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Pension Reform, Financial Market Development, and
Economic Growth: Preliminary Evidence from Chile 1/

Prepared by Robert Holzmann

Authorized for Distribution by Vito Tanzi

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Abstract

The Chilean pension reform of 1981, in which Chile moved from an unfunded to a funded scheme, is considered to have contributed to this country's excellent economic performance since the mid-1980s. The paper highlights the theoretical underpinnings of the claimed economic effects and presents empirical data and preliminary econometric testing of the conjectured growth, capital formation, and saving effects. The empirical evidence is consistent with most of the claims. In particular, the direct impact of financial market development on private saving is found to be negative, which underscores the importance of sound fiscal policy and public saving to support the transition.

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	<u>Page</u>
Summary	iv
I. Introduction	1
II. Theoretical Background	4
1. Pareto-superior transition and economic externalities	4
2. Financial market intermediation and endogenous growth	7
III. Testing the Impact: Conceptual Considerations and Data	11
IV. Preliminary Empirical Results	14
1. Pension reform and financial market development	14
2. Total factor productivity and financial market development	16
3. Pension reform and labor market development	21
4. Capital formation, saving, and financial market development	22
5. Pension reform and domestic saving	25
V. Preliminary Conclusions	31
1. Consistency of empirical findings with most hypothesis	31
2. The causality of saving and the importance of public saving	31
3. Message for reform countries in Central and Eastern Europe	34
Appendices	
1. Main Features of the Chilean Pension Reform	35
2. Data Sources	37
Tables	
1. Chile: Macroeconomic Indicators and Pension Fund Performance, 1970-94	2
2. Growth Accounting and Total Factor Productivity	18
3. Total Productivity and Financial Market Development	19
4. Capital Formation and Financial Market Developments	24
5. Private Savings and Financial Market Developments	26
6. Pension Reform and Saving Effects in SNA	28
7. Private and Public Savings Interaction	29
8. The Net Impact of the Pension Reform on Private Saving	33
Figures	
1. Financial Market Indicators	38
2. Stock Market Indices	38
3. Pension Fund Assets and Financial Market Indices	39
4. Pension Assets and Financial Assets Mispricing	39
5. Asset Distribution of AFPs	39

6.	Coverage under New Pension Scheme	40
7.	Capital Formation and Financing	41
8.	Pension Reform and Domestic Saving	41
9.	Fiscal Performance, 1970-93	42
References		43

Summary

The Chilean pension reform of 1981, in which Chile moved from an unfunded to a funded scheme, has considerable attraction for other countries in Latin America and Central and Eastern Europe. In the view of many domestic and foreign observers, this reform has contributed to Chile's excellent economic performance since the mid-1980s because of its positive effects on financial market development and domestic saving. If confirmed, the externalities of such a reform would go far beyond the successful restructuring of a major expenditure program because it would allow the reforming country to achieve a higher growth path than would otherwise be possible. Placing the reform effects within the framework of endogenous growth theory allows, in principle, a Pareto-superior transition to a funded scheme, because the transition generation is not burdened twice.

The paper presents empirical data and preliminary econometric testing of the claimed growth, capital formation, and saving effects and highlights the theoretical underpinnings of these claimed effects. The empirical evidence is consistent with most, but not all, of the claims.

The available data and statistical evidence suggest a close relationship between the development of pension funds and financial markets, rendering them deeper, more liquid, and more competitive. Based on different financial market indicators, such as the financial intermediation ratio, the financial interrelation ratio, and a composite stock market index, the preliminary econometric evidence suggests a contribution of financial market developments on total factor productivity of some 0.5 to 1.3 percentage points, and on real capital formation of some 0.4 to 0.8 percentage point. The resulting contribution to the growth rate is some 0.9 to 2.1 percentage points. In contrast, the direct impact of financial market development on private saving is found to be negative, which underscores the importance of sound fiscal policy and public saving to support the transition.

I. Introduction

The reform of the public retirement scheme is a standing agenda in essentially all countries throughout the world. 1/ It is of particular importance for the emerging economies of Latin America and Central and Eastern Europe since their current schemes constitute an important drain on the public budget, reducing domestic saving, capital formation and growth, and are held responsible for main distortions in the labor market. Thus the experience of the Chilean pension reform of 1981 has special attraction for other emerging economies as this reform was thought to have contributed to the excellent economic performance since the mid-1980s (after the shocks of the foreign debt and domestic banking crises of 1981-83 had been absorbed; see Table 1). Very recently, a few countries in Latin America, such as Argentina, Peru, Colombia, and Mexico have begun to imitate to some extent the Chilean approach and former centrally planned economies, such as Croatia and Latvia, are taking preparatory steps in this direction. 2/

In a nut-shell, the Chilean reform consisted of a shift from a conventional unfunded and defined-benefit plan to a funded defined-contribution plan, in replacing public administration of the program with private administration by competing pension funds (AFPs) and in separating the social assistance element from the mandated saving element of retirement provisions. Government involvement remains high with regard to supervision and regulation of the new mandatory but funded scheme, the guarantee of minimum benefits, and the financing of the transition. Otherwise, the market is allowed to play its role. 3/

By domestic and foreign observers, various advantages of the reform approach are claimed:

At the political level, three effects stand out. First, the approach provides a break in the deadlock of traditional reform attempts since it suggests a time consistent and hence credible reform (Holzmann (1994)). Second, the approach isolates retirement provisions to a large extent from political interference and risk (Arcaya and Valdés-Prieto (1994) and Diamond (1995)). Last, but not least, it sensitizes workers to financial issues and enterprise performance, reducing the dichotomy between capital and labor (Piñera (1991)).

1/ For a recent study on reform issues in developing and developed economies, see World Bank (1994); for a comprehensive study of the OECD countries, see Holzmann (1988).

2/ For a survey of the Latin American pension reform attempts, see Queisser (1995); for an outline of the original Latvian pension reform concept, see Holzmann (1994).

3/ For a detailed survey and analysis of the Chilean pension reform in English see Diamond and Valdés-Prieto (1993); a very short summary is provided in the Annex.

Table 1. Chile: Macroeconomic Indicators and Pension Fund Performance, 1970-94

Macroeconomic Indicators	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980				
GDP growth (real)	2.1	9.0	-1.2	-5.6	1.0	-13.3	3.2	8.3	7.8	7.1	7.7				
Inflation--CPI (December to December)	34.9	22.1	163.3	508.4	375.9	340.7	174.3	63.5	30.3	38.9	31.2				
Unemployment rate	5.7	3.9	3.3	5.0	9.5	14.9	12.7	11.8	14.2	13.6	10.4				
Real exchange rate <u>1/</u>	48.5	45.2	41.9	62.7	95	123.8	111.4	100	119.3	122.9	106.5				
Macroeconomic Indicators	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	
GDP growth (real)	6.7	-13.4	-3.5	6.1	3.5	5.6	6.6	7.3	9.9	3.3	7.3	11.0	6.3	4.2	
Inflation--CPI (December to December)	9.5	20.7	23.1	23.0	26.4	17.4	21.5	12.7	21.4	27.3	18.7	12.7	12.2	8.9	
Unemployment rate	11.3	19.6	14.6	13.9	12.0	8.8	7.9	6.3	5.3	5.7	5.3	4.4	4.5	5.9	
Real exchange rate <u>1/</u>	92.6	103.3	124	129.6	159.2	175.1	182.7	194.7	190.2	197.4	186.3	171.8	170.4	165.7	
Pension funds (AFPs) Performance															
Rate of return (real)	21.3	28.8	21.3	3.5	13.4	12.3	5.4	6.4	6.9	11.5	29.7	3.1	16.2	18.2	
AFP assets in percent of GDP	0.9	3.6	6.4	8.6	10.6	12.7	14.2	15.1	17.7	24.3	30.4	30.6	37.1	41.1	
AFP assets in percent of market assets	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
Enterprise bonds	0.4	0.9	8.4	10.2	7.7	11.1	27.1	46.0	47.5	58.2	60.8	61.0	68.1	59.7	
Shares	--	--	--	--	--	2.0	3.2	4.2	4.8	5.5	8.3	10.1	10.9	10.8	

Sources: Central Bank of Chile, Monthly Bulletin; and Superintendency of AFP, Statistical Bulletin.

1/ An increase indicates a real depreciation of the domestic currency (1977=100).

At the economic level, three main reform effects are claimed. First, the reform establishes a close link between contribution and benefits, thus reducing the labor market distortions with which traditional and unfunded programs are considered to be fraught (World Bank (1994)). Second, the reform approach furthers and accelerates financial market developments and thus efficiency of resource allocation. Last, but not least, the reform affects positively national saving and capital accumulation, and hence contributes to economic growth (IMF (1995)).

It is the investigation of these economic effects and first attempts at empirical testing which are the core of this paper. If confirmed, the positive effects of such a pension reform approach would go far beyond the successful restructuring of a major public expenditure program, since it would allow the economy of a reforming country to be put permanently on a higher growth path than would otherwise be possible. Placing the reform effects within the framework of endogenous growth theory would also allow, in principle, traditional arguments against a shift from an unfunded to a funded scheme to be overcome since the transitional generation would not necessarily be burdened twice. But mere transitory growth effects of relevant size may substantially reduce, or even eliminate the transition costs.

To analyze these hypotheses, the structure of the paper is as follows. Section II presents the theoretical underpinnings of the claimed welfare economic effects of the pension reform approach, stressing the importance of externalities and putting it within the framework of modern endogenous growth theory and a specific testable model. Section III outlines the research strategy and discusses the problems of empirical testing in view of the short-time span since the reform and the multiple economic reforms were undertaken. Section IV presents empirical data and preliminary econometric testing of the claimed effects for Chile on: economic growth, labor market participation, capital formation, and saving. The empirical results are, in general, consistent with most but not all hypotheses, and underscore the importance of a sound fiscal policy to support such a reform. Some preliminary conclusions are drawn in Section V.

II. Theoretical Background

Shifting from an unfunded to a funded scheme raises the issue of the repayment of the implicit debt of the existing pension scheme and the burdening of the transition generation. For this reason, countries have generally rejected this reform option. However, the welfare economic issue of a "Pareto-superior transition"--for example, making at least one generation better and no other worse off--receives a different assessment once economic externalities of the reform are taken into account, and the case for reform can be strengthened if those effects are embedded in the theory of endogenous growth. This section outlines these considerations.

1. Pareto-superior transition and economic externalities

In the conventional neoclassic world, an unfunded pension scheme is Pareto efficient even when the interest rate permanently exceeds the natural growth rate if the given scheme does not create economic distortions; for example, it is financed via lump-sum taxes and provides lump-sum transfers. Although only the first generation gains and all later generations are worse off, there exists no mechanism to reverse the situation without the welfare position of at least one generation deteriorating (Breyer (1989)). The result is intuitively and immediately understandable, since it amounts to an application of the second basic theorem of welfare economics: any lump-sum redistribution of income entails an allocation which is different but also Pareto efficient (Homburg (1990)).

Consequently, a Pareto-superior transition requires either that the fully-funded (FF) scheme exhibits less distortions compared with the unfunded (UF) scheme, for example, a reduction in negative externalities takes place, or it has to be shown that the FF scheme introduces positive externalities, such as shifting outside the intertemporal budget constraint of the economy. These externalities may result from special growth effects.

The case of lower negative externalities

Lower negative externalities can be motivated by the many distortions an unfunded scheme may exert on intertemporal consumption or on labor supply decisions, resulting in an excess burden. Through the UF/FF shift, the reduction or elimination of the excess burden may be used to repay the implicit debt of an unfunded scheme within finite time (Homburg (1990)). Since public pension schemes and the way they are financed, quite definitely entail numerous distortions, a change in the funding mechanism may thus actually improve welfare and, further on, may diminish the impact of population aging.

