1.013	0.949	0.961
Grand United†	0.994	0.982	0.976
Grand United Corporate Health†	1.004	0.977	0.981
HBF	0.976	0.945	0.922
Hospitals Contribution Fund	1.010	0.954	0.964
Health Care Insurance*	1.014	0.960	0.973
Healthguard	1.127	0.940	1.060
Health Partners	1.001	0.976	0.977
Health Insurance Fund of WA	0.991	0.966	0.956
Latrobe Health Services	1.023	0.983	1.006
Lysaght Peoplecare*	0.955	0.945	0.901
MBF	1.079	0.976	1.053
MBF Health†	1.194	0.953	1.137
Medibank Private	1.067	0.968	1.033
Mildura District Hospital Fund	1.011	0.959	0.970
Manchester Unity	1.064	0.958	1.019
Navy Health*	0.983	0.958	0.942
NIB	1.056	0.942	0.995
Phoenix Health Fund*	1.027	0.977	1.003
SA Police Employees Health Fund*	0.988	0.976	0.965
Qld Country Health	1.050	0.911	0.995
Qld Teachers' Union Health Fund*	1.097	0.978	1.072
Railway & Transport Health Fund*	0.930	0.951	0.884
St Luke's	1.054	0.974	1.027
Teachers Federation Health*	1.034	0.956	0.988
Transport Health*	1.080	0.986	1.065
Western District Health Fund	0.908	0.938	0.852
Mean	**1.024**	**0.964**	**0.987**

Notes: † denotes a for profit fund. * denotes a restricted member fund.

A prominent feature of the productivity growth results is that all the funds had negative technical change. The frontier moved inwards over time because output growth was often considerably less than input growth for individual funds. This result corroborates the importance of recent fund initiatives to focus on both expanding membership and reducing costs to improve productivity growth.

Alternative models (i.e. Models 2, 3 and 4) were also used in a sensitivity analysis, where we obtained annual productivity growth of minus 1.3 per cent, minus 6.7 per cent and minus 6.8 per cent which is equal or worse than the productivity results for Model 1. The spearman rank coefficients between the preferred model and the alterative models were 0.97, 0.84 and 0.82, which suggests the models produce similar productivity rankings for the health funds.

The average productivity growth measures presented above are standard unweighted means. If large funds generally have better annual productivity growth than the smaller funds, this measure produces a biased assessment of industry performance. To gain better insights of industry performance, average member coverage over the sample period was used to weight (geometrically) the productivity growth results in table 8. This exercise suggests that industry annual productivity growth was 1.39 per cent, which is a

substantial improvement compared to the unweighted industry annual productivity growth of minus 1.3 per cent.

Annual productivity growth for large funds and small funds was 1.33 per cent and minus 0.07 per cent, respectively. Funds open to the public and funds with restricted membership had annual productivity growth of 1.55 per cent and zero per cent, respectively.

Comparisons with productivity growth rates in other sectors of the economy are fraught with difficulties. A sector can have impressive productivity growth, albeit from a low base, because it is undergoing reform to remove inefficiencies. Different techniques used to measure productivity growth provide added challenges to making sensible comparisons.

That said, the weighted annual productivity growth for health funds is better than the annual productivity of the market economy over a similar period. The ABS (2007b) estimated that the annual market economy productivity growth rate over 2001 to 2006 was 0.8 per cent (ABS 2007b). However, there was a wide variation in performance among industry sectors. Communications had annual productivity growth of 2.7 per cent and mining had annual productivity growth of minus 5.9 per cent. Finance and insurance, which more closely aligned to the private health insurance industry, had annual productivity growth of 0.2 per cent.

International comparisons of performance could provide more challenging benchmarks for the funds. However, this exercise faces several hurdles. First, few countries have a health system similar to Australia. Thus, it is difficult to establish close international counterparts or peers for health funds. Second, broader comparisons are difficult to make because the recent productivity studies on other insurance and banking services reviewed in this paper use relatively old data. To our knowledge, neither international statistical agencies nor the OECD publish industry sector productivity growth estimates like those published by the ABS.

