Centre on Regulation and Competition

WORKING PAPER SERIES

Paper No. 11

THE EFFICIENCY OF PENSION FUND MANAGERS IN LATIN AMERICA

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October 2001

ISBN: **1-904056-10-5**

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Published by: Centre on Regulation and Competition,
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INTRODUCTION

The spread of pension reform in Latin America in the 1990s has replaced unfunded semi-public pension schemes with individual retirement saving plans managed by private pension fund managers (Barrientos 1998; Mesa-Lago and Bertranou 1998; Queisser 1998b)[1]. The creation of a pension fund management market is one of the most consequential effects of the reform, with far reaching implications for the evolution of the reform, and its impact upon the economies of the region (Barrientos 1999). Pension fund managers have many important functions. They collect workers' contributions into a pension fund, invest this fund in a range of financial assets, arrange disability and survivor insurance for active contributors, pension benefits for those retired, and provide a range of supporting services. The success or failure of the pension reform will come to depend on whether the pension fund managers are effective as pension providers.

The designers of the new pension schemes in Latin America aimed for the pension fund managers to operate in a competitive environment, albeit subject to detailed supervision and regulation. Competition extends to commission and charges, rates of return, and the quality of the services provided. Contributors are able to transfer easily from one pension fund manager to another in search of a better deal. This is meant to ensure that competitive pressures spur the pension fund managers. The regulation of fund managers is set by government authorities, and implemented by an ad hoc regulator. Regulation is extensive, and covers products, commission and charges, investment portfolios, rates of return, and standards of service and probity.

By comparison with issues of pension plan design, the literature on pension fund managers in Latin America is small (Queisser 1997, 1998a; Sinha, Martinez et al. 1998; Barrientos 1999). In part this is because pension reform has been established only recently in the region. Given the performance of pension fund managers to date has been mixed, issues regarding the efficiency

[1] Pension reform was implemented in Chile (1981), Peru (1993), Argentina and Colombia (1994), Uruguay (1996), Bolivia and Mexico (1997), Costa Rica and El Salvador (1998). Similar reforms have been implemented in Poland, Hungary and Kazakhstan.

and regulation of the pension fund management market must be tackled urgently. The paper aims to contribute to this literature by developing measures of the efficiency of pension fund managers using data envelopment analysis. It identifies trends in the performance and efficiency of pension fund managers, the impact of the regulation, and discusses whether market pressures or regulation explain the high costs of pension plans. The empirical work focuses on Chile because it has the longest experience with pension reform, and because it provided a model of the competitive and regulatory structure for pension fund managers which others countries have followed closely.

The paper is organised as follows. Section One provides an outline of the main features of the new pension fund management market established by pension reform. Section Two explains the focus on the efficiency of the new pension fund managers and identifies the key issues for analysis. Section Three outlines data envelopment analysis and discusses its appropriateness to the study of pension fund managers. Section Four presents estimated measures of efficiency of pension fund managers in Chile and discusses their implications.

1. Pension Reform and the New Pension Fund Managers

The 1981 pension reform in Chilean replaced unfunded pension schemes with individual retirement saving plans. In the new pension plans, dependent workers are required to contribute a fraction of their earnings to an individual retirement account with a pension fund manager. Independent workers can make voluntary contributions. The pension fund managers (*Administradoras de Fondos de Pensiones* or AFPs) supply the administration, investment and management of individual retirement accounts. The pension fund managers are corporations set up with the exclusive objective of managing individual retirement accounts, and are regulated by the *Superintendencia de Administradoras de Fondos de Pensiones* (SAFP).

The pension fund managers collect workers' contributions into a pension fund and invest this fund in a range of permitted assets. Until recently, the pension fund managers could only administer a single pension fund for all their affiliates, but regulations introduced in 1999 allowed them to offer a second fund with a fixed interest portfolio aimed at protecting workers close to retirement from the fluctuations of variable interest assets. Both these funds are insulated

from the pension fund managers' own assets, which belong to their shareholders to whom profits are distributed. The pension funds, on the other hand, are owned by the affiliates. The only flows allowed between the pension fund and the pension fund managers' assets consist of permitted deductions for commission.

2. The Performance of Pension Fund Managers: Efficiency and Regulation Issues

This section examines the behaviour and performance of fund managers against in the context of competition and regulation, and identifies the main efficiency issues to be investigated in the next section. The efficiency of the pension fund managers is crucial to the success of pension reform in Latin America, and will determine its impact upon the economies of the region. The reforms have had to establish a market from scratch, as only Brazil had a significant pension fund management market before the recent reforms (Yermo 2000). This, and the fragility of other financial intermediaries, explains the need for extensive regulation of the emerging market.

The pressures of competition and regulation largely explain the market behaviour and performance of the pension fund managers. The pension fund managers are expected to compete for business, by attracting and retaining savers. At the same time they are subject to extensive regulation, restricting their services to standard products, as well as determining the incidence, though not the level, of commissions. The regulatory framework also includes prudential regulation on pension funds' investment portfolios, minimum rates of return, and standards for information disclosure to both contributors and the regulator.

Competition in the pension fund management market

Standard market indicators provide conflictive signals on the extent to which the pension fund management market is competitive. Table 1 shows key performance indicators.

Table 1. Key Indicators of 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).

Firstly, variation in the number of pension fund managers over time suggests barriers to entry eased significantly in the 1990s. Entry requirements for pension fund managers include a minimum capital, a reserve of 1 percent of the pension fund [2], and 'fit and proper' licensing by the SAFP (Yermo 2000). The number of providers remained stable throughout the 1980s, oscillating between 12 and 14. In 1992 and 1993 the number of pension fund managers in the market rose to 22, but subsequent mergers reduced these to 13 by August 1997. A further consolidation of the market led to the number of pension fund managers falling to 8 by December 1999. The rise in the number of providers in the early 1990s was encouraged by high profit levels, and by the relaxation of entry regulations. The evolution in the number of pension fund managers suggests that market entry is not too difficult, and that aggressive marketing can initially secure market share. At the same time, the rapid decline in the number of providers from 22 in 1994 to 13 in 1997 and to 8 in 1999 illustrates the difficulties faced by new entrants in protecting their market share. The consolidation of the market in the late 1990s resulted from strong market pressures and adverse investment returns.