The conclusion rests, however, on the assumption that the funded scheme is less distortionary for individual saving decisions and labor supply than the unfunded one. Yet, such a result is not necessarily linked with the funding procedure but, under the assumption of elastic labor supply, is typically related to an inadequate benefit/contribution link of unfunded

schemes. Public and earnings-related pension schemes traditionally have a distributional and annuity component, and it is the mingling of both components and the lack of a clear contribution/benefit link which is claimed to be responsible for the distortions (Schmidt-Hebbel (1993) and World Bank (1994)). However, these distortions may also be reduced in an unfunded scheme, by separating both components more clearly as, for example, in a two-tier scheme with a basic tax-financed flat-rate scheme (of a universal or assistance type) taking care of distributional and poverty considerations, and a fully earnings-related one, financed by earmarked contributions only; albeit at theoretical level it remains unclear if such a separation always creates fewer distortions than a well-conceived traditional social insurance scheme. The basic component will exist in any alternative concept and the incurred distortions are the inevitable consequence of introducing distributional activities, and forced saving always affects labor supply in a distortive manner unless assumptions about perfect credit markets are made, allowing individuals to borrow freely against their future labor and pension income. Then the remaining, potentially avoidable, distortions are reduced to the effects of an alternative funding mechanism. These effects may exist since a nondistortionary pension scheme requires actuarial neutrality which can be achieved in an unfunded scheme only if the implicit rate of return (the natural rate of growth) equals the rate of interest (i.e., the golden rule of growth holds; Breyer and Straub (1993) and Perraudin and Pujol (1995)). Put differently, a pension system can still entail a net tax on labor even if the contribution/benefit link is tight, provided that the system's implicit rate of return is below market.

Even if the funded scheme were nondistortionary, compared to the unfunded one, new distortions are likely to be introduced through the transition and the financing of the now explicit social security debt. The interest payments on this debt have to be financed via taxes which introduce a new excess burden, unless financed via lump-sum taxation. Hence the scope of the now explicit debt, the level of interest rate, and the type of additional tax financing determine the level of the new excess burden compared with that existing under an unfunded scheme. 1/

Finally, the decision for a UF/FF shift is also a question of the scope of the expected welfare gains. Simulation studies with OLG models à la Auerbach and Kotlikoff (1987) suggest that the welfare gains resulting from the elimination of labor market distortions are comparatively small. A model calibrated on the German pension system exhibits long-term welfare gains of some 9 percent of life-time resources of future generations if the transition generation is not compensated. With compensation, the long-term welfare gains are reduced to some 1.5 to 2 percent of life-time resources of future generations (Raffelhüschen (1993)). Furthermore, in the latter case the study assumes that tax burden to finance the interest costs of the

1/ For a discussion of the new excess burden in an OLG model, see Arrau and Schmidt-Hebbel (1993) and Holzmann (1994).

transitional public debt is allocated on a lump-sum basis. Simulations by Kotlikoff (1995) provide higher welfare gains to future generations of 4.5 percent (while compensating the transition generation) when assuming that the benefit-tax linkage is low, that the initial tax structure features a progressive income tax, and that consumption tax is used to finance the transition. However, when the initial tax structure is a proportionate income tax, the tax-benefit linkage is strong, and when income taxes are raised to finance the transition there is 3.1 percent welfare loss to future generations. Other studies exhibit similar low and distant welfare gains even if the transition generation is burdened twice by repaying the implicit debt via higher transitory taxation: an OLG model calibrated to the Chilean reform results in an increase in GDP after 200 years of 3 to 5 percent, compared to the baseline scenario (Arrau and Schmidt-Hebbel (1993)), a result similar to simulations for the U.S. economy (Auerbach and Kotlikoff (1987)). A full or even partial double burdening of the transition generation, however, may be excluded for political reasons.

Long-term welfare effects of some 1.5 to 4.5 percent under a potential Pareto-superior transition, however, are likely to be too small to convince politicians to undertake a transition which is difficult in technical and political terms and when potential gains emerge only in the distant future.

The case of positive externalities

The other avenue to argue for a shift toward (fully or partially) funded pensions is based on positive externalities resulting from a change in the financing mechanism.

In the framework of traditional neoclassic theory (i.e., exogenous technical progress and thus given intertemporal budget constraint) welfare gains can be derived from portfolio considerations. It can be argued that the internal rate of return of an unfunded scheme--the natural growth rate--is a stochastic variable which exposes each pension cohort to an income risk. The same can be claimed for the internal rate of return of a funded scheme--the interest rate. Thus, if the covariance of both returns is lower than one, a mixed financing mechanism reduces the overall income risk and provides positive welfare effects. ^{1/}

Potentially higher welfare effects can be achieved by a change in the financing mechanism leading to an outward shift of the intertemporal budget constraint. Such a shift can be derived from endogenous growth considerations with regard to labor market and financial market externalities.

^{1/} For Austrian evidence of a negative correlation between the internal rate of return of the public scheme and the market rate of interest, see Holzmann (1988).

At the labor market level, the type of pension scheme (UF/FF) and the perceived contribution/benefit link can determine the distribution of labor supply between the formal and informal sectors. If the latter is less productive, a pension reform which moves labor supply to the formal sector will enhance overall productivity and in an endogenous growth (EG) model can lead to a higher growth path (Corsetti (1994)).

At the financial market level, a UF/FF shift can promote the development of financial markets, making them deeper, more liquid, and more competitive. The resulting enhanced resource allocation may not only lead to a one-time efficiency gain, but can lead to a permanently higher growth path (Holzmann (1994)). 1/

2. Financial market intermediation and endogenous growth

The modeling of financial markets and investigations of their welfare economic and growth implications are still in its infancy. The claim that the effectiveness of financial markets and the level (or rate of growth) of real activity are closely related, however, is not new and empirical investigations have been undertaken for decades. 2/ Against the background of neoclassic growth theory, however, these studies could argue only for temporary efficiency effects resulting from financial market developments. More recent developments in growth theory allow for level as well as growth path effects.

In the following, first, the available directions of modeling are briefly surveyed. Then, a testable model is proposed which contains financial market effects in a reduced form, but allows also for other effects since pension reform and financial market developments are usually surrounded by many other policy changes at macro- and microeconomic level.

Financial market modeling

(a) The simplest way to introduce financial market considerations in EG models is through AK-technology, and the assumption that, A , the rate of return on capital, which is bounded from below, depends positively in the level of financial market intermediation:

1/ It has to be stressed that the mere change of the financing mechanism of an unsustainable unfunded retirement scheme is not sufficient to put it on a sustainable funded basis. Any real pension reform has to undertake two changes essentially simultaneously: reducing the commitment of the given pension scheme (with given target income replacement rates, essentially through an increase in the retirement age) and shifting the financing mechanism. This was done in the Chilean pension reform by harmonizing the different pension schemes and increasing the standard retirement age to 65 for men and 60 for women.

2/ See, for example, Goldsmith (1969), McKinnon (1973), and Shaw (1973).

$$\partial K / \partial t = A(\theta) K - C ; \partial A / \partial \theta > 0$$

Such an interpretation is given by Roubini and Sala-i-Martin (1992), in developing a model of financial repression in which θ is higher the less financial markets are repressed. Estimates based on Barro (1991) data and specification, and applying alternative measures for financial market repression suggest nonnegligible and statistically significant effects on the transitional growth rate of 0.5 to 3.1 percent per annum (and tending to make the regional dummy for Latin American countries insignificant).

(b) The recent other models concentrate on specific aspects of financial markets and their impact on real activity: for example, financial markets provide liquidity, allowing a shift from current liquid, but unproductive, assets toward less liquid, but more productive assets (Bencivenga and Smith (1991), Levine (1991), and Bencivenga et al. (1995)). Or, financial markets promote the acquisition and the dissemination of information allowing for better resource and risk allocation (Diamond (1984) and Greenwood and Jovanovic (1990)). Or, financial markets permit agents to increase specialization, shifting away from less specialized and inefficient technologies (Cooley and Smith (1993) and Saint-Paul (1992)).

All these models cover important aspects of financial markets and their impact on real activity, providing important analytical insight on issues raised by the literature for decades. However, they all fall short of providing a comprehensive framework of the different effects of financial markets and of empirically testable relationships. This still awaits future work.

A testable model proposal

To introduce potential growth effects of financial market developments in an EG model in a simple manner, borrowing from Villanueva (1993), the following structure is proposed: 1/

$$[1] \quad \partial K / \partial t = s(\kappa, \dots) Y - \delta K, \quad \text{with } \partial s / \partial \kappa > 0$$

1/ The other equations of this growth model are traditional and specify the output, Y, via a production function with constant returns to scale on capital, K, and labor, N, (man-hours in efficiency units):

$$Y = F(K, N) = Nf(k),$$

an exogenous growth rate, n, of population/employed (in man-hours L)

$$\partial L / \partial t = nL,$$

a definition equation between N and L via the technical-change multiplier, T:

$$N = TL, \text{ and}$$

the capital coefficient:

$$k = K/N.$$

$\partial(\cdot) / \partial t$ is the time derivative and, δ , the rate of depreciation of capital.

$$[2] \quad \partial T / \partial t = \alpha(\kappa, \dots)K / L + \lambda T, \quad \text{with } \alpha > 0$$

The saving ratio (i.e., investment ratio in a closed economy) is positively related to variable measuring the depth, liquidity, and maturity of financial markets, summarized in the parameter κ . Further variables which may influence the domestic saving rate are public saving behavior or tax regulations. Also the change in technical progress dT/dt is not only dependent on the exogenously given rate of labor-augmenting technical change, λ , but also on an efficiency variable, α , which interacts multiplicatively with the capital/labor ratio. $\alpha(\kappa, \dots)$ depends on the financial market variable, κ , and also on other variables traditionally quoted in the literature (such as level of export orientation and share of education expenditure in the budget). λ captures other growth effects not explicitly detailed in the model.

Since the model features an external effect, the solution of the social planner's problem will not necessarily coincide with the competitive equilibrium in the decentralized economy. In the latter, each agent will take K/L , the economy-wide ratio of capital per head as given, thus ignoring the effect of their investment decision on the rate of technological progress. In consequence, in a decentralized economy individuals tend to overinvest, and output to grow more rapidly, but consumption per efficiency unit is lower because a larger share of output has to be devoted to keeping K/L at its steady-state. However, if the social planner chooses a savings rate below the one in the decentralized solution, his choice will become binding and the central and decentral outcome will coincide if an appropriate nondistortive enforcement mechanism can be found (such as auctioning of the saving/investment volume). If the social planner chooses a higher saving rate, the decentralized solution will prevail. For the following, we consider the social planner's solution, implicitly assuming that government sets the saving rate below the one derived in the decentralized economy.

In this model, the steady-state growth rate of the economy depends positively on the level of κ :

$$[3a] \quad [(dY/dt)/Y]^* = s(\kappa, \dots)f(k^*) / k^* - \delta$$

$$[3b] \quad = \alpha(\kappa, \dots)k^* + \lambda + n = g^*(k^*)$$

with, k^* , the steady-state capital intensity measured in efficiency units of labor. 1/ The model leads to the traditional result for $\alpha = 0$. With $\alpha > 0$, however, a higher saving rate leads not only to an increase in the optimal capital/labor ratio (as in the traditional growth models), but also

1/ This result is valid for both environments but the steady-state capital intensity in the competitive equilibrium, k^{**} , tends to exceed the planner's solution, k^* .

to a higher steady-state growth rate, which in traditional models is not influenced by the saving rate.

A further important property of the model under an optimal consumption plan (i.e., $\partial c^*/\partial s = 0$) is that both steady-state growth rate and optimal net return on capital are higher than the exogenous rates of technical progress and population growth:

$$[4] \quad f'(k^*) - \delta = g^*(k^*) + \alpha(\kappa, \dots)k^* = \lambda + n + 2\alpha(\kappa, \dots)k^*$$

Under such a golden-rule condition, the optimal rate of return is higher than $\lambda + n$ when $\alpha > 0$ because of two factors: the impact of higher savings (i.e., capital accumulation) on the equilibrium growth rate, and the required compensation of capital for a higher equilibrium output growth induced by the efficiency term $\alpha(\kappa, \dots)k^*$. Compensating the transition generation by the conventional rate of return of an unfunded scheme only (i.e., by $\lambda+n$, assuming that α was zero prior to the UF/FF shift), while using part of the growth differential (up to $2\alpha(\kappa, \dots)k^*$) for financing the transition allows, in principle, for the construction of a Pareto-superior UF/FF transition. 1/ One approach could be to pay wages (and pensions) to individuals according to the old-growth path until the growth differential allowed to repay the implicit debt. Since the marginal product of each worker increases at the same rate as his efficiency, $g^*(k^*)-n$, in order to capture the growth differential, this requires the use of lump-sum taxation to ensure Pareto indifference for the transition generation until the social security debt is repaid.

