

HOW EFFICIENT ARE PENSION FUND MANAGERS IN CHILE?*

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ABSTRACT The paper measures and evaluates technical efficiency among pension fund managers in Chile. Recent pension reform has established pension fund management market in nine countries in Latin America. The new pension providers compete for affiliates on the basis of fees, rates of return, and quality of service, and are subject to extensive regulation. Applying data envelopment analysis to data from Chile 1982-1999, the paper examines issues of efficiency, competition, and regulation. The analysis concludes that pension fund managers operate below the estimated “efficiency frontier”, and there is no evidence of a sustained upward trend in technical efficiency over time.

Key words: pension reform, pension fund managers, efficiency, competition, regulation

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QUÃO EFICIENTES SÃO OS ADMINISTRADORES DE FUNDOS DE PENSÃO NO CHILE?

RESUMO Este artigo se propõe a avaliar e medir a eficiência técnica dos administradores de fundos de previdência privada no Chile. A recente reforma sofrida pela previdência deu lugar a um mercado de gestão de fundos de aposentadoria em nove países da América Latina. Esses novos gestores de fundos de pensão competem por investidores através do custo de suas tarifas, dos índices de rendimento oferecidos e da qualidade do serviço prestado, estando sujeitos a uma regulamentação rigorosa. Aplicando a análise por envoltória de dados (DEA) aos dados obtidos para o Chile

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entre 1982 e 1999, examinamos aqui as questões de eficiência, competitividade e regulamentação. Nossa análise conclui que os administradores de fundos de previdência privada operam abaixo do nível de eficiência desejado, e não há previsão de que venha a ocorrer nenhuma melhora consistente na eficiência técnica desses fundos num futuro próximo.

Palavras-chave: reforma da previdência; administradores de fundos de pensão; eficiência; competitividade; regulamentação

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INTRODUCTION

The spread of pension reform in Latin America in the 1990s has replaced unfunded semipublic pension schemes with individual retirement saving plans managed by private pension fund managers (Barrientos, 1998; Mesa-Lago and Bertranou, 1998; Queisser, 1998b).¹ The establishment of a pension fund management market is one of the most consequential elements of the reform, with implications for financial and insurance markets, and for the welfare of pensioners (Barrientos, 1999).² Pension fund managers perform key functions. They collect workers' contributions into a pension fund, invest this fund in a range of financial assets, provide disability and survivor insurance, arrange pension benefits for those retiring, and provide a range of supporting services. To an important extent, the success or failure of pension reform hinges on whether pension fund managers are effective as pension providers. However, research on the performance of pension fund managers in the region is scant, and the efficiency of pension fund managers has not been addressed explicitly. This paper applies data envelopment techniques to measure and evaluate the technical efficiency of pension fund managers, and to assess the structure and performance of the pension fund management market in Chile.

Under the 1981 pension reform in Chile, dependent workers are required to contribute a fraction of their earnings to an individual retirement account with a pension fund manager, or *Administradoras de Fondos de Pensiones* (AFP). These corporations are set up with the exclusive purpose of managing retirement accounts, and are regulated by the *Superintendencia de Administradoras de Fondos de Pensiones* (SAFP).³ The designers of pension reform in Chile, and elsewhere in Latin America, planned for pension fund managers to operate in a competitive environment, albeit subject to detailed supervision and regulation. Competition extends to fees, rates of return, and quality of service, with affiliates able to transfer their accounts from one pension fund manager to another in search of a better deal. The regulation of fund managers is extensive, and covers products, fees, investment portfolios, rates of return, and standards of service and probity. Competition is held to be instrumental to the efficiency of the market, while regulation addresses information asymmetries and provides a prudential safety net.⁴

The literature on the emerging pension fund management market in Latin America is limited. Some contributions address market design issues (James and Vittas, 1996; James, Ferrier et al., 1998); regulation (Queisser, 1998a; Vittas, 1998); fees (Paredes, 2000; James, Smalhout et al., 2001); finance (Yermo, 2000); and issues of market efficiency and competition, which have been covered in evaluations of pension reform as a whole in Chile and Latin America (Diamond, 1993; Edwards, 1996; Barrientos, 1998; Mesa-Lago and Bertranou, 1998; Queisser, 1998b; Schmidt-Hebbel, 1999; Mesa-Lago, 2002). Few contributions focus on the operation of the pension fund management market (Superintendencia de Administradoras de Fondos de Jubilaciones y Pensiones, 1996; Bertín, 1997; Barrientos, 1998; James, Ferrier et al., 1998; Queisser, 1998b; Sinha, Martínez et al., 1998; Barrientos, 1999), and the efficiency of pension fund managers has not been tackled directly, despite the key role of pension fund managers in the reformed pension environment.