Secondly, the number of pension plan contributors transferring their accounts from one pension funs manger to another suggests a healthy measure of competition. The design of individual retirement pension plans in Chile encourages individual choice of pension fund manager, as a

[2] This reserve, or *encaje*, was initially 5 percent of the pension fund.

means of ensuring that competitive forces prevail. In order to facilitate this choice, pension products are standard, commissions are uniform for all affiliates to a single AFP, and secondary products are closely regulated. In theory, pension plan participants in Chile are expected to compare rates of return, commission levels and service quality across the different pension fund managers, and transfer their accounts to the one with the best deal. 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 resulted in a rapid rise in transfers, further encouraged in 1992 by the aggressive marketing efforts of new market entrants.[3] In 1987, there were 181.048 transfers, or 10 percent of active contributors, by 1995 there were 1.32 million transfers, or 53 percent of active contributors. Reinstatement of the requirement to apply for the transfer in person at a branch office reduced transfers to 0.48 million in 1999, or around 18 percent of active contributors.

It is questionable whether the high level of transfers is a good indicator of healthy competition. Abuhadba (1994) studied the determinants of transfers using a panel of monthly cross sections of individual transfers across pension fund managers for the period April 1992 to June 1993. He regressed transfers on a range of rates of return, sales and commission variables. He found that rates of return and commissions had a small impact on transfer behaviour, although returns over a longer period had little effect, but that the dominant factor was the number of sales personnel deployed by fund managers. Pension plan participants appear to be fairly insensitive to differences in performance indicators across pension fund managers. This may be due to the high information costs required to make pension plan choice decisions,[4] or to that fact that these performance differentials across pension funds are too small to matter.[5]

Thirdly, market concentration is high, suggesting that competition is limited. The three largest pension fund managers accounted for 63 percent of active contributors in 1982, rising to 67 percent in 1990, and to 75 percent in 1999, after a period of market consolidation. Pension fund

[3] Transfer charges are permitted by the regulations but have seldom been applied by pension fund managers.

[4] See Valdés-Prieto (1992) for a discussion of the complexity of the information required, and Diamond (1993) for a more general discussion of market failure in the context of insurance markets.

management market concentration in Chile can be explained by economies of scale in the management of retirement accounts.[6] The general literature suggests that economies of scale are present in banking and other financial institutions. A recent survey of research in this area concluded that the average cost curve of banking institutions shows a flat U-shape (Berger, Hunter et al. 1993). It reports that among US banks with over US $1 billion in assets, average costs appear to be lowest in the range of US $2-10 billion. In December 1995, pension fund managers pension fund assets ranged from US $ 152 to $5000 million. Mitchell (1996) studies the cost structure of different pension saving institutions and finds significant economies of scale in pension fund provision. For employer sponsored pension plans in the USA, costs rise by 0.27 percent for every 1 percent rise in assets, and 0.8 percent for every 1 percent rise in contributors.[7] Miranda (1994) measured economies of scale in the Chilean pension fund management market. Using data from a panel of pension fund managers for the years 1982-1993 he estimated a log cost function, and found 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.

In sum, there appear to be limits to competition in the pension fund management market. These derive from the regulation and from market pressures reflecting the presence of economies of scale.

The cost structure of pension fund managers and trends

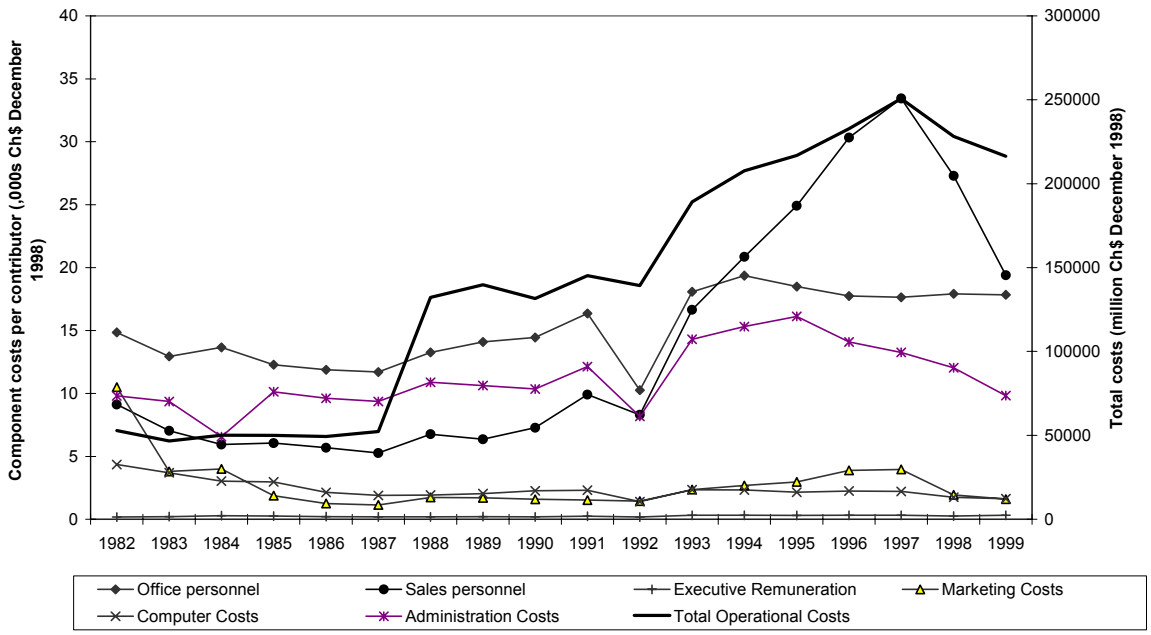
Examination of the cost structure of pension fund managers, and trends over time, provides further information on their behaviour and performance. Data on the operational costs of the pension fund managers can be obtained from their financial reports. Operational costs include costs of personnel (in administration, sales and management), as well as administrative, computing and marketing costs, and amortisation and depreciation. Figure 1 below, shows the evolution of operational per active contributor. To facilitate comparison across time, the series

[5] At issue is why are rates of return and commissions very similar across pension fund managers. Some commentators argue that regulation ensures herd behaviour among pension fund managers, while others blamed pressures from market structure.