1/ In the decentralized solution the net rate of return with externalities is $f'(k^*) - \delta = \lambda + n + \alpha(\kappa, \dots)k^*$, still leaving a growth differential of $\alpha(\kappa, \dots)k^*$ for compensation of the transition generation.

III. Testing the Impact: Conceptual Considerations and Data

Establishing a statistically significant link between pension reform, the financial market variable, κ , and the endogenous variable of technological progress, $\alpha(\kappa, \dots)$, and the saving/investment rate, $s(\kappa, \dots)$, is fraught with, at least, four main problems:

(i) The multiplicity of reform undertaken, and hence, in principle, the task to separate the influence of competing explanations for growth developments, such as strengthened macroeconomic stability, enhanced export orientation of the economy or human capital formation. Furthermore, the effects are likely to interact.

(ii) The likely fact that financial market development is only a necessary but not a sufficient condition for higher growth to which pension reform may contribute via acceleration. However, compared to traditional models, such a contribution may lead not only to faster convergence to the long-term growth path, it may also lead to a permanently higher growth path.

(iii) Currently there is no established methodology to test for endogenous growth effects and to differentiate between conditional convergence (i.e., convergence in the traditional growth model, but with different starting positions due to differences in the production function, exogenous variables, and parameters) and potential endogenous growth effects.

(iv) Coping with data problems and the length of usable time series. The Chilean economic data are in better shape than most other emerging markets. This qualification, however, is only true for the most recent data, whereas longer and consistent time series are officially not available but exist only in the data banks of individual researchers and are often not comparable. Data on the public sector in the SNA are still weak.

Against this background, a research strategy is applied which should allow for enhanced confidence in the advanced hypothesis of pension reform, financial market development, and growth effects, although a water-tight proof may not exist. The strategy consists of the following elements:

(i) Constructing appropriate indicators of financial market developments, determining the impact of pension fund activities, and empirical testing of the relationship between those indicators and α and s . The indicators used follow partly conventional design, partly the concept of the cross-country study for reasons of comparison, and partly a new design. Pension funds should contribute to the deepening of financial markets, higher liquidity, enhanced competition, and better risk allocation in financial markets. The financial market indicators should allow for measuring these effects.

The FIR (financial interrelation ratio) compares the range of financial instruments with net wealth of the economy (approximated by the capital

stock). The FMR (financial intermediation ratio) compares the scope of financial instruments with the assets of the financial institutions.

Two alternative measures of financial instruments and thus indices are considered: FIR-1/FMR-1 follows an instrument concept as used in some Chilean studies to present the scope and structure of financial markets (De la Cuadra and Valdés-Prieto (1992b)). This instrument measure covers only financial liabilities, enhanced by the assets (\approx liabilities) of pension funds, mutual funds, and insurance companies. FIR-2/FMR-2 follows the more traditional approach of measuring financial market instruments (as pioneered by Goldsmith (1969)). The instruments included cover both the asset and liability side of the financial market, and thus deliberate double counting, but is restricted to claims to the financial and nonfinancial sectors plus equity holdings. Traditionally, the FIR-2 index has been rising with economic development, leveling off in most countries at 125 percent to 175 percent (Goldsmith (1969)).

The FIR-1(2) and FMR-1(2) indicators are similar in magnitude, but differ somewhat in their composition and thus in trend (Figure 1). The main difference is due to the scope of bank credits to the private sector (included in instrument measure 1), which rose as a percent of the assets of financial institutions from 15 percent in 1975 to 140 percent in 1982, and decreased with the banking crisis and access of enterprises to other resources to 40 percent in 1994.

Specific stock market development indicators have been used in cross-country study to measure the impact on real economic activity (Levine and Zervos (1995)):

The MCR (market capitalization ratio) equals the value of listed shares divided by GDP. It is assumed that the overall stock market size is positively correlated with the ability to mobilize capital and to diversify risk on an economy-wide basis.

The VTR (total value traded ratio) equals the total value of shares traded on the stock market exchange divided by GDP. The turnover should reflect liquidity on an economy-wide basis.

The TOR (turnover ratio) equals the value of total shares divided by market capitalization. Since MCR may be high, but VTR low, and vice versa, the ratio of both complements the prior indicators.

The SMI (stock market index) equals the average of the prior three indicators.

These financial market indicators are proxies for financial market deepening and liquidity. Indicators for competitiveness and risk allocation may be derived by asset mispricing, for example, calculating the systematic deviations of actual returns and those implied by reference models (capital assets pricing model (CAPM) and arbitrage pricing model (APM)); Korajczyk

(1994)). The hypothesis is that rising pension fund activities should make the financial system more efficient, thus contributing to a reduction in the mismatch between the actual returns and those implied by reference models. However, these pricing indicators, and their link to pension reform and economic growth are still in preliminary stage of investigation.

(ii) Comparison with cross-country results. Very recent results exist for 41 countries for the period 1976-93, which investigate the impact of financial market developments on economic growth, capital accumulation, and productivity improvement, using the SMI approach. Controlling for initial conditions and various economic and political factors, this relation turns out to be statistically significant and robust; the predictive power of financial market developments to forecast economic growth over 18 years implies that: (a) financial developments do not simply follow economic activity, and (b) the strong link between both does not merely reflect positive correlation among contemporaneous shocks to financial markets, institutions, and economic activity (Levine and Zervos (1995)).

These results give confidence in the causality of the influence and allow for a comparison with its own results with regard to the sign and magnitude of estimated parameters.

(iii) Cross-checking with other methods and data. Given the multiplicity of the reforms in Chile and the often nonquantitative nature of the link between pension reform, financial market developments, and changes in macroeconomic variables, no full proof of the hypothesis advanced can be expected. However, applying different methods and checking for consistency with the advanced claims should enhance confidence in the results.

IV. Preliminary Empirical Results

Based on the EG model of Section II and currently available data, this section presents, first, empirical evidence and preliminary econometric results. In view of the need to achieve a reasonable number of degrees of freedom despite the limited number of observations (maximum 1975 to 1994), likely breaks in the data series, significant cyclical fluctuation, and external shocks, special attention needs to be given to the specification.

1. Pension reform and financial market development

A central claim about the effects of the Chilean pension reform, echoed internationally, is its contribution to the development of the financial sector (IMF (1995)). The general hypothesis is that rising investment needs of the pension funds (AFPs), the instruments thereby created, and competitive set-up of the privately managed pension funds made the financial market deeper, more liquid, and more competitive. An inspection of the data and very simple empirical testing seemingly confirms the claim on market deepening.

Essentially all investigated FMIs exhibit a strong upward movement once the banking crisis of 1981/83 has been solved (Figures 1 and 2). The financial interrelation ratios (FIR) show a strongly rising tendency which well exceeds the reported level for prior decades. 1/ The financial intermediation ratios (FMR) exhibit a similar development, with FMR-2 reflecting the strong increase in bank credits to the private sector, ultimately leading to the banking crisis, and the consolidation afterward. 2/ The almost linear rise in the stock market index (SMI), starting in 1985 corresponds to the year of the first participation of pension funds in stock market activities. Prior to this date the investment rules allowed only for the purchase of debt instruments. At the end of 1994 pension funds assets constitute almost 40 percent of all outstanding financial instruments, and the total pension fund assets at the end of 1994 amount to 41 percent of GDP (Figure 3).

The correlation of AFP assets and FMIs, and of AFP shares in total traded shares and MCR, is very strong with coefficients in simple

1/ No strictly comparable FIRs could be established for the pre- and post 1975 period. However, the available data for Chile suggest a long-term decrease in the FIR-2 from 63 percent (1940), 32 percent (1950), 29 percent (1960), with a slight increase to 39 percent (1971) prior to a major shake-up of the economy (Cerda and Zeballos (1975)). The increase in the FIRs between 1975-1980/81 corresponds to a period of accelerated growth and very fast and little regulated financial market liberalization, being held responsible for the banking crisis of 1981/83.

2/ In the late 1970s, the credits to the private sector were financed largely by borrowing from abroad. The banking crisis emerged with the collapse of copper prices and the strong devaluation of the peso.

regressions close to 1 and R^2 of 0.9 and above (not shown). At a monthly level, there is also a strong correlation between the turnover in asset trade (in bonds, shares, etc.) and the level of assets held by the pension funds at the end of month (as a proxy for turnover since no such data are available), with a break around the turn of 1984/85. Before 1985, the correlation is zero or negative, except for the trade in assets with fixed return ($\rho = 0.65$); this corresponds to the period when pension funds were restricted to the holding of debt instruments. For the period January 1985 to June 1995 the correlation between the monthly turnover in each asset and the stock of pension fund assets at month-end is always above 0.9. This empirical evidence is consistent with the claim that pension funds made the financial markets deeper and more liquid.

With regard to contribution of pension funds to enhanced competitiveness and risk allocation, the available data only allow for a very cursory investigation. Figure 4 presents yearly data for the asset mispricing indicators (based on the arbitrage pricing, the capital asset and the international asset pricing model, AP, CAP, and ICAP, respectively; Korajczyk (1994)) and indicators of pension fund assets. 1/ The mispricing indicators measure the actual performance of financial assets compared to a reference performance based on alternative model calculations. If the pension fund activities improve the performance of the finance market the mispricing should decrease with enhanced fund activities. The correlation between the mispricing and pension fund indicators is the correct sign, is statistically significant at 5 percent error level, and ranges between -0.27 and -0.52.

As regards the contribution of pension funds to the development of financial instruments, such as indexed annuities, the provision of funds to key sectors, such as mortgage bonds to finance housing, the importance of enterprise bonds which are mainly held by pension funds, and the increased holding of traded shares by the pension funds; this evidence seemingly indicates the contribution of pension fund activities to a more sophisticated financial market. With the gradual relaxation of regulations for pension fund investments, their portfolio also has become more diversified, with central bank liabilities still constituting almost 40 percent of AFP's assets (Figure 5). Various evidence suggests that pension funds are operating efficiently and the selected portfolio, given the restrictions on asset investments which are only gradually lifted, is on the (restricted) efficiency frontier (Walker (1991a and 1991b) and Zuñiga-Maldonado (1992)). In a competitive environment this may constitute indirect proof of the overall efficiency of the financial system.

Yet, all this evidence does not establish watertight proof that the establishment of pension funds has been the decisive factor, or even only an important component, for the impressive development of financial markets

1/ These data are used in Levine and Zervos (1995), and the access granted by Ross Levine is gratefully acknowledged.

since the mid-1980s. The empirical evidence is only consistent with the claim. The healthy growth and development of financial markets after 1983 may simply reflect changes in legislation, and the learning from experiences and mistakes of the late 1970s and early 1980s. 1/ Since the counterfactual of the development of financial markets without pension reform cannot be established, and empirical evidence from other countries with similar reform is not at hand, it may actually be impossible to prove. Hence, in order to increase confidence in the claim, further evidence with different approaches is required. 2/

Nevertheless, for the emerging economies of Central and Eastern Europe such a proof may not be necessary in order to follow a similar approach. What is important is that their financial markets are still underdeveloped, that pension funds may importantly accelerate their development if the required framework is established, and that developed financial markets can contribute to economic growth.

2. Total factor productivity and financial market development

The model outlined above assumes that the change in labor productivity, $\partial T/\partial t$, is determined by an exogenous component λ and an endogenous component $\alpha(\kappa, \dots)K/L$ which is positively dependent on the financial market indicator κ . Since technological progress has to be labor augmenting in order for a model to have a steady-state with constant growth rates (Barro and Sala-i-Martin (1995)), we can immediately use total factor productivity (TFP) for our specification. Hence, in a linear approximation, TFP should exhibit a positive dependence from κ :

$$[5] \quad TFP_t = a_0 + a_1 D(L)\kappa_t + a_2 X_t + u_t$$

with $D(L)$, an appropriately chosen lag-structure for κ , since the effects can be expected to be distributed over various periods, and X representing other variables able to capture further impacts, most importantly cyclical effects.