This paper examines the efficiency of pension fund managers. It uses data envelopment analysis to measure and evaluate the technical efficiency of pension fund managers in Chile over the period from 1982 to 1999. We focused on Chile because it is the country with the longest experience with pension reform, and because it provided a model for the structure of the market other countries have followed closely. The estimated measures of technical efficiency provide evidence on the performance of the pension fund management market over time, the limits on competition, and the effects of fees regulation on the market strategies of the pension fund managers. We found that the potential technical efficiency gains in the market are significant, and that there is no evidence of a sustained upward trend in technical efficiency over time.

The paper is organized as follows: section one outlines and discusses the performance of pension fund managers in Chile to date, identifying key efficiency, competition, and regulation issues; section two introduces Data Envelopment Analysis (DEA) and justifies its applicability to the pension fund management market; section three reports on the estimated technical efficiency measures and discusses their implications for the evaluation of the structure and performance of the market; a final section summarizes the main conclusions.

1. THE PERFORMANCE OF PENSION FUND MANAGERS IN CHILE: EFFICIENCY AND REGULATION ISSUES

This section examines the performance of fund managers in Chile and identifies key efficiency, competition, and regulation issues.

(a) Competition in the pension fund management market

Table 1 below shows key performance indicators for the pension fund management market in Chile. These indicators provide conflictive signals on the extent of competition in the market.

The number of pension fund managers oscillated around 12 in the period up to the early 1990s, when a relaxation in entry regulations⁵ led to a rise in the number of pension fund managers to 22 in 1993. A subsequent consolidation in response to strong market pressure and adverse investment returns resulted in only eight fund managers remaining in the market. Entry requirements for pension fund managers include a minimum capital requirement, a reserve of 1 percent of the pension fund,⁶ and “fit and proper” licensing by the SAFP (Yermo, 2000). The evolution in the number of pension fund managers suggests that market entry is not too difficult, and that aggressive marketing from new entrants can secure some market share initially.

The market is very concentrated. The three largest pension fund managers accounted for 63 percent of active contributors in 1982, their share rising to 67 percent in 1990, and to 75 percent in 1999. Market concentration can be explained by economies of scale in the management of retirement accounts.⁷ Miranda (1994) measured economies of scale in the Chilean

Table 1: Key Indicators of the Pension Fund Management Market in Chile

Indicator	1982	1985	1990	1995	1999
Number of AFPs	12	11	14	16	8
Largest 3 share (% contributors)	0.63	0.62	0.67	0.67	0.75
Affiliates (m.)	1.44	2.28	3.73	5.32	6.10
Contributors (m.)	1.06	1.32	1.96	2.48	2.69
Transfers (m.)		0.18	0.31	1.32	0.48
Sales personnel (,000s)	1.88	2.41	3.44	15.43	
Annual rate of return (%)	12.8	13.4	15.6	-2.5	16.3

Data Source: Barrientos (1998), Superintendencia de Administradoras de Fondos de Pensiones (several issues).

pension fund management market. Using data from a panel of pension fund managers for the period from 1982 to 1993, he estimated that, for every 1 percent rise in the number of active contributors, operational costs rise in the range of 0.6 to 0.8 percent. James et al. find substantial economies of size in asset management, and estimate, in the case of Chile, that scale economies are fully exploited when a pension fund manager “has three million affiliates and [assets of] US\$ 15 billion — half the current Chilean market” (2001, p.267).

The design of pension plans in Chile encourages an individual choice of pension fund manager, as a means of ensuring that competitive forces prevail. In order to facilitate this choice, pension products are standard, fees are uniform for all affiliates to a single AFP, and secondary products are closely regulated. Pension plan participants in Chile are expected to compare rates of return, fees and service quality between the different pension fund managers, and to transfer their accounts to the one with the best deal.

The number of transfers would seem to indicate a healthy measure of competition, but the variation in the number of transfers over time is largely explained by regulatory changes. Initially, participants wishing to transfer to another AFP had to make a request in person at a branch office, but in February 1988, the regulations were relaxed to allow participants to request a transfer through a signed form. This led to a rapid rise in transfers, further encouraged in 1992 by the aggressive marketing efforts of new market entrants.⁸ In 1987, there were 181,048 transfers, equivalent to 10 percent of active contributors, but, by 1995, the number of transfers had skyrocketed to 1.32 million transfers, equivalent to 53 percent of active contributors. The reinstatement of the requirement to apply for the transfer in person at a branch office reduced transfers to 0.48 million in 1999, equivalent to 18 percent of active contributors.