[6] Strictly, these are economies of size rather than economies of scale. In financial institutions size differences normally involve more than a simple scale factor, and include output, as well as input, efficiency gains (Berger, Hunter et al, 1993).

are reported in constant prices. Total operational costs remained steady from 1982 to 1987, but show a steep change in 1988 which is explained by the costs of reinsurance of survivor and disability benefit liabilities.[8] From 1988 to 1992 operational costs rise steadily, accelerating later on due to competition. The introduction of stricter regulations on transfers in 1998 stems the rise in costs.

Figure 1. Operational costs per contributor and Total operational costs of pension fund managers Chile 1982-1999



When operational costs are disaggregated into the different components and are standardised per active contributor, the series that the rapid rise in sales personnel costs encouraged by the large number of new entrants in 1992 is the main factor in the rise in operational costs. Their strategy was to capture market share by attracting contributors from existing pension fund managers, hence the emphasis on sales personnel. The existing pension fund managers reacted by expanding their sales force to protect their market share. From 1994 onwards, the 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

[7] These include defined benefit and defined contribution pension plans.
[8] Prior to 1988, the pension fund managers had not sought to reinsure these liabilities.

combined. In addition the number of transfers increased generating extra costs. The new restrictions on transfers introduced in 1998 are accompanied by a fall in sales costs as transfers decline. Overall operational costs per contributor show a tendency to rise over time. This runs counter expectations that pension fund managers could exploit economies of size, or that competition could force costs down.

The impact of commission regulations

Regulation can reduce the scope for competitive behaviour on the part of pension fund managers. The general view is that regulation must be strong initially as the market is established anew, to be relaxed gradually as the market develops (Vittas 1998). Chile's experience with regulation reflects this approach. In particular, regulations on fund's portfolios have evolved to take account of market and macroeconomic changes. Nonetheless, some commentators have argued that regulation is responsible for the mixed performance of the pension fund managers. Shah (1997) argues that pension fund managers' 'herd' behaviour is a consequence of the strict regulation of pension fund portfolios reducing the scope for competition in asset management, and regulation on minimum rates of return forcing fund managers to target average market returns.

It can also be argued that the problem is that regulations are too loose. Regulations on commission and charges are important in this context. Pension fund managers charge savers commission for their services, and this is their main source of revenue. The regulatory framework defines what services the pension fund managers can charge commission for, and the type of commission, but pension fund managers are free to decide whether or not to implement these charges, and their level. Services on which charges are permitted include fund management, retirement account deposits, transfers, deposits and withdrawals from voluntary saving accounts, withdrawals from voluntary severance accounts, and pension benefit payments.

The fact that fund managers are free to set charges encouraged them to select a commission structure that maximises their market advantage *vis a vis* other financial institutions, but one which is out of line with their cost structure (Barrientos 1998). Initially, the pension fund managers charged fixed and proportional commission for fund maintenance. One effect of this was to reduce dramatically the pension fund of workers who, due to unemployment or inactivity,

ceased to contribute regularly.[9] Adverse public perception led to changes in the regulations. In mid 1983, inactive contributors were exempted from fixed commission on the fund balance, and in January 1988 this commission was eliminated for all. Since 1988, earnings-related commission charged on deposits has been the mainstay of pension fund managers' revenue. This is charged as an additional contribution over the basic contribution rate.[10]

The pension fund managers have been reluctant to use the full range of permitted commissions. In order to forestall retaliation measures, they have charged commission for transfers to other pension fund managers only very occasionally. They have not charged for the management of retirement accounts in order to compete with insurance companies offering pension annuities.[11] They have never charged commission on voluntary saving and severance saving accounts because this makes these accounts more attractive to potential savers relative to savings accounts offered by banks. This has produced a situation in which the full operational costs of fund managers fall upon regular contributors to individual retirement accounts, mainly through earnings related variable commission. As a consequence their commission structure is out of line with their cost structure, with adverse effects on competition and performance.

Competition, regulation and market strategies

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 focused instead on attracting high earners. They 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 organisations. Their market strategy relies on the fact that the overwhelming proportion of the fund managers' revenue comes from earnings

[9] There is also concern over the regressive impact of fixed commission as they have a greater impact upon low earning workers, and their accumulated pension fund.

[10] The basic contribution rate is 10 percent of earnings, and the additional contribution has fluctuated between 2.4 and 3 percent of earnings. The additional contribution includes a disability and survivor insurance premium. In December 1999, for example, the average additional contribution was 2.4 percent and the insurance premium 0.65 percent. The net variable commission was therefore 1.75 percent of earnings.

[11] In December 1999 two pension fund managers, Planvital and SumaBansander, charged fixed commission for withdrawals under the phased withdrawal and deferred life annuity retirement pensions. Two other fund managers, Cuprum and Habitat charged variable commission on the retirement fund.

related commission on retirement account deposits.[12] Operational costs, on the other hand, do not rise in line with contributory earnings. In fact, to the extent that economies of scale exist in the market, average operational costs are more likely to decline in contributory earnings. Smaller pension fund managers can therefore absorb high operational costs by focusing on high earning workers. A selective marketing strategy allows small pension fund managers to survive and prosper in the market. Competition, if effective, should result in the exit of less efficient firms, and the survival of the more efficient ones. The problem is that there are two viable strategies observed in the fund mangers' market, one of which relies on economies of scale and the other on attracting the highest earners.

The discussion in this Section demonstrates the complex interplay of market pressures and regulation shaping the behaviour of pension fund managers. It also identifies a number of important issues for investigation. It is important to evaluate the extent to which pension fund managers are efficient. It is also important to consider what are the key sources of inefficiency, and whether inefficiencies are a factor of regulation or market structure. The length of experience with pension reform in Chile provides the data needed to measure changes in pension fund manager efficiency over time. The next Section makes use of data envelopment analysis to throw light on these issues.