To estimate TFP, a simple growth-accounting exercise is undertaken, calculating it as the residual of the well-known equation (with logarithmic approximation to account for discrete time):

$$[6] \quad TFP_t \approx \log(A_{t+1}/A_t) = \log(Y_{t+1}/Y_t) - (1-\beta_t)\log(K_{t+1}/K_t) - \beta_t \log(L_{t+1}/L_t)$$

1/ For an analysis of the experience and mistakes of financial market liberalization during this early period of economic reform, see De la Cuadra and Valdés-Prieto (1992a and 1992b) and Valdés-Prieto (1992).

2/ A further approach in preparation intends to investigate the impact of pension fund activities on asset-price mismatching on a monthly basis, using monthly stock, turnover, and return data of pension funds.

with β_t , the labor share of income, which is held constant at 0.65 (using the estimates by Coeymans and Mundlak (1993)).

Table 2 presents the results of this exercise which leads to the following observations.

(i) For the total period surveyed (1961-94), the TFP is 1.3 percent. This rate is slightly below the rate of 1.5 percent reported for the period 1940-80, when the average GDP growth was 3.8 percent (Elias (1990)).

(ii) There is a clear difference between the periods 1961-85 and 1986-94, reflected in the estimated TFP of 0.8 and 2.6 percent, and GDP growth rates of 2.6 and 6.5 percent, respectively. The first period was characterized by two important negative shocks (an internal at the beginning of the 1970s, and an external/internal at the beginning of the 1980s), but also a period of high TFP and GDP growth (1976-81).

(iii) Comparing the two periods of high TFP/high GDP growth raises the question whether they both represent only a catch-up after a deep slump, leading to the (low) long-term GDP growth rate of some 3-4 percent, or whether the current growth period constitutes a structural shift in TFP, capital and labor growth, and hence long-term GDP-growth prospects. The difference in growth rates of the capital stock in both periods signals a change.

Estimating equation [5] with some appropriately chosen additional variables may clarify this issue, while highlighting the impact of financial market developments. In view of the cyclical development during the period under investigation and the high likelihood that the stock of factors (capital and labor) do not correctly reflect the factor services actually provided, the level of unemployment and its change is used to proxy cyclical effects, leading to a very satisfying statistical fit for the reduced sample period (Table 3). 1/ Since TFP may follow an adjustment process, estimations with a one-period lag were also undertaken, with somewhat mixed results. Adding the financial market indicators improves the overall fit,

1/ The parameter estimates for the Δ FIR and Δ SMI variables slightly differ from previously presented estimates due to data revisions and the normalization of the respective sample average to one. The normalization allows for a direct parameter comparison between different financial market indicators and a straightforward interpretation of the parameter value.

Table 2. Growth Accounting and Total Factor Productivity

	1961-94	1961-85	1986-94	(86-94)/(61-85)	1976-81
	<u>(Average annual change in percent)</u>				
TFP annual	1.3	0.8	2.6	1.9	4.2
GDP-log change	3.6	2.6	6.5	3.9	6.9
Contribution of factors	2.4	1.8	3.9	2.1	2.8
Contribution of capital	0.9	0.7	1.6	0.9	0.6
Contribution of labor	1.4	1.1	2.2	1.1	2.2
Capital-log change	2.7	2.0	4.6	2.7	1.7
Labor-log change	2.2	1.7	3.4	1.7	3.3

Sources: Central Bank of Chile; Coeymans et al. (1993); and own calculations.

Table 3. Total Productivity and Financial Market Developments

Endogenous Variable:	TFP	Constant	TFP(-1)	Unempl. Rate	Δ UER(-2)	FMI(-1)	
EQ(1a)		0.049 (4.37)		-0.512 (4.76)	-0.579 (4.40)		$R^2=0.858$ DW=2.21
EQ(1b)		0.055 (4.38)	-0.125 (1.66)	-0.566 (4.77)	-0.569 (4.42)		$R^2=0.871$ DW=1.77
EQ(2a)		0.021 (1.16)		-0.331 (2.39)	0.661 (5.16)	0.011 (1.85)	$R^2_c=0.891$ DW=2.19
FMI ₋₁ = Δ FIR1							
EQ(2b)		0.025 (1.47)	-0.175 (1.72)	-0.374 (2.87)	-0.679 (5.73)	0.013 (2.32)	$R^2_c=0.916$ DW=1.48
FMI ₋₁ = Δ FIR1							
EQ(3a)		0.029 (1.92)		-0.407 (3.64)	-0.700 (5.17)	0.010 (1.93)	$R^2_c=0.894$ DW=2.13
FMI ₋₁ = Δ FIR2							
EQ(3b)		0.0349 (2.28)	-0.132 (1.53)	-0.462 (3.96)	-0.703 (5.34)	0.010 (2.02)	$R^2_c=0.908$ DW=1.75
FMI ₋₁ = Δ FIR2							
EQ(4a)		0.040 (2.47)		-0.440 (3.12)	-0.428 (4.65)	0.004 (0.80)	$R^2_c=0.866$ DW=2.20
FMI ₋₁ = Δ SMI							
EQ(4b)		0.043 (2.78)	-0.171 (1.81)	-0.475 (3.46)	-0.592 (4.66)	0.005 (1.23)	$R^2_c=0.888$ DW=1.58
FMI ₋₁ = Δ SMI							
EQ(5a)		0.034 (3.21)		-0.427 (4.65)	-0.548 (5.24)	0.009 (2.73)	$R^2_c=0.916$ DW=2.52
FMI ₋₁ = Δ FMR1							
EQ(5b)		0.042 (5.54)	-0.260 (3.69)	-0.509 (7.67)	-0.541 (7.58)	0.012 (5.01)	$R^2_c=0.964$ DW=2.48
FMI ₋₁ = Δ FMR1							
EQ(6a)		0.049 (5.40)		-0.562 (6.28)	-0.645 (5.92)	0.005 (2.67)	$R^2_c=0.914$ DW=2.51
FMI ₋₁ = Δ FMR2							
EQ(6b)		0.055 (5.48)	-0.119 (1.86)	-0.613 (6.38)	-0.645 (6.07)	0.005 (2.70)	$R^2_c=0.926$ DW=2.43
FMI ₋₁ = Δ FMR2							

Note: OLS; period of estimation: 1979-94, with lagged variables for FMI estimator starting as of 1975. Absolute t-value in parenthesis.

yielding for most lagged FMI-variables (with an Almon-lag type structure) $\frac{1}{s}$ coefficients which are significant at a 5 percent level and below, while reducing the significance of the constant. The low t-value for stock market index (SMI) may be due to high multicollinearity between the unemployment rate and the SMI, but alternative specification and estimation techniques (such as IV) were not successful. The estimated parameter values prove to be robust for different specifications and time periods of estimation (not shown), and the lagged impact of financial market indicators (compared to the contemporaneous impact, which proves statistically totally insignificant) gives confidence in the causality.

Taken at face value, the results would suggest strong effects of financial market developments on TFP. Using the point estimates and assuming an equilibrium unemployment rate of 5 percent, the exogenous technical progress would amount to some 1 percent, to which 1+ percent of technical progress generated by financial market developments are added, yielding a long-term annual TFP of 2+ percent. The estimated FMI effect of 1+ percent is likely to proxy other effects, which may be highly correlated with financial market developments, such as reductions in exchange rate restrictions and increasing openness of the economy. Given data restrictions, the separation of these effects is not possible currently.

The magnitude of parameter estimates for the SMI variable in equation [4] invites comparison with the estimates for the cross-country study quoted above. Their point estimate is 0.007 (with a t-value of 1.96) compared to our result of 0.004 to 0.005. While the statistical closeness of the point estimates may be spurious, the coincidence, however, is surprising.

In summary, the tentative empirical evidence suggests a positive impact of financial market developments on total factor productivity and thus economic growth. The available data and estimates do not allow one to distinguish between permanent and transitory effects. Yet, even if the higher TFP of 1 percent per annum were only of a temporary nature, accumulated over 20 to 40 years they would provide welfare gains for current

$\frac{1}{s}$ The approach uses the data structure of the Almon lag to calculate a composite variable $\Delta FMI(1,s)_t = 1^s \Delta FMI_t + 2^s \Delta FMI_{t-1} + \dots + 1^s \Delta FMI_{t-1}$. Thus $\Delta FMI(2,2)_t = \Delta FMI_t + 4\Delta FMI_{t-1} + 9\Delta FMI_{t-2}$. This approach results from economic, econometric, and data considerations. Economically one would assume that improvements in the financial market, measured by changes in the level of FMI, will have little immediate impact, but that the impact follows with a lag, and the strength of the impact growing over time for some periods. However, a direct application of the traditional Almon procedure is prevented by the short period of observation, with increasing s under the full Almon approach reducing the degree of freedom on a pro-rata basis. In addition, $\Delta FMI(1,s)$ for 1 and $s=1, \dots, 3$ proved to be highly correlated. Finally, unless very strict conditions are met, the Almon procedure will yield biased and inconsistent estimates.

(and all future) generations which should allow for a major compensation of the transition generation to take place.

3. Pension reform and labor market development

Shifting toward a funded scheme, which establishes a close link between contributions and benefits, is frequently claimed to reduce labor market distortions and informal market activities, to encourage formal labor market participation and contribution payments, and consequently to increase retirement coverage of the population. In some model setting, shifting labor from the informal to the formal sector may even contribute to endogenous growth if the latter sector employs a more productive technology (Corsetti (1994)). The available data are consistent with some but not all of these claims. Yet, the data basis is somewhat shaky and does not allow a comparison with developments prior to 1982. 1/

Figure 6 presents key ratios of labor market participation, contribution payment, and pension coverage which suggest the following tentative conclusions:

(i) Pension coverage for dependent workers under the new scheme seemingly increased. The ratio of actual contributors under the old and new pension schemes to the number of potential mandatory contributors (i.e., all civilian dependent workers) has increased since 1982, reaching well above 90 percent since the late 1980s and implying an increase in the coverage rate of some 10 percentage points for all workers within 10 years of the system's operation.

The overall labor force participation rate (employed to population aged 15 and older) has also increased by some 10 percentage points. This may be linked with the new pension system but may also simply reflect the favorable

1/ The multiplicity of social security funds prior to 1981 with frequent double counting and the lack of comparability does not allow a comparison with post-1981 developments. But the post-1981 data are also surrounded by uncertainties, inter alia:

The total number of actual contributors to the new scheme, as regularly published by the Superintendencia de AFP comprises payments for the current month, for cleared arrears of past months, and for payments in transit (not yet allocated to individual AFP). Only if the distribution of these payments between current/arrears/transit over the months is constant is the number of actual contributors a good indicator for effective contributors.

Military and police staff have conserved their unfunded schemes (i.e., they are not required to contribute to the new scheme) but the number of contributors is not published. In order to calculate the ratio of old and new contributors to mandatory contributors requires an estimation of their number (for which a ratio to the published number of beneficiaries is taken).

macroeconomic developments and the decline in the unemployment rate (see Table 1).

(ii) The rising ratio of new contributors to all employed persons, starting below 40 percent in 1982 and reaching almost 60 percent in 1994, reflects the decreasing number of contributors under the old-pension scheme (below 300,000 at end-1994) while new entrants in the labor market have to join and contribute to the new scheme (total contributors of almost 2.9 million at end-1994).

(iii) The ratio of contributors under the old and new schemes to all employed (i.e., all potential contributors) has largely stabilized since 1987 at around 60 percent. This stability and the high coverage rate for mandatory insured dependent workers reflects a very low permanent take-up rate by the self-employed (including employers and nonremunerated family members). By end-1994, only some 60,000 self-employed are voluntarily contributing to the new funded scheme, roughly equivalent to the number of insured under the old unfunded scheme (out of almost 1.6 million self-employed at end-1994, i.e., less than 8 percent).