Potential use in price regulation

The following discussion provides an illustration on how the PHIAC could use the DEA results to encourage funds to achieve efficient management expenses. This information, along with judgments on benefit payments and prudential standards, would help the Minister make better decisions to approve premiums. For the purpose of this discussion we assume that the efficient management expenses are set over five years according to a CPI-X regime to be consistent with utility price determinations. That said, there is no reason why incentive regulation for management expenses cannot be applied to annual premium reviews.

Table 8 presents the illustrative X-factors for the health funds. We solely rely on the results of this study to help set efficient benchmarks for management expenses as there

are no previous productivity studies for the health funds.[45] However, PHIAC could use the annual productivity growth of the finance and insurance sector or other sectors of the economy to help set efficient management expenses. We assume that the regulator requires all funds to achieve the weighted industry average annual productivity growth over the next five years of 1.4 per cent. Further, the less efficient funds have to catch up 50 per cent of their initial VRS efficiency gap over this period.[46]

We assume that PHIAC uses the VRS efficiency scores to calculate the catch-up in efficiency for funds that are not fully efficient so that they become efficient. The efficiency catch-up is one component of the X factor. However, the Dutch energy regulator used CRS efficiency scores to determine the catch-up in efficiency for electricity firms, which were previously predominately scale inefficient. PHIAC may consider a similar approach is necessary for the large health funds to achieve efficient management expenses.

Table 8: Illustrative X-factors (%)

Health fund	VRS efficiency	TFPC	Catch-up	X-factor
ACA Health Benefits Fund*	1.000	1.4	0	1.4
Aus. Health Management Group	0.598	1.4	3.7	5.1
AMA Health Fund*	0.552	1.4	4.1	5.5
Aus. Unity Health†	0.671	1.4	3.0	4.4
BUPA Aust.†	1.000	1.4	0	1.4
CBHS Friendly Society*	1.000	1.4	0	1.4
Cessnock District Health Benefits Fund	0.674	1.4	3.0	4.4
Credicare Health Fund	0.621	1.4	3.5	4.9
Defence Health*	1.000	1.4	0	1.4
Druids NSW	0.361	1.4	5.7	7.1
Druids Vic	0.434	1.4	5.1	6.5
Federation Health	0.275	1.4	6.3	7.7
GMHBA	0.902	1.4	0.9	2.3
Grand United†	0.376	1.4	5.5	6.9
Grand United Corporate Health†	0.399	1.4	5.4	6.8
HBF	1.000	1.4	0	1.4
Hospitals Contribution Fund	1.000	1.4	0	1.4
Health Care	0.653	1.4	3.2	4.6

[45] We note that IPART (1999a) used wider industry productivity growth estimates, in conjunction with industry specific studies on productivity growth, to help set the productivity offset for electricity distributors.

[46] By comparison, the Netherlands Competition Authority required electricity businesses to fully catch-up to the efficient frontier over one price determination that set prices for six years.

Insurance*				
Healthguard	0.559	1.4	4.0	5.4
Health Partners	0.786	1.4	2.1	3.5
Health Insurance Fund of WA	0.562	1.4	4.1	5.5
Latrobe Health Services	0.447	1.4	5.1	6.5
Lysaght Peoplecare*	0.845	1.4	1.6	3.08
MBF	0.914	1.4	0.7	2.1
MBF Health†	1.000	1.4	0	1.4
Medibank Private	1.000	1.4	0	1.4
Mildura District Hospital Fund	1.000	1.4	0	1.4
Manchester Unity	0.483	1.4	4.7	6.1
Navy Health*	0.544	1.4	4.2	5.6
NIB	0.758	1.4	2.3	3.7
Phoenix Health Fund*	0.848	1.4	1.6	3.0
SA Police Employees Health Fund*	0.745	1.4	2.5	3.9
Qld Country Health	0.773	1.4	2.1	3.5
Qld Teachers' Union Health Fund*	0.485	1.4	4.7	6.1
Railway & Transport Health Fund*	0.485	1.4	4.7	6.1
St Luke's	0.487	1.4	4.7	6.1
Teachers Federation Health*	1.000	1.4	0	1.4
Transport Health*	1.000	1.4	0	1.4
Western District Health Fund	0.700	1.4	2.8	4.2
Mean	**0.716**	**1.4**	**2.6**	**4.0**

To demonstrate how the X-factors in table 8 were calculated consider the second fund, the Australian Health Management Group, which had a VRS technical efficiency score of 0.598. It is required to catch up (1-0.0598)/2 = 0.201 or 20.1 per cent over five years. The catch up is equivalent to an annual compound rate of $(1.201)^{1/5}$ or 4 per cent. Thus the X–factor for the fund is 1.4 per cent plus 4 per cent which equals 5.4 per cent. Consequently, this fund is required to reduce real unit management expenses by 5.4 per annum.