3. Efficiency Measurement and Data

Data Envelopment Analysis (DEA) has been used to compare the technical efficiency of relatively homogeneous sets of production units. It was initially developed to compare the efficiency of public sector and not-for-profit production units (Charnes, Cooper et al. 1978), but more recently 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 efficiency of pension fund managers in Latin America. These are restricted by regulation to providing specified and equivalent services, and to apply similar commission and charges to their affiliates.

[12] For the market as a whole nearly 95 percent of commission income came from this source in 1995.

CCR and BCC models

In DEA analysis, efficiency is defined as the ratio of a weighted sum of outputs to 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):

$$Max\, h_0 = \frac{\sum_{r=1}^{t} u_r\, y_{rj0}}{\sum_{i=1}^{m} v_i x_{ij0}} \qquad (1)$$

subject to

$$\frac{\sum_{r=1}^{t} u_r\, y_{rj0}}{\sum_{i=1}^{m} v_i x_{ij0}} \le 1, \qquad j = 1,.....,n; \quad u_r, v_i \ge \varepsilon\ ; \forall r\ and\ i$$

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 and assumed to be non-negative, and will be chosen to maximise the efficiency of the 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:

$$h_0 = Max \sum_{r=1}^{t} u_r \, y_{rj0} \qquad (2)$$

subject to

$$\sum_{i=1}^{m} v_i \, x_{ij0} = 100,$$

$$\sum_{r=1}^{t} u_r \, y_{rj} - \sum_{i=1}^{m} v_i \, x_{ij} \leq 0 \qquad j = 1,\ldots\ldots\ldots, n,$$

$$-u_r \leq -\underline{\varepsilon}, r = 1,\ldots, t, \; v_i \leq -\underline{\varepsilon}, i = 1,\ldots, m.$$

With this linearisation, 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, as in:

$$Min \; 100 \, Z_0 - \varepsilon \sum_{r=1}^{t} s_r^+ - \varepsilon \sum_{i=1}^{m} s_i^- \qquad (3)$$

subject to

$$x_{ij0} Z_0 - s_i^- - \sum_{j=1}^{n} x_{ij} \lambda_j = 0, \; i = 1,\ldots, m,$$

$$-s_r^+ + \sum_{j=1}^{n} x_{rj} \lambda_j = y_{rj0}, \; r = 1,\ldots, t,$$

$$\lambda_j, s_i^-, s_r^+ \geq 0 \quad \forall j, \; r \; and \quad i, \; Z_0 \; unconstrai \quad ned \; .$$

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 (1984), who extend the CCR model to assess pure technical and scale efficiencies of units. The 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:

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

subject to

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

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

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

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 resources and all outputs produced by the firm. In practice the selection of inputs and outputs is restricted to those that can be observed fully, and can be measured with some accuracy. The selection of inputs and outputs is also restricted by the size of the sample of units observed. The numbers of inputs and outputs needs to be small compared to the number of unit used in the analysis for the discriminating powers of DEA to be effective. Boussofiane et al (1991) suggest that the product of the number of inputs and outputs is a reasonable indicators of the minimum number of units needed to prevent a distortion of the efficiency measure.

A further issue with the selection of the inputs and outputs refers to the underlying conceptualisation of production in financial services. The question here is to identify what it is that the financial providers produce? The literature on applying DEA to the banking sector has identified two different approaches (Ferrier and Lovell 1990). One approach stresses the intermediation function of financial providers, the intermediation between savers and borrowers. Within this approach, banking sector output can be identified as, and measured by, the value of loans extended. A second approach, described as the production approach, focuses on banking services and products, and measures output by the value of a bank's accounts and transactions. In some respects pension fund managers resemble banks, but when due account is taken of the

dedicated nature of retirement saving accounts, and the binding investment regulation, their intermediation role is reduced to a minimum. In the context of pension fund managers, we consider the production approach to be preferable.

Pension fund managers employ a labour force, use capital equipment and buildings, and marketing services to attract and retain affiliates. In view of this, the analysis below focuses on two measures of output *Total Revenue* and the number of *Contributors*. Earnings related contribution and commission charges account for the largest share of revenue. Contributors are affiliates who make regular contributions, while affiliates are all those who at any time have opened a retirement saving account. Inputs are *Marketing and Sales Costs*, *Office Personnel and Executive Pay*, and *Administration and Computing Costs*. As noted 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.[13]