(iv) The low number of contributing self-employed in any month contrasts with the high number of affiliates, for example, those persons which have contributed at least once to the new pension scheme, amounting to over 90 percent of the labor force and almost 97 percent of employed persons at end-1994. Apparently, the self-employed prefer not to contribute constantly to the new scheme but to save for old age through their own, mostly small enterprises. Besides liquidity and rate-of-return considerations, such behavior of the self-employed may also be generated by the legal provision which requires only 20 years of contributions to qualify for the minimum pension financed from general government resources (after the accumulated individual assets with an AFP are depleted).

In summary, the new pension scheme seems to have been no obstacle for higher labor market participation and may have generated a higher and more formal labor force participation of the dependently employed. As regards the self-employed, their voluntary contribution status in the new scheme may also have reduced informal labor market activities; on the other hand, it may have substantially limited permanent program participation and comprehensive pension coverage. If this reflects liquidity constraints, an important share of future elderly persons may have recourse to social assistance provisions (which, however, is currently limited in terms of the number of people that can be covered); if it results from strategic behavior to obtain a minimum pension only, this may create an important burden for future budgets.

4. Capital formation, saving, and financial market development

In the economic policy discussion both capital formation and domestic savings are generally claimed to be positively influenced by a pension reform-induced deepening of the financial market (IMF (1995)). In a closed

economy the overall effect should be identical, but may lead to different distribution between public and private sector investment and saving balances. For example, with given public capital formation, a stronger impact on private capital formation than on private saving has to be compensated by public saving if the private investment were to take place. In an open economy, foreign saving may additionally compensate for sectoral investment/saving imbalances.

Traditional wisdom is that the influence of financial market deepening on both capital formation and saving is positive (McKinnon (1973) and Shaw (1973)). However, further theoretical considerations and international empirical evidence suggest that it can go both ways, or be zero.

A positive relation between FMI and capital formation (measured by the change in real capital stock) is suggested by considerations of better access to financing (i.e., reduced borrowing constraints), enhanced incentives to undertake longer-term investment projects, and better risk allocation. However, a more efficient market with reduced transaction costs and higher rate of return for all investment projects may also lead to a redirection of the holding of wealth by economic agents in the form of existing equity claims and to invest less in the initiation of new capital investments (Bencivenga et al. (1995)).

Preliminary econometric testing for Chile suggests that the change in capital stock follows an adjustment process, with the lagged variable entering very significantly, and this is also influenced by cyclical effects, or expectations about future developments, measured by the unemployment rate (Table 4). Entering the lagged FMI variables (again with an Almon-type lag) leads to an improvement in the equation fit and to coefficients which are consistent in sign and significant at a 5 percent level and below, except for SMI. The SMI variable leads to insignificant coefficients, which may reflect the same multicollinearity problems as noted above.

Again, taking the point estimates for the FIR/FMR variables at face value, the long-term increase in capital stock is some 5+ percent, reduced by an assumed long-term unemployment rate of 5 percent by 1 percentage point, but increased by the enhanced financial markets by around 0.5+ percentage point, or some 1/8 of its "natural" level. This result hints at nonnegligible effects of financial market developments on the formation of the capital stock which have to be added to the effects of TFP in their growth consequences. 1/

With regard to the relation of FMI and saving the same theoretical qualifications about the a priori sign and strength apply. Financial market

1/ Our reported point estimates of FMI on capital accumulation of 0.004 to 0.008 are close to the estimate in the cross-country study of 0.011 (with a t-value of 2.38); Levine and Zervos (1995).

Table 4. Capital Formation and Financial Market Developments

Endogenous Variable:	K Percent	Constant	K Percent(-1)	UER	FMI(-1)	R_c^2	DW
EQ(7)		0.030 (5.10)	0.79 (9.11)	-0.21 (5.14)		0.945	1.63
EQ(8)		0.026 (4.78)	0.526 (3.74)	-0.175 (4.38)	0.008 (2.19)	0.962	1.92
FMI ₋₁ =ΔFIR1							
EQ(9)		0.033 (6.33)	0.565 (4.64)	-0.247 (6.38)	0.007 (2.28)	0.963	2.21
FMI ₋₁ ΔFIR2							
EQ(10)		0.028 (4.18)	0.770 (8.47)	-0.195 (3.92)	0.001 (0.70)	0.947	1.68
FMI ₋₁ ΔSMI							
EQ(11)		0.026 (5.17)	0.746 (10.3)	-0.193 (5.55)	0.004 (2.61)	0.966	2.00
FMI ₋₁ ΔRM11							
EQ(12)		0.038 (6.95)	0.684 (8.88)	-0.295 (6.78)	0.005 (2.85)	0.969	2.37
FMI ₋₁ ΔRM12							

Note: OLS; period of estimation: 1979-94, with lagged variables for FMI estimator starting as of 1975. Absolute t-value in parenthesis.

developments may induce higher (private) saving via the provision of attractive saving outlets, but may also reduce it due to higher real interest rates and the dominance of conventional income effect over the substitution effect; better risk diversification providing a given rate of return and risk level with lower savings, thus changing the form of saving but not the level; the availability of annuities (allowing for higher old-age consumption and reducing the amount of unintended bequests, Auerbach et al. (1992)); or improved access to consumer credits (allowing for a better consumption smoothing). ^{1/}

Preliminary econometric testing suggests that the negative effect of financial market developments on private saving prevails (Table 5). The basic specification of the private saving rate, with the constant and unemployment variables as the explanatory variables, is generally improved if FMI variables are added. All FMI variables enter negatively with significant parameter at a 5 percent level and below (except again SMI). This finding is consistent with international evidence on the impact of financial market liberalization and private saving behavior (IMF (1995)).

Yet, in view of the rising domestic and private saving in Chile in recent years, the result is surprising and requires a closer look at the components and developments of saving.

5. Pension reform and domestic saving

Inspecting the structure and development of capital formation and its financing over the last 20 years exhibits a strong rise in the private saving rate since the mid-1980s, the substantial importance of public saving, and the relative fall in importance of foreign saving (Figure 7). Domestic saving reaches levels not achieved since at least 1970.

To gauge the impact of pension reform on domestic saving a different disaggregation, consistent with SNA, is proposed. To this end, a balancing item is calculated which consists of the private saving generated (in an accounting sense) by the new scheme reduced by the fiscal costs (i.e., public dissaving):

(i) The saving generated consists of two flows: (1) the net contribution payment to the new scheme (essentially the 10 percent premium revenue); in the SNA these premiums are considered as private saving; and (2) the returns on assets generated by the new scheme. These returns are not equivalent to the change in assets by the AFPs (net of contribution payment) since the asset increase comprises both capital gains and flow

^{1/} See Masson et al. (1995) for empirical references.

Table 5. Private Savings and Financial Market Developments

Endogenous Variable: Private Saving as a Share of GDP	Constant	UER	Δ UER(-2)	FMI(-1)	
EQ(13)	0.274 (18.7)	-1.53 (11.4)	0.662 (3.94)		$R_c^2=0.904$ DW=1.43
EQ(14) FMI ₋₁ = Δ FIR1	0.309 (10.0)	-1.75 (7.87)	0.811 (3.98)	-0.013 (1.31)	$R_c^2=0.914$ DW=1.72
EQ(15) FMI ₋₁ = Δ FIR2	0.302 (14.7)	-1.66 (10.9)	0.844 (4.52)	-0.013 (1.86)	$R_c^2=0.924$ DW=1.75
EQ(16) FMI ₋₁ = Δ SMI	0.306 (11.2)	-1.78 (8.12)	0.814 (4.00)	-0.010 (1.26)	$R_c^2=0.913$ DW=1.76
EQ(17) FMI ₋₁ = Δ FMR1	0.308 (23.6)	-1.68 (16.3)	0.859 (6.89)	-0.018 (4.12)	$R_c^2=0.961$ DW=2.96
EQ(18) FMI ₋₁ = Δ FMR2	0.267 (21.5)	-1.37 (10.5)	0.761 (5.30)	-0.008 (2.85)	$R_c^2=0.942$ DW=1.89

Note: OLS; period of estimation: 1979-94, with lagged variables for FMI estimator starting as of 1975. Absolute t-value in parenthesis.

effects. We are only interested in the latter which is part of private saving in SNA. Both flows were estimated from available data. 1/

(ii) The financial costs (public dissaving, excluding the interest payments resulting from the higher fiscal deficit) consist also of two flows: (1) the deficit in the old scheme due to the loss of contributors. This deficit was approximated by the state contribution to the old scheme (excluding assistance pension financing); and (2) expenditure for recognition bonds as reported in the statistics of social security.

Table 6 reports on the data, indicating that the contribution of pension reform to domestic saving was negative between the inception of reform in 1981 until 1988. The positive balance since 1989 is essentially due to higher returns on capital investment, while the flows from premiums in percent of GDP remains largely constant at around 2.5 percent; also the fiscal costs exhibit in 1990 only a shift of some 0.8 percent of GDP (due to improved pension indexation by the new government), compensated by higher returns on assets in that year (due to a stricter monetary policy).

Figure 8 disaggregates domestic saving along different lines and according to: (i) the saving balance of pension reform; (ii) the private sector saving net of the pension system; and (iii) the public sector saving net (i.e., plus) of the fiscal costs. The striking message of this disaggregation is the parallel rise of each net-saving item and the leveling off in the period 1988-90. Since then private and public saving net of the pension system remains largely constant at almost identical levels of closely above 10 percent of GDP. The positive net-contribution of the new pension to domestic saving comes in much later, essentially after both public and private saving (net of the pension system effect) have peaked. This confirms the econometric evidence that there was no direct and positive impact of pension reform on private and domestic saving.

Tentative empirical estimates indicate that private saving is not influenced by the net saving created by pension reform but that it reacts negatively to public saving (Table 7). The latter result, which is both valid for public and corrected public saving (S^*_{public}), allows for different interpretations: a Ricardian/Barro-type reaction of the private sector, (partially) compensating any saving/dissaving by the public sector; or a Keynesian-type reaction, where a higher public saving is achieved at

1/ The premium payments until 1989 are available from Iglesias et al. (1991). For outer years they were calculated from the wage bill and the number of contributors, corrected for indicated underpayment of premiums for the period until 1989.

The flow returns on AFP assets were calculated by the average yearly stock and a representative interest rate of the financial market.

In principle, the flows ought to be corrected for savings generated in the up-stream insurance companies and dissavings by benefit payout. Both data were not at hand.

Table 6. Pension Reform and Saving Effects in SNA

Year	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
	(In percent of GDP)													
Total effect (net)	-0.2	-2.2	-1.7	-1.0	-0.1	-0.8	-0.2	-0.5	1.9	3.7	3.0	2.2	2.9	2.4
Private saving generated	1.3	2.6	3.1	3.8	4.5	3.9	4.7	4.2	6.4	9.0	8.3	7.3	8.3	8.0
Flows--net contribution <u>1/</u>	0.9	1.7	1.5	1.6	1.6	1.7	1.6	2.0	2.2	2.3	2.4	2.4	2.4	2.5
Flows--net saving <u>2/</u>	0.4	0.9	1.5	2.2	2.9	2.3	3.1	2.2	4.2	6.7	5.9	4.9	5.8	5.5
Fiscal costs of reform	-1.5	-4.8	-4.8	-4.8	-4.6	-4.7	-4.8	-4.7	-4.5	-5.3	-5.3	-5.1	-5.4	-5.6
Deficit coverage <u>3/</u>	-1.5	-4.7	-4.6	-4.6	-4.3	-4.3	-4.4	-4.2	-4.1	-4.8	-4.8	-4.6	-4.8	-5.0
Recognition bonds	--	-0.1	-0.2	-0.2	-0.3	-0.4	-0.5	-0.5	-0.4	-0.5	-0.4	-0.5	-0.6	-0.7

Sources: National statistics; and own calculations.

1/ Pension contributions to AFPs minus benefit payments.

2/ Change in pension assets net of capital gains.

3/ State contribution to social security pension funds (net of payments for social assistance).