The X-factors vary from 1.4 per cent for the VRS efficient funds to 7.7 per cent for Federation Health, which is the least efficient fund. The industry average X-factor is 4 per cent. Thus, premium increases could fall, on average, by about 0.4 per cent because management expenses are about 10 per cent of industry total costs.

The average X-factor is 4.6 per cent if the CRS efficiency scores are used to set the price cap for health insurance. Consequently, premium increases could decline by about half a per cent.

The benchmarking results should not be used in a prescriptive manner to set fund X-factors because the models and the data are imperfect. However, governments, regulators and business often make decisions with imperfect information. Waiting for perfect data would result in lengthy delays. That said, the results of the study are relatively robust and allow the regulator to frame tighter questions about variations in performance during premium approval process compared to the existing process to assess fund efficiency against an industry average.

8. Discussion and Policy Recommendations

The potential to reduce premium increases

The study suggests that health funds can potentially reap large productivity gains, which would help staunch premium increases. On average, health funds could potentially increase outputs by 28 per cent given existing inputs. Unit management expenses could potentially be reduced, on average, by 4 per cent per annum. Thus, premium increases could potentially decline by about 0.4 per cent per annum as management expenses are about 10 per cent of industry total costs. Premium increases could fall by about a half of a per cent per annum if health funds were encouraged to achieve scale efficiency. Further reductions in premiums are possible if the hypothetical price determination period for funds was lowered from 5 years or the less efficient funds were required to catch up more than 50 per cent of their VRS efficiency gap over the price determination or both.

However, these results are sensitive to the assumptions that underpin the DEA analysis. Further work is required to test the sensitivity of the results to choice of benchmarking technique. We intend to use the SFA method to produce Malmquist productivity indexes for the health funds.

That said, the key public policy recommendations to achieve further health fund productivity gains are regulatory reform of the premium approval process, health fund mergers and greater discipline in controlling benefit payments. Greater public transparency is required on the regulatory weight given to benefits paid, management expenses and prudential standards during the premium approval process. The use of sophisticated benchmarking techniques like DEA and SFA to help the Minister for Health and Ageing assess funds' claims for premium increases would further assist the community to reap the additional productivity gains.

Controlling benefit payments is largely achieved by the greater use of cost effective treatments by medical practitioners that are underpinned by rigorous scientific research (i.e., evidence-based medicine), and the health funds and the broader community having better access to information on private hospital performance, especially costs. Hospital

cost increases appear to be passed straight through to the public under the current regulatory price controls. Consequently, health funds and private hospitals have little incentive to improve performance.

The National Health and Hospitals Reform Commission is currently conducting a review of the Australian healthcare system, which could help identify the existing rents in the system and the beneficiaries that appropriate the rents. As part of the review, the Commission will focus on, among other things, 'health financing [and] maximising a productive relationship between public and private sectors' (Rudd and Roxon 2008, p.1). Value for money is a key principle developed by the Commission to help it assess the effectiveness and efficiency of the current health care system.

To our knowledge, only two studies exist on private hospital performance in Australia, which are quite dated. Webster, Kennedy and Johnson (1998) used several frontier techniques to develop measures of hospital efficiency. The study provided inconclusive findings on hospital performance.

The Productivity Commission (1999) assessed private hospital efficiency against several financial and partial productivity measures. Real casemix-adjusted costs per separation acute care hospitals declined by 3 per cent over 1993-94 to 1996-97. However, hospitals owned by religious organisations or charities had significantly higher real unit casemix-adjusted costs. Labour productivity increased by about 5 per cent over 1991-92 to 1996-97. The efficiency analysis suggested that for profit hospitals were more efficient than not for profit counterparts. However, private hospital profits declined over the 1990s. For profit hospitals had superior profits relative to their not-for-profit counterparts.