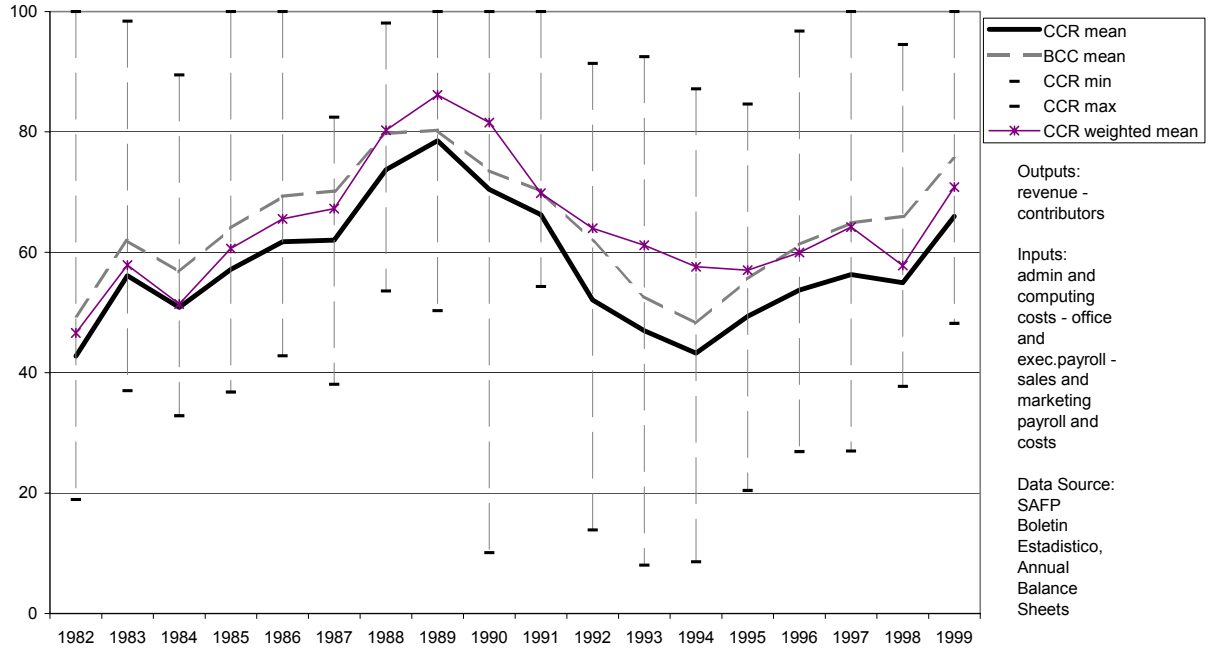
4. Results and Discussion

The efficiency of pension fund managers over time

Applying DEA to the data for pension fund managers for the period 1982 to 1999, results in a technical efficiency score 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.

[13] The data used in the analysis below was extracted from the balance sheets of the pension fund managers reported annually to the regulator, and from published pension system information. (Superintendencia de Administradoras de Fondos de Pensiones several issues).

Figure 2. Fund management market efficiency Chile 1982-1999



It will be useful to focus first on the mean efficiency scores using the CCR model. These show three distinct phases. The first, running from 1982 to 1989, is characterised by rising efficiency, explained by the rapid initial growth in contributors which allows the pension fund managers to exploit economies of size. This means the large initial set up costs are distributed across a large number of retirement accounts, and there is a more efficient utilisation of capital equipment and branch networks. Whereas at the start of the market in 1982, pension fund managers could have provided the same services with just over 40 percent of the inputs, by 1989, inefficiency is reduced to a third. The second phase starts in 1990 and ends in 1994. This phase is characterised by a marked decline in efficiency. At the trough in 1994, the pension fund managers return to the inefficiency levels of 1982. An important contributory factor is the expansion in the number of fund managers in the market and the associated rise in sales and marketing costs. The third phase begins in 1995, with a steady improvement in market efficiency accelerating after 1998. A fall in administration costs after 1994 partly compensates for the continued rise in sales costs, but it is the precipitous fall in the latter following restrictions on transfers that explains the rapid rise in

efficiency in the last year. The key conclusion here is that there is no evidence of a sustained improvement in the technical efficiency of pension fund managers over the whole period.

The range of annual efficiency scores is large, from very poor to very good performers. Again, there is no evidence of a trend towards a reduction in the range of efficiency scores of pension fund managers. The dispersion in efficiency scores rises with the entry of new pension fund managers into the market in 1992. A weighted average of CCR efficiency scores (weighted by the share of contributors) is higher than the unweighted average, indicating that larger pension fund managers have higher efficiency scores throughout the period.

The BCC efficiency scores are similar to the CCR scores, but whereas the efficiency scores obtained using the CCR model fail to distinguish between technical and scale inefficiency, but the BCC model takes into consideration scale effects. As a reasonable approximation, the difference ratio of CCR to the BCC efficiency scores provides a measure of scale inefficiencies, and therefore of potential scale efficiencies. As can be seen from the Figure, there is scope for scale efficiency improvements among pension fund managers, but technical inefficiencies are of much greater importance than scale inefficiencies.

The overall conclusion is that the pension fund management market is inefficient, in the sense that the same services could have been provided with a fraction of resources used. At the end of the period under examination, pension fund managers could have produced the same level of output with around 35 percent fewer resources. Although there are changes in efficiency over time, these do not show a sustained trend towards continuous improvement. It is interesting that entry of new fund managers resulted in a decline in market efficiency, whereas a subsequent period of consolidation resulted in an improvement in efficiency. The evidence presented in the Figure suggests that larger pension fund managers have better efficiency scores than smaller one. This could be explained by the presence of significant scale economies, but the analysis suggests that technical inefficiency is much more important.

Pension fund manager efficiency and market strategies

Table 2 below shows, for selected years, efficiency scores for pension fund managers ranked in descending order according to the CCR scores. It demonstrates the wide range of efficiency scores, with some very low scores. There is some persistence in the ranking of pension fund managers over time. Habitat and Cuprum, for example, can be found among the top three rankings in all four years. At the other end of the spectrum, it appears that those pension fund managers with lower scores have a smaller chance of remaining in the market, especially when comparing 1994 and 1999. The consolidation in the market in the late 1990s appears to have eliminated the long tail of fund managers with low efficiency scores in 1994.

It is noticeable that the fund managers in operation in 1999 had been, with a single exception, in the market from the very beginning. This suggests there are advantages to early entrants, which new entrants find it difficult to match. These advantages are not exclusively to do with size. In fact, as argued above, there is evidence of two different market strategies. On the one hand, there is a group of large fund managers who rely on market share to exploit economies of size. These tend to spend less per head of contributor on sales and marketing because they put less effort on selecting and retaining specific groups of contributors. They are likely to have lower spending on sales per head of contributor, and a low contributor to affiliate ratio. On the other hand, other pension fund managers choose to remain small and focus on attracting and retaining high earners. They have higher spending on sales and marketing needed to identify high earners, and have higher ratio of contributors to affiliates as higher earners are less likely to have contributory gaps and are given incentives to stay with their fund manager. The higher costs faced by the latter group can be absorbed by higher commission and charges which are mainly earnings-related. Relatively small fund managers with lower efficiency scores can thus remain in the market. Magister is one example, as it has remained in the market despite low efficiency scores across the selected years.