It is questionable whether a high level of transfers is an indicator of healthy competition. Abuhadba (1994) studied the determinants of transfers using a panel of monthly cross sections of individual transfers between pension fund managers for the period from April 1992 to June 1993. He regressed transfers on a range of variables including rates of return, fees and sales personnel. He found rates of return and fees had only a small impact on transfer behaviour, and returns over a longer period had little or no effect. The dominant factor was found to be the number of sales personnel

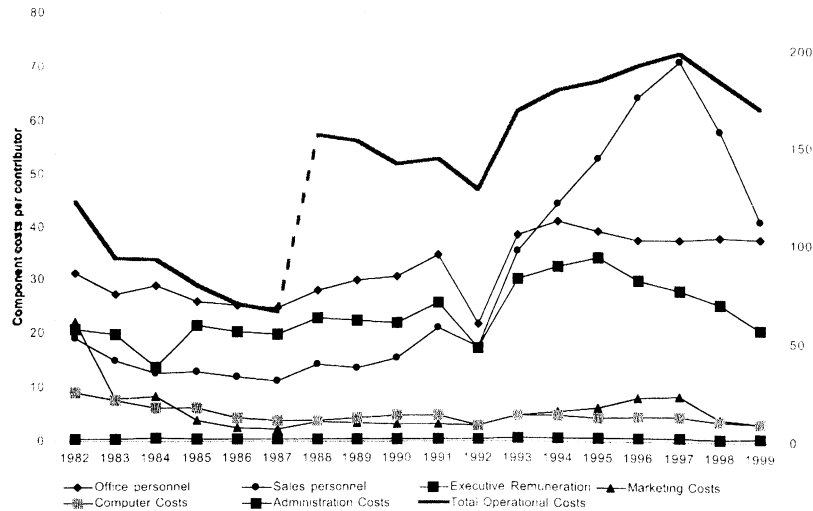
employed by fund managers. Pension plan participants appear to be fairly insensitive to differences in performance indicators between pension fund managers. This may be due to the high information costs required to make pension plan choice decisions,⁹ or to the fact that these performance differentials between pension fund managers are too small to matter. The conclusion is that competition is limited in the pension fund management market.

(b) Trends in the cost structure of pension fund managers

Information on the performance and efficiency of pension fund managers can also be extracted from the examination of their cost structure. Figure 1 shows the evolution of operational costs per active contributor. These include costs of personnel (in administration, sales and management), as well as those associated with administration, computing and marketing. To facilitate comparison across time, the series are reported in constant US\$ and per active contributor.¹⁰ Total operational costs per active contributor decline from 1982 to 1987, reflecting the spread of large setup costs across a rising number of contributors. In 1987, pension fund managers began to reinsure against disability and survivor liabilities, which is reflected in a step change in their cost structure. Operational costs decline steadily from 1988 to 1992, but they show a rising trend after 1992, accelerating later on due to the impact of new entrants. The introduction of stricter regulations on transfers in 1998 stems the rise in costs. Overall operational costs show a sustained increase over time. This runs counter expectations that competition would force pension fund managers to reduce costs.¹¹

When operational costs are disaggregated into their different components, it becomes apparent that the rise in operational costs after 1992 is explained by the rapid rise in sales personnel costs. New entrants relied upon sales personnel to capture market share by attracting contributors from existing pension fund managers, who in turn reacted by expanding their sales force to protect their market share. From 1994 onwards, pension fund managers employ more personnel in sales than in administration, and the salary costs of sales personnel are greater than the salary costs of administrative and management personnel combined. The sustained increase in operational costs over time, and especially sales costs, is not consistent with improvements in efficiency.

Figure 1: Operational costs per contributor (US\$ December 1998)



(c) Fee structure, regulation, and market strategies

Fee income is the main source of revenue for the pension fund managers.¹² It would be expected that the steady rise in their operational costs would come up against restrictions on the revenue side, but regulation effectively lifts these potential restrictions. The regulatory framework defines what services can attract fees, and the type of fees (fixed or proportional), but pension fund managers are free to decide whether or not to implement these charges, and to what degree. Fees can be levied on fund management, retirement account deposits, transfers, deposits and withdrawals from voluntary savings accounts, withdrawals from voluntary severance accounts, and pension benefit payments.