Table 7. Private and Public Savings Interaction

Endogenous Variable: Private Saving as a Share of GDP	Constant	UER	Δ UER(-2)	S_i /GDP	
EQ(19)	0.274 (18.7)	-1.53 (11.4)	0.662 (3.94)		$R_c^2=0.904$ DW=1.43
EQ(20) $S_i = S_{pension}$	0.284 (8.609)	-1.63 (5.47)	0.687 (3.35)	-0.193 (0.30)	$R_c^2=0.904$ DW=1.45
EQ(21) $S_i = S_{public}$	0.319 (18.7)	-1.84 (13.7)	0.698 (5.46)	-0.546 (3.44)	$R_c^2=0.904$ DW=2.33
EQ(22) $S_i = S_{public}^*$	0.391 (6.45)	-2.13 (6.58)	0.841 (4.63)	-0.821 (1.97)	$R_c^2=0.927$ DW=2.20

Note: OLS; period of estimation: 1977-1994. Absolute t-value in parenthesis.

the expense of the disposable income of the private sector, reducing the private saving rate. Current tax revenue as well as current expenditure in percent of GDP have been falling constantly since the mid-1970s.

The negative coefficient of private saving response to public saving effort of around -0.5 is consistent with past and recent empirical findings for developed and developing countries (Corbo and Schmidt-Hebbel (1991) and Masson et al. (1995)).

Figure 9 highlights the contribution of fiscal performance and public saving to support the transition from an unfunded to a funded pension scheme, and the fiscal costs involved. A restrictive fiscal policy which pays off government debt through higher taxes or lower expenditure and hence shifts resources from current to future generations encourages higher saving and capital formation.

Reportedly, the Chilean authorities preceded the inception of the pension reform for some years with a deliberate strengthening of the fiscal stance, leading in 1980 to a positive balance of general government of 4.4 percent of GDP and a public saving rate of 7.4 percent of GDP, respectively. The ensuing decline in both the fiscal stance and public saving as a result of the reform start to be compensated immediately in the following years, reaching again a positive public saving rate in 1985 and a balanced fiscal stance in 1988. In view of the declining share of current revenue as a percent of GDP due to various tax reforms and tax rate cuts, strengthening of the fiscal stance was achieved by program reforms and expenditure cuts (Larrain (1991) and Marshall and Schmidt-Hebbel (1994)). The new democratic government which came into office in 1989 has stabilized the expenditure level but not reduced it.

On the surface, this fiscal behavior suggests that pension reform and its transition is fully financed by the current generation through a lower level of public consumption, in contrast to the alternative of shifting the burden to future generations via higher (explicit) public debt. However, this assessment is partly changed if the counterfactual chosen represents the old growth path without reform. In an extreme formulation, if all the growth differential of real GDP of some 2 percent per annum, resulting from higher TFP and capital formation were to be attributed to pension reform, with fiscal costs of transition at some 5 percent per annum, the net burden for the transition generation would amount to around 3 percent per annum. Yet, also in this counterfactual a strengthening of the fiscal stance is required since the budget captures only a fraction of the increased income level (some 20+ percent) while the remainder flows to the private sector.

V. Preliminary Conclusions

Given the still incomplete state of data and very tentative and simple econometric testing, the conclusions reached can only be seen as very preliminary. Yet, three main conclusions are suggested.

1. Consistency of empirical findings with most hypotheses

The empirical findings are seemingly consistent with the claim that financial market developments enhance economic growth and that pension reform has contributed to this development. The link between financial market indicators (FMI) and total factor productivity (TFP) and capital accumulation (percent K) is surprisingly robust and, given the degrees of freedom, statistically significant at a 5 percent and below level. A link between pension funds and financial market developments is suggested by the data with regard to the level and scope of interaction; as regards the contribution of pension fund activities to the liquidity and competitiveness of the financial market, the available evidence also supports the conjecture, but further research and data are required. However, the question may never be answered: how the financial market in Chile would have developed had the pension reform not taken place.

The results for the stock market influence are consistent in sign and magnitude with findings in a very recent cross-country study, with statistically better secured parameter estimates. This lends support to our findings.

The results are also consistent with the claim that moving to a funded scheme and establishing a strong contribution/benefit link has a positive impact on the labor market. Pension coverage for dependent workers under the new scheme improved. The ratio of actual contributors under the new and old pension scheme to the number of potential mandatory contributors has increased since 1982 by some 10 percentage points and reached over 95 percent in 1994.

As regards the impact of pension reform on private saving, however, the results suggest that the widely held view on the Chilean reform to have increased the private saving rate may not be valid, or at least needs to be qualified.

2. The causality of saving and the importance of public saving

Contrary to the common belief about the effects of the pension reform, the empirical findings suggest that the direct contribution of financial market developments to private saving was negative. The parameter estimates indicate a sizable negative impact of some 0.8 to 1.8 percentage points on the private sector saving rate (in percent of GDP). The result is supported by an alternative approach which disaggregates the impact of pension reform on the domestic saving rate along SNA lines. The data indicate that net-pension saving (the balance between net premiums plus asset returns under

the new scheme and fiscal costs of the reform) was negative until 1989 and small afterward. Both independent approaches suggest that the conventionally assumed causality of the impact of a Chilean-type pension reform on private (and domestic) saving may not hold.

The proposed alternative causality is two-fold: economic growth due to higher TFP, higher capital accumulation, and better labor market performance are at the origin of a higher private saving rate; the increase in the private saving rate is strengthened by higher public saving.

The rise in the private saving rate seems to be related to an increase in disposable income (reflected in our specification by the fall in the unemployment rate) and is thus consistent both with other studies stressing, in the Latin American context, the level and change of income (Bosworth et al. (1994)), and with recent international evidence for the positive impact of economic growth on the saving rate of the private sector (Masson et al. (1995)). Consequently, pension reform may have had two opposing effects on private saving: an indirect positive and a direct negative one. A crude estimate of the net impact is outlined in Table 8. Inasmuch as the reform contributed to economic growth (through increased TFP, capital formation, and labor market performance 1/), the impact on saving was positive. Taking alternative parameter estimates from a recent IMF study on the relation between the private saving rate and growth rate (Masson et al. (1995)) leads to a rise in the private saving rate in the range of 0.1 and 3.8 percentage points of GDP. Subtracting our estimated negative direct impact of financial market development on the private saving rate leads to net effect which ranges between minus 1.7 and plus 3.0 percentage points of GDP.

An important contribution to the rise in private and domestic saving, however, comes also from the public sector, highlighting the importance of sound fiscal policy in the reform environment. Public saving, including the financing of the transition costs of the reform, increased by some 10 percentage points of GDP of which half was used to finance the reform. Shifting between lower social security contributions and high premiums, however, leads by mere SNA definition to a rise in the measured private and fall of the public saving rate. If the domestic saving rate is to increase, the public saving rate net of reform costs has to increase as well. However, public saving does not add to private saving on a one to one basis; the private sector compensates for roughly 50 percent. Thus, the public saving effort has to be even higher which was the case in Chile.

1/ The impact of pension reform on labor market performance was not econometrically investigated. Yet, since 1980 the growth rate of labor force was 1.7 percentage points per annum above the growth rate of the working population, the value which is taken for deriving the high-growth estimate.

Table 8. The Net Impact of the Pension Reform on Private Saving

	Low Estimate (le)	High Estimate (he)
(1) Impact of reform on growth rate on TFP <u>1/</u> in percent	0.5	1.3
Through capital formation <u>2/</u> in percent	0.2	0.6
Through labor market <u>3/</u> in percent	0.0	1.1
Total in percent	0.7	3.0
(2) Relation between saving and growth rate <u>4/</u>	0.2	1.3
(3) Indirect effect on private saving rate (row 1 x row 2) in percent	0.1	3.8
(4) Direct effect on private saving rate <u>5/</u> in percent	-0.8	-1.8
(5) Net effect on private saving rate		
(5a) Row (3) plus row (4) in percent	-0.7	2.0
(5b) Row (3)-le/he plus row (4)-he/le in percent	-1.7	3.0

Sources: Masson et al. (1995); own calculations based on Tables 3, 4, and 7.

1/ Parameter estimates for FMI variable of EQ(6a) and EQ(2b), Table 3.

2/ Long-run parameter estimates for capital formation variable of EQ(11) and EQ(8), Table 4, times capital share of 0.35.

3/ Difference between employment and population growth of 1.7 percent per annum during period 1980-94 times labor share of 0.65.

4/ Parameter estimates for time series/cross section data from Masson et al. (1995).

5/ Parameter estimates for FMI variable of EQ(18) and EQ(17), Table 5.

These considerations also caution the optimism reigning in countries in Latin America and Eastern Europe where such a reform is seen as an easy vehicle to boost domestic saving, thus capital accumulation and growth. To receive the economic benefits of such a reform is likely to require a comprehensive and credible economic reform package and does definitely require a tight fiscal stance. Otherwise, the positive effect of financial market development on TFP may not emerge, or is (partially) compensated by reduced capital formation, or requires higher foreign saving. The latter, however, may not materialize if the fiscal stance is considered weak.

3. Message for reform countries in Central and Eastern Europe

The main message for the emerging economies in Central and Eastern Europe from the Chilean experience is, in principle, encouraging:

(i) Pension reform and a UF/FF shift may create positive externalities (on labor and financial markets) leading to an acceleration toward a higher growth rate.

(ii) These potential (endogenous or transitory) growth effects ease or, perhaps, even eliminate the problem of a double burden for the transition generation (if measured at the old growth path).

(iii) The potential higher growth path may allow for some backloading of the fiscal implications via recognition bonds and other devices.

However, pension reform à la Chile requires a comprehensive reform package covering essentially all areas of macroeconomic and microeconomic policy, and institution building, and has to be supported by a tight fiscal policy. And, pension reform must not be left to social policy specialists, but to economists with different backgrounds, ranging from industrial economics, public finance, and financial markets.

Main Features of the Chilean Pension Reform 1/

Coverage: With the start of the new scheme as of May 1, 1981 all new entrants to the labor market as dependent workers are covered under the funded retirement system. Self-employed can join the system; insured dependent workers and self-employed under the existing social security system could join the new system or remain in the unfunded scheme.

Eligibility and benefit structure: For old-age benefits it is a defined-contribution plan with individual accounts held with pension. At the age of eligibility the individually accumulated funds can either be converted into an annuity with an insurance company, or withdrawn in a phased sequence (with a maximum size depending on remaining life expectancy). The normal retirement age is 65 (men), and 60 (women). Earlier retirement is possible if the accumulated funds allow for a replacement rate of at least 70 percent of indexed taxable income over the previous 10 years.

Disability and survivors' benefits follow a defined-benefit plan, with an extra insurance promising to top-up the individual account to a target level set by various formulas. The target benefit level for full (partial) disability is 70 percent (50 percent) of indexed earnings.

The minimum pension covers old-age, disability, and survivorship. The benefit is guaranteed by the government but financing starts only once the individually accumulated funds are exhausted. Eligibility requires at least 20 years of contribution and is income-tested.

Financing and taxation: The mandatory contribution rate paid by every covered worker for retirement is 10 percent; voluntary contributions are possible (and unlimited since 1989). The additional contribution rate of 3 to 4 percent covers disability and survivors' insurance, and a commission for the AFPs.

Mandatory and voluntary contributions and earnings by the pension funds on behalf of individuals are tax exempt while benefits (as annuities or as phased withdrawals) are subject to income tax.

Organization: Private pension funds (AFP: Administradoras de Fondos de Pensiones; 21 AFPs as of April 1995) which provide fund management services, do the record keeping of individual accounts, purchase the group

1/ This description draws on various sources, in particular, Iglesias et al. (1991), Diamond and Valdés-Prieto (1993), and Superintendencia de AFP (various issues). For interesting insights into the political economy of this pension reform see Piñera (1991), then the Minister of Labor and Social Affairs, and a main driving force for the implementation of the reform. The intellectual antecedents of the reform approach, however, go back to at least 1973 (De Castro (1992)).

insurance policy for invalidity and survivorship, and perform collection and payments function; they cover their operating costs and profits through fees. Affiliates are free to select any AFP and to switch any time after a minimum of four months with an AFP.

Funds operate under tight regulation and supervision from the superintendency of pension funds, and have a comprehensive disclosure obligation. The fund operator has to guarantee a minimum rate of return (measured from the average of all funds). Only if the guarantee bond posted with the government are insufficient will government funds become involved.