Table 2. Efficiency of pension fund managers

AFPs 1984	CCR	BCC	AFPs 1989	CCR	BCC
Habitat 1984	89.46	89.75	Habitat 1989	100	100
Cuprum 1984	87.81	92.44	Provida 1989	100	100
Summa 1984	51.75	51.95	Cuprum 1989	87.17	87.77
Santa Maria 1984	51.21	60.65	Planvital 1989	86.55	88.47
Concordia 1984	50.50	52.27	Proteccion 1989	83.35	85.06
Magister 1984	43.95	45.52	Summa 1989	81.73	81.73
Provida 1984	43.84	92.60	Futuro 1989	81.00	85.10
El Libertador 1984	42.06	45.59	Union 1989	76.09	76.18
Alameda 1984	41.09	44.39	El Libertador 1989	74.65	76.15
Invierta 1984	37.95	39.21	Invierta 1989	73.10	74.17
Planvital 1984	34.16	35.65	Santa Maria 1989	71.09	81.14
San Cristobal 1984	32.84	32.97	Concordia 1989	55.94	56.51
			Magister 1989	50.31	51.59

AFPs 1994	CCR	BCC	AFPs 1999	CCR	BCC
Cuprum 1994	87.13	90.56	Cuprum 1999	100	100
Proteccion 1994	64.84	66.97	Provida 1999	72.35	100
Habitat 1994	62.96	77.89	Habitat 1999	67.38	89.19
Summa 1994	58.70	63.23	Planvital 1999	63.36	63.45
Provida 1994	57.54	86.24	SummaBans 1999	63.31	72.70
Santa Maria 1994	55.74	71.31	Santa Maria 1999	59.38	74.91
Bansander 1994	53.89	54.26	AportaFomenta 1999	53.85	55.05
Planvital 1994	45.99	46.34	Magister 1999	48.17	48.79
El Libertador 1994	45.54	45.66			
Magister 1994	44.61	44.92			
Concordia 1994	41.41	41.92			
Fomenta 1994	38.96	40.40			
Union 1994	38.94	40.23			
Futuro 1994	36.59	38.78			
Banguardia 1994	34.82	36.39			
Previpan 1994	24.99	28.32			
Armoniza 1994	23.49	28.68			
Qualitas 1994	23.04	25.44			
Genera 1994	16.69	21.15			
Valora 1994	8.590	14.39			

The presence of these two strategies can be observed more clearly in a scatterplot of efficiency scores and the ratio of contributors to affiliates on the one hand, and to the sales spending per contributor on the other. These are shown in Figures 3 and 4 respectively. It can be observed that some fund managers have higher than average sales spending per contributor, and also higher than average ratio of contributors to affiliates. In Figure 3, Cuprum, Aporta and Magister in 1992 have higher than average ratio of contributors to affiliates. This ratio of contributors to affiliates is likely to fall over time for all fund managers, as some affiliates cease to contribute, but the change is marked for Magister between 1992 and 1999.[14] In Figure 4, sales spending per contributor rises in the period covered by the two point observations, but sales costs are particularly higher for smaller fund managers, Magister, Aporta and Cuprum, and relatively smaller for larger fund managers such as Habitat, Provida and Santa Maria. The market segmentation produced by these two different market strategies has tended to decline over time because as fewer smaller fund managers remain in business.

Figure 3. Efficiency scores and contributors to affiliates ratio

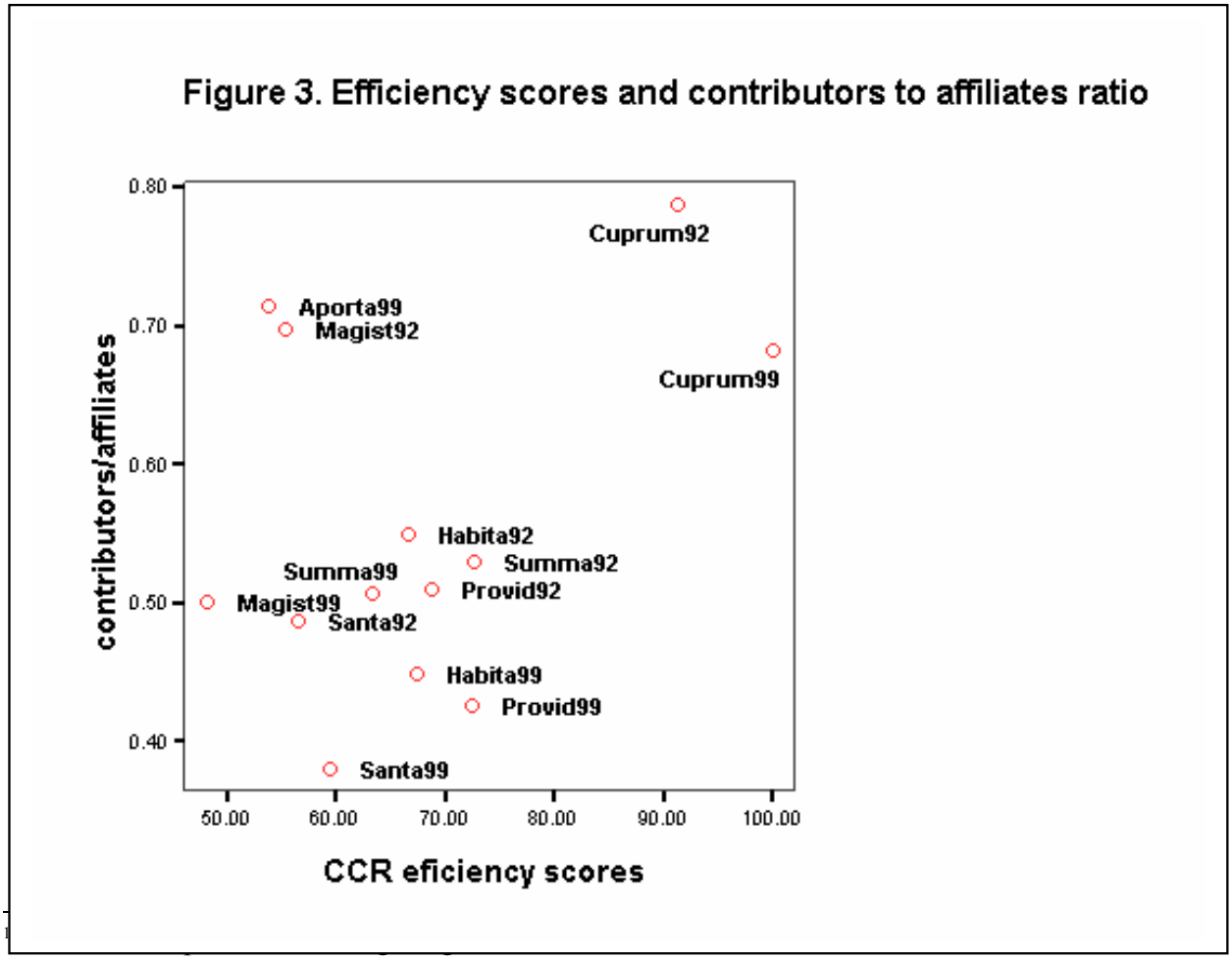
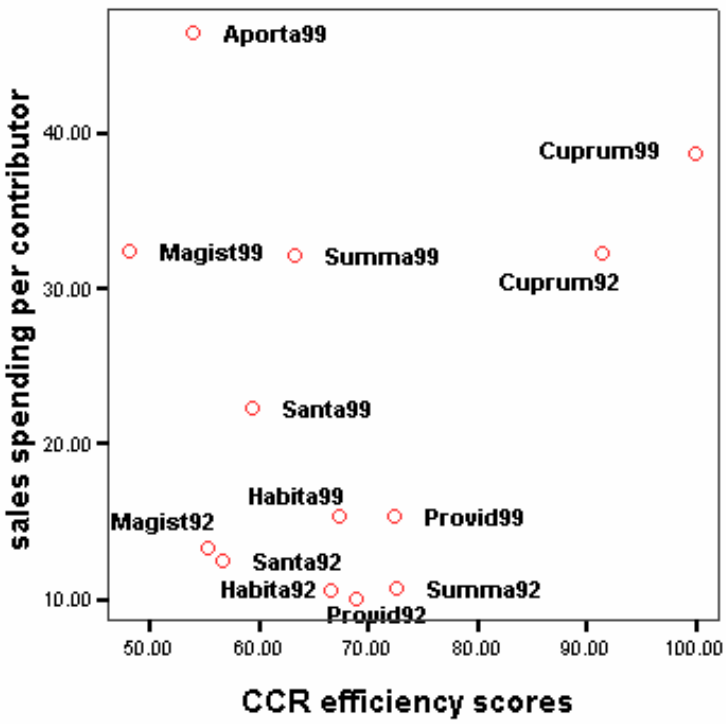