Research is required to update and benchmark the performance of private hospitals. This information would assist health funds to negotiate better commercial agreements with private hospitals. It would also provide prospective patients with additional information to make better decisions about the effectiveness and costs of medical treatments offered by private hospitals.[47]

[47] The Council of Australian Government's annual review of government services publishes information on the effectiveness and efficiency of public hospitals at the State level (SCRGSP 2007). The Commonwealth, States and Territories are examining options to introduce a national system to benchmark individual public hospital performance. This initiative would assist in framing the hospital funding agreement between the Commonwealth and the States and Territories (see AFR 2008d).

Medibank Private

The sale of Medibank Private is a secondary issue to improving industry productivity growth. Our results suggest that Medibank private is relatively efficient and for profit funds do not have superior performance to not-for-profit funds. That said, the private health insurance market is contestable and health funds mergers are permitted. Therefore, there are no compelling reasons for not selling Medibank Private provided the sale price (net of selling costs) reflects at least the net present value of future dividend payments to the Commonwealth.

Incentive regulation

Incentive regulation for health funds can be introduced with minimal costs. Most of the information to underpin this initiative is collected by the two health regulators. Initial steps to reforming price regulation for the industry require PHIAC to improve certain information on fund activities, improve benchmarking approaches to assess industry performance and learn from the experiences other regulators that use incentive regulation to minimise the regulatory costs incurred by the funds and the broader community.

First, PHIAC should include all capital costs in heath fund expenses. A return on capital is currently not included in management expenses. Second, it must publish price deflators for management expenses and premiums to help consumers, health funds, regulators and the broader community make better assessments about industry performance and the value of health insurance products.

Improving the price deflator for management expenses is a relatively straight forward exercise. We expect that PHIAC has access to the actual individual cost shares for fund management expenses, which is usually not published in its regulatory statistics. The current management expense price deflator used in this study assumed that the publicly available industry cost sharers for 2002-03 are constant over funds and time.

There is greater scope to improve the price deflator for premiums as the public information on individual fund premium increases funds is relatively poor. Currently, the Commonwealth publishes an average premium increase for all funds and limited information on the average premium increase for individual funds. The premium price deflator this study is based on the average premium increase across all funds. Ideally, the price deflator for premiums should reflect the premium increases for individual health insurance products, and associated revenue shares, for individual funds.

Third, PHIAC should analyse partial performance indicators over time to make judgments on potential productivity growth for the industry before developing advice to help the Minister approve premiums. The advice should include the unit costs of the relative efficient peers for a health fund rather than an average industry unit cost, which is the current practice used by the regulator. DEA and SFA provide additional information to allow funds to be benchmarked against the sample best practice.

PHIAC should consult with industry to establish an agreed set of partial productivity indicators, and to refine the DEA models presented in this paper, before benchmarking results be used to help set premiums. A potential framework to guide these discussions is the performance measurement framework developed by the Steering Committee for the Review of Government Services (2007). The committee assesses the performance of government services according to equity, effectiveness and efficiency considerations. Consequently, people can make judgments on whether increased service productivity is associated with an increase in service quality or better access to services by certain community groups.

However, the results obtained from improved benchmarking methods are not be used in a prescriptive manner to set price caps for the health funds. Judgment is still required to set premiums because models, by their nature, are imperfect. Consequently, funds should have the opportunity to comment on and challenge the initial X-factors. But they must provide additional information to substantiate claims that the initial price caps are too severe. The opportunity for industry to review and comment on initial pricing decisions is standard practice in other regulated industries (e.g., water, electricity and gas).

Fourth, PHIAC should consider closer ties with regulators (e.g., the Australian Competition and Consumer Council or the Independent Pricing and Regulatory Tribunal of NSW) that use incentive regulation and performance assessment to set utility and transport prices to gain a better understanding of the major issues in implementing and administrating incentive regulation.

Over time, the Commonwealth could consider setting premiums for five years which is consistent with utility price determinations. This reform reduces the compliance costs for funds and provides greater business certainty and confidence to develop innovative products. It also establishes an intermediary step to the eventual deregulation of private health insurance premiums.

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