Fund managers are, as a result, free to set a fee structure that is out of line with their cost structure, but which maximises their market advantage *vis a vis* other financial institutions (Barrientos, 1998). Pension fund managers have been reluctant to use the full range of permitted fees. In order to forestall retaliation measures, they are reluctant to charge fees for transfers. In order to compete more effectively with insurance companies offering pension annuities, they have been slow to charge for the management of retirement accounts.¹³ They have never charged fees on voluntary savings and on

severance savings accounts, in order to maximise their attractiveness relative to savings accounts offered by banks. As a result, the full operational costs of fund managers fall upon regular contributors to individual retirement accounts mainly through earnings – related variable fees.¹⁴ There is a significant misalignment of their revenue and cost structures, with adverse effects on competition and performance.

Two broad market strategies have evolved in the pension fund management market. Some pension fund managers have sought to maximise market share in order to exploit economies of size in the market. At the other end of the spectrum, some pension fund managers have chosen to remain relatively small, and to focus their marketing efforts on finding and retaining high earners. This is made easier where affiliates have a strong allegiance nurtured by trade unions and other organizations. Those managers rely on a misalignment of costs and revenues. Mean operational costs are likely to decline in contributory earnings, but fee income rises directly with contributory earnings. Smaller pension fund managers can therefore absorb high operational costs by focusing on high earners, and a selective marketing strategy allows them to survive and prosper. A segmentation in market strategy could well be detrimental to competition, as well as to improvement in market efficiency.

In summary, standard indicators of performance in the pension fund management market help identify a number of issues regarding efficiency, competition and regulation in the market. The following sections seek to elaborate on these.

2. EFFICIENCY MEASUREMENT AND DATA

Data Envelopment Analysis (DEA) is a nonparametric technique which has been used to compare the technical efficiency of relatively homogeneous sets of production units. It was initially developed to compare the technical efficiency of public sector and not-for-profit production units (Charnes, Cooper et al., 1978), but, more recently, it has been applied successfully to the financial sector (Fields and Murphy, 1989; Ferrier and Lovell, 1990; Fields, Murphy et al., 1993; Nasser Katib and Matthews, 1999). It is therefore appropriate to the task of analysing the technical efficiency of pension

fund managers in Latin America, especially as these are restricted by regulation to provide standard services, and to apply similar fees and charges to their affiliates.

(a) CCR and BCC models

In DEA, efficiency is defined as the ratio between a weighted sum of outputs and a weighted sum of inputs, where sets of weights for each of the observed production units are found by solving the following model proposed by Charnes, Cooper and Rhodes (1978), referred to as the CCR model (Boussofiane and Dyson, 1991):

$$\text{Max } h_0 = \frac{\sum_{r=1}^t u_r y_{rj_0}}{\sum_{i=1}^m v_i x_{ij_0}} \quad (1)$$

subject to:

$$\frac{\sum_{r=1}^t u_r y_{rj_0}}{\sum_{i=1}^m v_i x_{ij_0}} \leq 1, \quad j = 1, \dots, n; \quad u_r, v_i > \varepsilon; \quad \forall_r \text{ and } i$$

where n indexes units, t indexes outputs, m indexes inputs, and

y_{rj} = amount of output r from unit j ,

x_{ij} = amount of input i to unit j .

u_r = the weight given to output r ,

v_i = the weight given to input i ,

ε = a small positive number.

In this model, the efficiency of unit j_0 is maximised subject to the efficiencies of all units in the set, having an upper bound of 1. The weights are treated as unknowns, assumed to be nonnegative, and will be chosen to maximise the efficiency of unit j_0 . The unit observed is relatively efficient if the efficiency measure h_0 equals 1, and inefficient if less than 1. The efficiency of all other observed units is then measured in turn.

This model can be converted to a linear form, in order that linear programming can be applied, as in:

$$h_0 = \text{Max} \sum_{r=1}^t u_r y_{rj_0} \quad (2)$$

subject to:

$$\begin{aligned} \sum_{r=1}^t v_r x_{rj_0} &= 100, \\ \sum_{r=1}^t u_r y_{rj} - \sum_{i=1}^m v_i x_{ij} &\leq 0 \quad j = 1, \dots, n, \\ -u_r &\leq -\underline{\varepsilon}, r = 1, \dots, t, v_i \leq -\underline{\varepsilon}, i = 1, \dots, m. \end{aligned}$$