Figure 4. Efficiency scores and sales spending per contributor



Determinants of pension fund efficiency

Is the inefficiency of pension fund managers explained by market structure or by regulation? As discussed above, some studies argue that the mixed performance of pension fund managers is explained by presence of economies of size, and large information costs to consumers, which limit competition. Others argue the chief reason for the performance of pension fund managers arises from their responses to regulation. This is investigated by regressing variables capturing market structure and regulation effects on efficiency scores. The dependent variable is the CCR efficiency score. The independent variables include the market share of fund managers measured as the fraction of total contributors in a particular year (*mkshare*), which captures the influence of market structure. The impact of regulation is proxied by the ratio of contributors to affiliates

(*ratio*), and a measure of sales spending per contributor (*sales*). The rationale for using these variables in this context is made clear from the discussion in the previous section. Less efficient pension fund managers can absorb higher costs if they are able to select high earners. Finally, a measure of revenue per contributor (*revenue*) is also included to attempt to control for the trend change in these variables over time.[15] The results of the regression are shown in Table 3 below.

Table 3. Regression results

Dependent Variable: CCR

	Parameter	t-stat	Sig.	Mean	Std. Deviation
Constant	45.03	10.51	0.00		
Mkshare	0.52	4.18	0.00	7.56	0.09
Sales	-0.62	-11.23	0.00	26.79	28.66
Ratio	0.12	2.12	0.04	59.77	0.18
Revenue	0.17	9.24	0.00	103.11	85.96

Mean of LHS = 56.9 ; R^2 = .648 ; Adj.R^2 = .410 ; N= 238

The regression results are very much as expected. When efficiency is measured with the CRR model, therefore conflating technical and scale inefficiencies, higher market share is associated with higher efficiency scores, reflecting size economies. The elasticity of the size effect is more than proportional. The coefficients associated with the variables proxying responses to regulation have different signs. Higher sales spending per contributor is associated with lower efficiency scores, but a higher ratio of contributors to affiliates has a positive effect on efficiency scores. The negative effect of *Sales* is larger than the positive effect of *Ratio*, resulting in a negative net effect. These results suggest that larger pension fund managers, perhaps because they are able to take advantage of size economies, have higher efficiency scores and contribute to the efficiency of the market; while fund managers' responses to the incentives generated by regulation are detrimental to market efficiency. It is likely that regulation which contributes to the misalignment of costs and commission charges is detrimental to the efficiency of the pension fund management market.

[15] As noted above, the ratio of contributors to affiliates, and sales spending, have a tendency to rise over time.

CONCLUSION

The paper has investigated the efficiency of the pension fund management market in Chile. Pension reform in Latin America has led to the creation of a pension fund management market in nine countries so far. In the reformed pension systems in Latin America, pension fund managers are expected to compete to attract and retain affiliates, but are subject to extensive regulation. The efficiency of the new pension providers will be key to the success of the reforms, to the impact of the reforms on the economies of the region, and to the wellbeing of the future elderly. However, the performance of pension fund managers to date has been mixed. Some suggest this could have been anticipated given the limitations of competition in financial, and particularly insurance, markets. The information requirements and costs of consumer's decision making on the one hand, and the presence of economies of size on the other, impose important limitations to competition in these markets. Others suggest the performance of pension fund managers has been unduly circumscribed by regulation. Chile provides a good ground on which to investigate these issues because it has two decades of experience with pension reform, and because it provided the model of regulation other countries have followed.