The investment rules for AFP were very tight and only over the years have been gradually relaxed, allowing for the purchase of domestic shares as of 1985, and investment in foreign assets as of 1990. In April 1995 a new law was passed providing further softening in investment regulations and more flexibility in risk classification of assets.

Transition rules and government guarantees: Prior to the implementation of the reform, the existing retirement system was substantially changed, most importantly the retirement age increased to common levels (65 for men and 60 for women).

Workers that had contributed to the social insurance scheme (at least 12 months during the previous 5 years) and switched to the new system were issued "recognition bonds;" the amount should represent the contributions made under the old system. This bond matures when the worker reaches pensionable age and earns a real rate of interest of 4 percent per annum between the date of switch and maturity.

The workers switching to the new scheme had their salaries grossed-up by the prior (employer's financed) social security contribution, which amounted to some 20 percent; under the new scheme premium payment totaling between 13 and 14 percent is an employee's obligation only.

The government covers, through general revenue, the shortfall in the balance of the old system through transfers and finances recognition bonds when they mature.

The main government guarantees under the new system concern the minimum pension, insolvencies of life insurance companies (guaranteeing 100 percent of the value of the annuity up to the minimum pension, and 75 percent above), and insolvencies of pension funds (guaranteeing a minimum rate of return after AFP's own resources are exhausted).

Data Sources

The data draw from a wide range of different sources mainly official but also private. Long-term time series in official publications are typically not available and sometimes require an index-type linking to overcome structural breaks.

System of National Accounts Data: Banco Central de Chile (various issues (1990 and 1993)); Coeymans (1992) and Coeymans and Mundlak (1993) and Coeymans private data bank for real and nominal capital stock.

Fiscal Data: Flores-Jaña (1991), Dirección de Presupuestos, and Instituto Libertad y Desarrollo, mimeographed.

Pension Systems and Labor Market Data: Iglesias et al. (1991), Superintendencia de AFP (various issues); Superintendencia de la Seguridad Social (various issues); Instituto Nacional de Estadísticas (various issues).

Financial Data: Banco Central de Chile (Boletín Mensual, various issues), and Desormeaux's private data bank (Instituto de Economía, Pontificia Universidad Católica de Chile).