With this linearization, the denominator has been set to a constant (arbitrarily set at 100), and the numerator is maximised for each unit in turn. Alternatively, the dual can be solved:

$$\text{Min } 100 Z_0 - \varepsilon \sum_{r=1}^t s_r - \varepsilon \sum_{i=1}^m s_i \quad (3)$$

subject to:

$$\begin{aligned} x_{j_0} &= Z_0 - s_i - \sum_{j=1}^n x_{ij} \lambda_j = 0, i = 1, \dots, m, \\ -s_r + \sum_{j=1}^n x_{rj} \lambda_j &= y_{rj_0}, r = 1, \dots, t, \end{aligned}$$

$$\lambda_j, s_i, s_r \geq 0 \quad \forall j, r \text{ and } i, Z_0 \text{ unconstrained}$$

Estimation of (3) generates an efficiency score for each of the units observed relative to all the others, which can be interpreted as an “efficient production frontier”. The aggregate efficiency estimated for a unit equals the product of its pure technical and scale efficiency. An alternative model was provided by Banker, Charnes and Cooper (Banker, Charnes et al., 1984), who extend the CCR model to assess pure technical and scale efficiencies of units. Their model takes account of the effects of returns to scale within the units observed and identifies the most productive scale size for each unit. It has the additional restriction that the sum of the multipliers λ_j should add to 1. The BCC model can be written as:

$$\text{Min } h - \varepsilon \left[\sum_{i=1}^m s_i^+ + \sum_{r=1}^t s_r^- \right] \quad (4)$$

subject to:

$$hx_{rj0} - \sum_{j=1}^n x_{ij} \lambda_j - s_r^- = 0, \quad i = 1, \dots, m,$$

$$\sum_{j=1}^n y_{rj} \lambda_j - s_r^+ = y_{r0}, \quad r = 1, \dots, t,$$

$$\sum_{j=1}^n y_{rj} \lambda_j = 1, \quad \lambda_j, s_j^+, s_r^- \geq 0$$

(b) Data

A key issue in the implementation of DEA is the selection of inputs and outputs. A production unit will use a variety of resources to produce a unit of output of standard quality. Ideally, one would want to include all inputs and all outputs produced by the firm, but, in practice, the selection of inputs and outputs is restricted to those that can be measured with some accuracy. The selection of inputs and outputs is also restricted by the size of the sample of units observed. Boussofiene et al. (1991) suggest that the product of the number of inputs and outputs is a reasonable indicator of the minimum number of units needed to prevent a distortion of the efficiency measure.

A further issue with the selection of inputs and outputs refers to the underlying conceptualization of production in financial services. The issue here is to identify what it is that financial providers produce. Related literature applying DEA to the banking sector has identified two different approaches (Ferrier and Lovell, 1990). One approach stresses the intermediation function of financial providers between savers and borrowers. Within this approach, the output of the banking sector can be identified as, and measured by, the value of loans extended. A second approach, the production approach, identifies outputs with banking services and products measured by the value of accounts and transactions. In many respects, pension

fund managers resemble banks, but of the two approaches mentioned, the intermediation approach is inappropriate, especially given the dedicated nature of retirement savings accounts, the restricted liquidity of retirement savings, and the strict investment regulations. The production approach is preferable. Pension fund managers employ labour services, use capital equipment and buildings, and employ marketing services to attract and retain affiliates.

The analysis below focuses on two measures of output: *total revenue* and the number of *contributors*. Inputs are *marketing and sales costs*, *office personnel and executive pay*, and *administration and computing costs*. As discussed above, competition among pension fund managers makes market share heavily dependent upon non-price advantage, that is, marketing and sales force capacity. This is captured by the first input variable. The nature of the business requires administrative competence, with a significant information technology component. This explains the selection of the other two variables.¹⁵

3. MEASURING THE TECHNICAL EFFICIENCY OF PENSION FUND MANAGERS

(a) The efficiency of pension fund managers over time

Applying DEA to the data for pension fund managers for the period from 1982 to 1999 generates efficiency scores for each fund manager in the market in each year. The average efficiency scores for the market over the period are presented in figure 2.

It will be useful to focus initially on the unweighted mean efficiency score generated using the CCR model. The time series shows three distinct phases. The first, running from 1982 to 1989, is characterized by rising technical efficiency. This is consistent with rapid growth in contributors, enabling pension fund managers to exploit economies of size, to better utilize capital equipment and branch network, and to distribute the large setup costs across more widely. At the end of the first year in 1982, pension fund managers could have provided the same services with 42.7 percent of the inputs, but, by 1989, efficiency rises to 78.5 percent, and inefficiency is down by almost two thirds. The second phase starts in 1990 and ends in