The paper began by outlining trends in the behaviour and performance of pension fund managers, and discussed key issues of competition and regulation. Whilst competition in the pension fund management market in Chile is limited, it was argued that regulation is ton an important extent responsible for the mixed performance of fund managers. Some commentators suggest that the problem arises because regulation in the pension fund management market is too extensive and too strict. A different view was taken in the paper. It was argued that current regulation allows a misalignment of costs and commission charges, making it possible for some fund managers to pursue market strategies which contribute to market inefficiency. This is a product of the limited nature of competition in the pension market, regulation, and the rent seeking practices of both pension fund managers and affiliates. Whilst economies of size imply the average costs of providing services in the pension market decline in contributory earnings, the majority of commission revenue comes from earnings related commission charges. In addition, marketing policy by the pension fund managers has concentrated commission charges on regular contributors to individual retirement accounts, instead of the wider universe of users. Commission charges therefore have only an indirect relationship to service costs

These issues are investigated by applying DEA to data for pension fund managers in Chile collected for the period 1982-1999. The findings suggest the pension fund management market in Chile suffers from significant inefficiency. There are important changes over time, but no trend towards an improvement in efficiency. At the start of the reform, pension fund managers could have produced the same output with 40 percent of the resources utilised. Efficiency improved during the 1980s, but new entrants in the early 1990s, and the rise in sales and marketing costs associated with their entry, led to a decline in market efficiency. Regulations restricting transfers introduced in 1998 have succeeded in scaling down sales and marketing costs and improving efficiency scores. At the end of the period, pension fund managers could have produced the same output with 65 percent of the resources utilised. Comparison of efficiency scores for individual pension fund managers over time shows that market stayers have higher efficiency scores compared to market leavers, thus suggesting that competition works, albeit imperfectly, over time, but there are important exceptions to this finding. Analysis of the determinants of efficiency shows that increased market share contributes positively to market efficiency. Sales and marketing costs, on the other hand, are detrimental to market efficiency. This is consistent with the view that a key problem in the operation of the pension market is the misalignment of commissions charged with the costs of the services provided. The misalignment of costs and commission charges leads to inefficient market outcomes, with adverse implications for future pension outcomes.

REFERENCES

Abuhadba, M. (1994), Aspectos Organizacionales y Competencia en el Sistema Previsional, mimeo, Santiago.

Banker, R. D.; A. Charnes and W. W. Cooper (1984), Some models for estimating technical and scale inefficiencies in data envelopment analysis, *Management Science*, **30**, no. 9, pp. 1078-1092.

Barrientos, A. (1998), *Pension Reform in Latin America*, Aldershot: Ashgate.

Barrientos, A. (1999), The emerging pension fund management market in Latin America, *Journal of Pensions Management*, **5**, no. 1, pp. 60-68.

Berger, A. N.; W. C. Hunter and S. G. Timme (1993), The Efficiency of Financial Institutions, *Journal of Banking and Finance*, **17**, pp. 221-249.

Boussofiane, A. and R. G. Dyson (1991), Applied Data Envelopment Analysis, *European Journal of Operational Research*, **52**, pp. 1-15.

Charnes, A.; W. W. Cooper and E. Rhodes (1978), Measuring the efficiency of decision making units, *European Journal of Operational Research*, **2**, no. 6, pp. 429-444.

Diamond, P. (1993), Privatization of Social Security : Lessons from Chile, Working Paper 4510, Cambridge MA: NBER.

Ferrier, G. D. and C. A. Lovell (1990), Measuring Cost Efficiency in Banking: Econometric and Linear Programming Evidence, *Journal of Econometrics*, **46**, pp. 229-245.

Fields, J. A. and N. B. Murphy (1989), An Analysis of Efficiency in the Delivery of Financial Services: The Case of UK Insurance Agencies, *Journal of Financial Services Research*, **2**, pp. 343-356.

Fields, J. A.; N. B. Murphy and D. Tirtiroglou (1993), An International Comparison of Scale Economies in Banking, *Journal of Financial Services Research*, **7**, pp. 111-125.

Mesa-Lago, C. and F. Bertranou (1998), *Manual de Economía de la Seguridad Social*, Montevideo: Centro Latinoamericano de Economía Humana.

Miranda, E. (1994), Evidencia de Economías de Escala en las Administradoras de Fondos de Pensiones, *Estudios de Administración*, **1**, no. 1, pp. 45-79.

Mitchell, O. S. (1996), Administrative Costs in Public and Private Retirement Systems, Working Paper 5734, Cambridge, MA: National Bureau of Economic Research.

Nasser Katib, M. and K. Matthews (1999), A Non-Parametric Approach to Efficiency Measurement in the Malaysian Banking Sector, Discussion Papers in Economics 99:113, Cardiff: Cardiff Business School.

Queisser, M. (1997), Pension Reform and Private Pension Funds in Peru and Colombia, Working Paper 1853, Washington DC: World Bank.

Queisser, M. (1998a), Regulation and supervision of pension funds: Principles and practices, *International Social Security Review*, **51**, no. 2/98, pp. 39-55.

Queisser, M. (1998b), The Second-Generation Pension Reforms in Latin America, Working Paper AWP 5.4, Paris: OECD.

Shah, H. (1997), Towards better regulation of private pension funds, Working Paper 1791, Washington DC: The World Bank.

Sinha, T.; F. Martínez and C. Barrios-Muñoz (1998), Performance of Publicly Mandated Private Pension Funds in Mexico: Simulations with Transaction Costs, mimeo, Mexico DF: Instituto Tecnológico Autónomo de Mexico.

Superintendencia de Administradoras de Fondos de Pensiones (several issues), Boletín Estadístico, Santiago: SAFP.

Valdés-Prieto, S. (1992), Selección de AFP y Regulación de la Información, Working Paper 140, Santiago: Instituto de Economía, Pontificia Universidad Católica de Chile.

Vittas, D. (1998), Regulatory Controversies of Private Pension Funds, mimeo, Washington DC: The World Bank.

Yermo, J. (2000), 'Institutional Investors in Latin America: Recent Trends and Regulatory Challenges', in *Institutional Investors in Latin America* OECD (ed.) OECD, Paris, pp. 23-120.