Figure 1. Financial Market Indicators

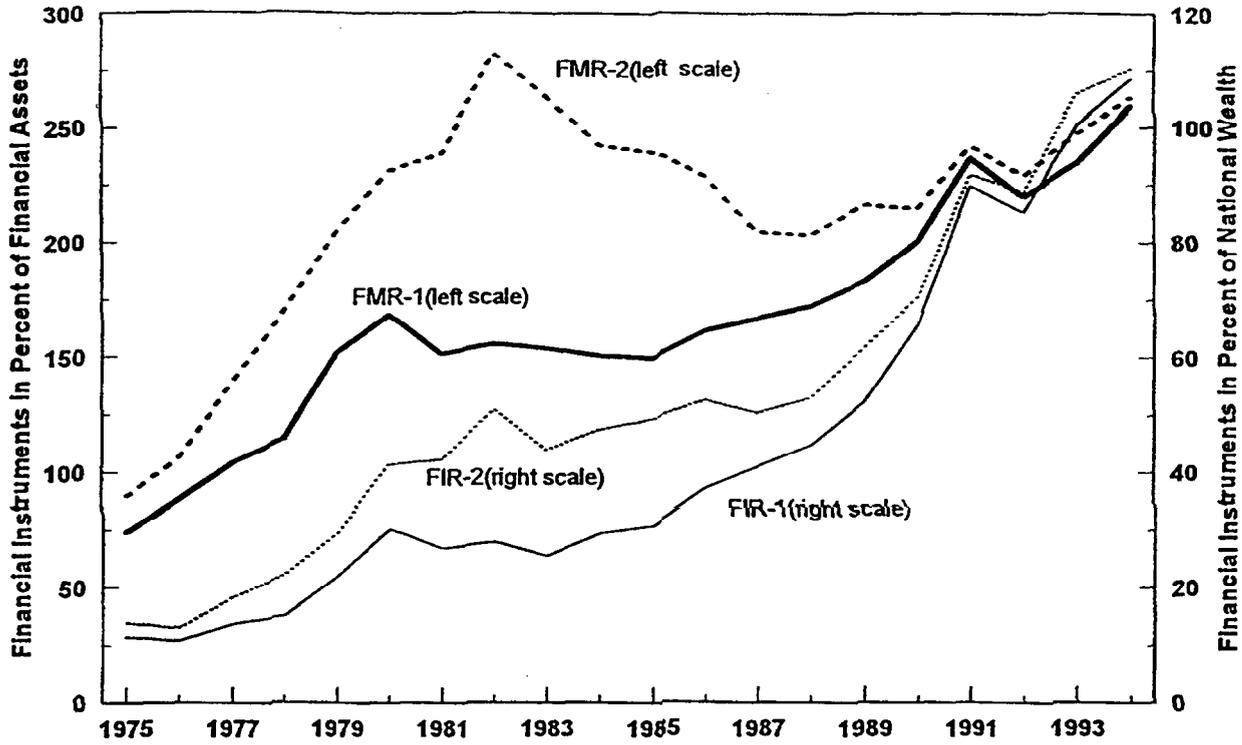


Figure 2. Stock Market Indices

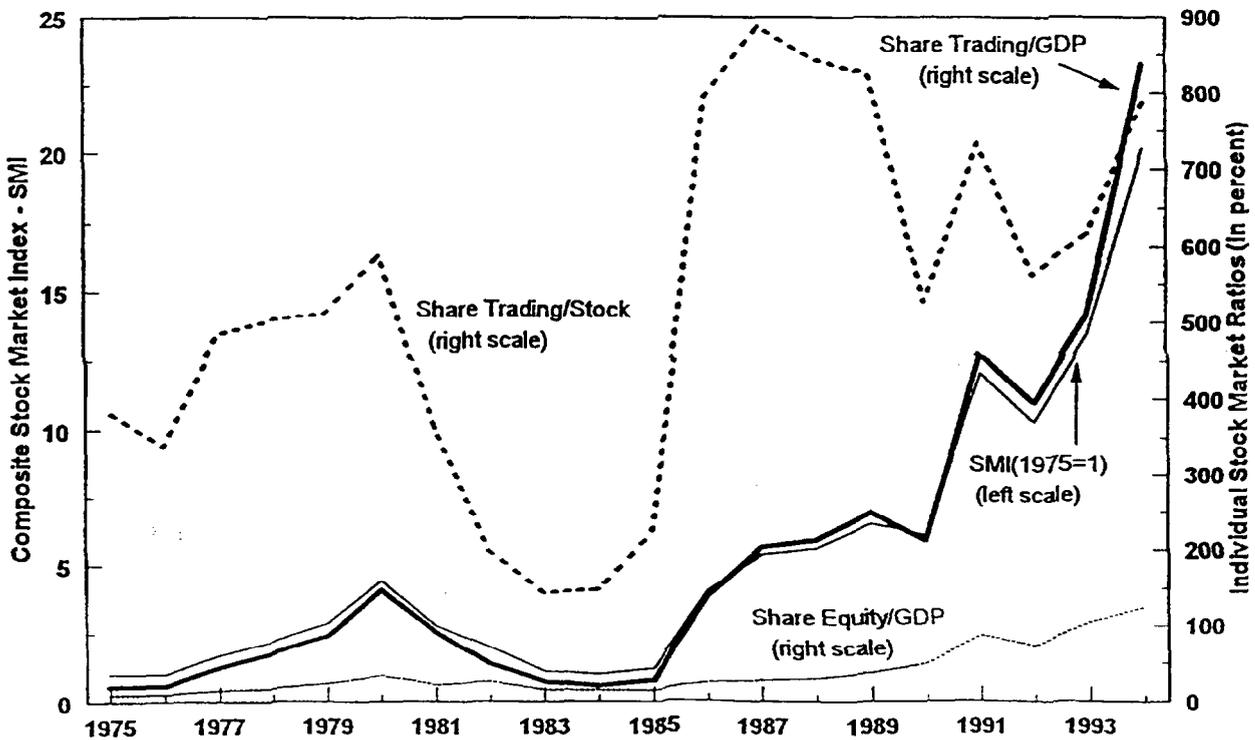


Figure 3. Pension Fund Assets and Financial Market Indices

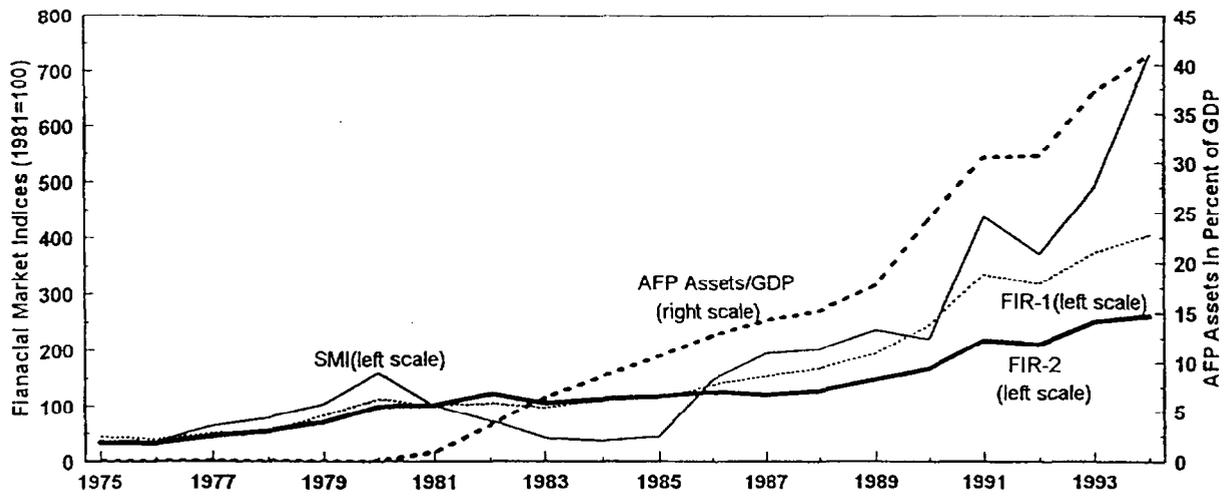


Figure 4. Pension Assets and Financial Assets Mispricing

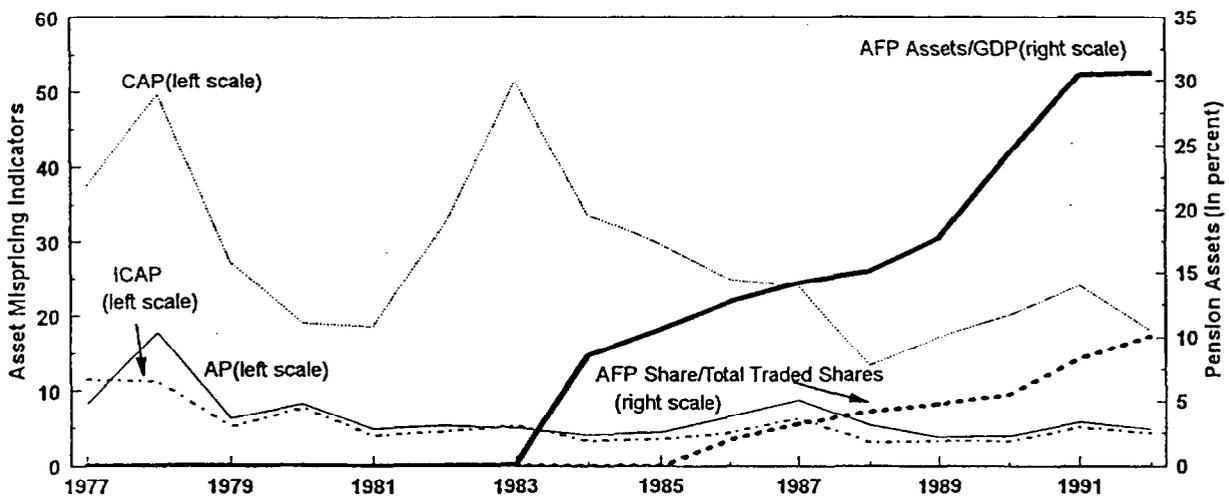


Figure 5. Asset Distribution of AFPs

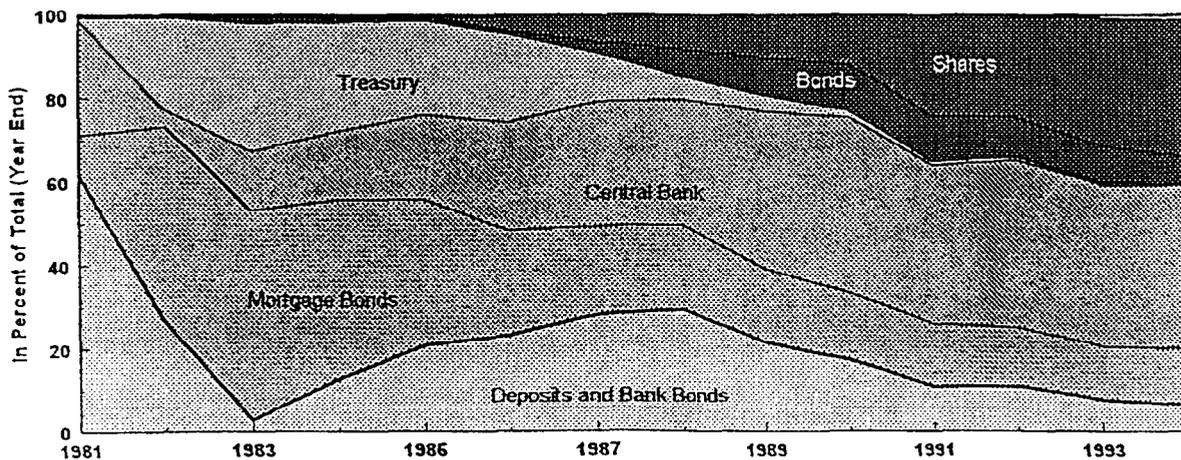


Figure 6. Coverage under New Pension Scheme

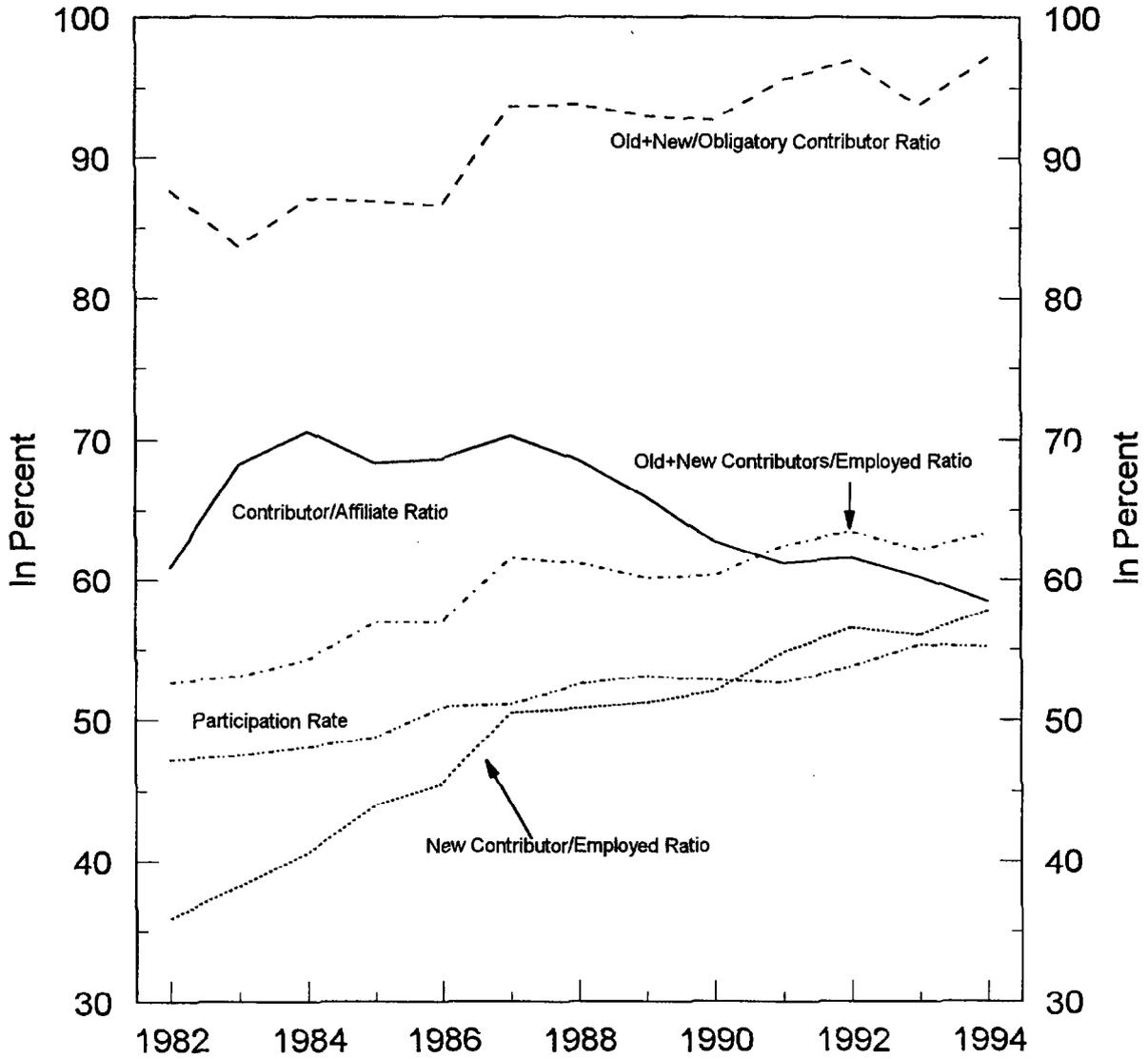


Figure 7. Capital Formation and Financing

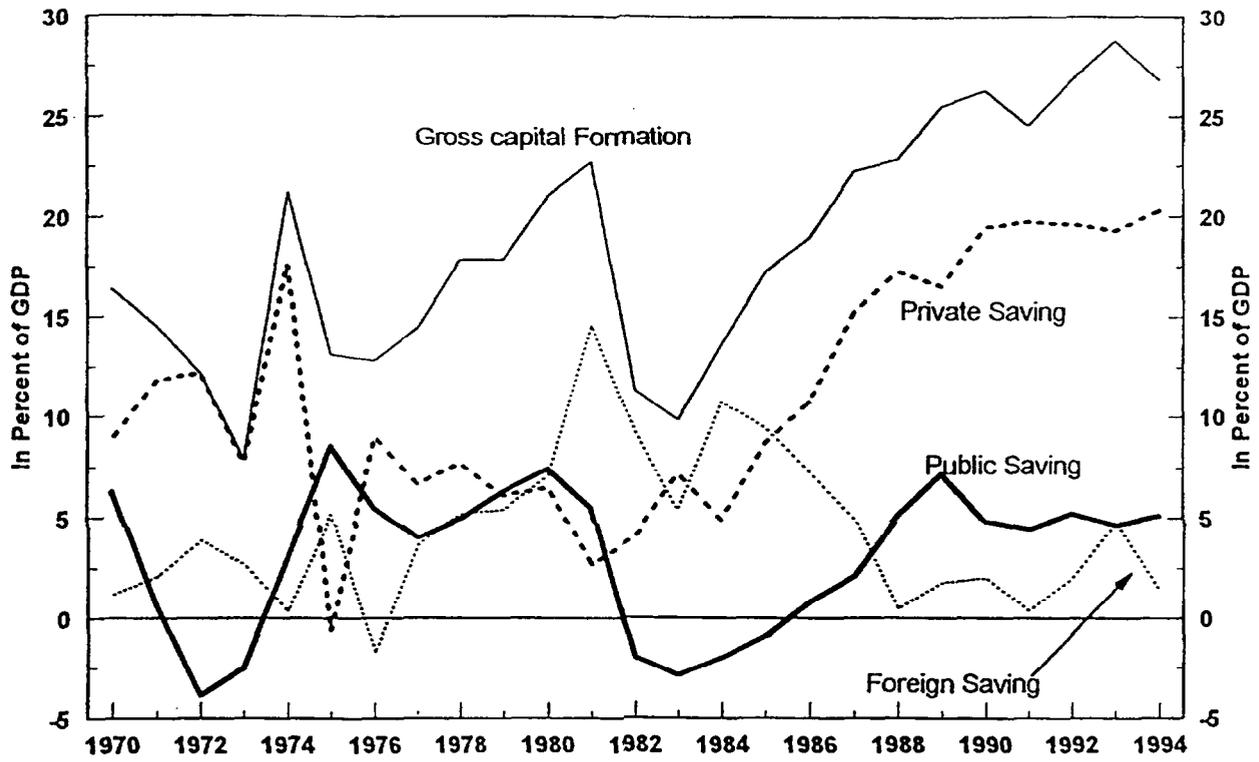


Figure 8. Pension Reform and Domestic Saving

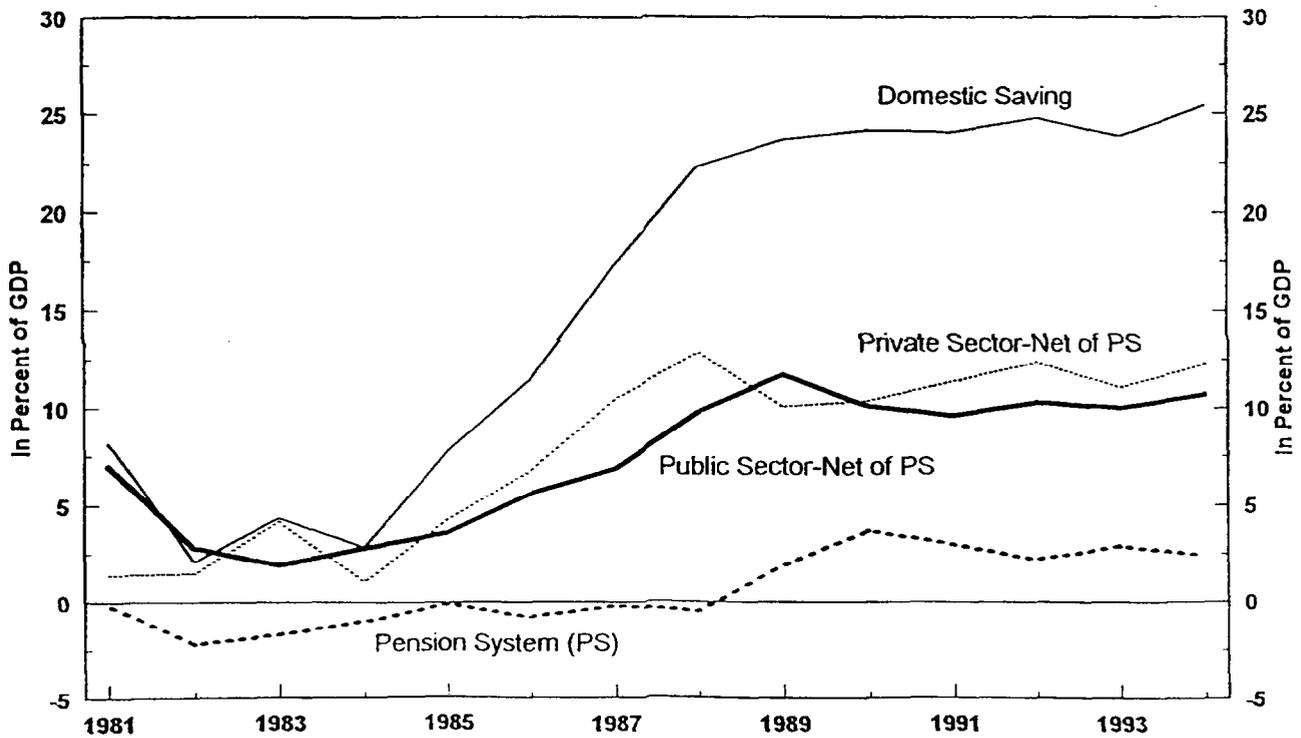
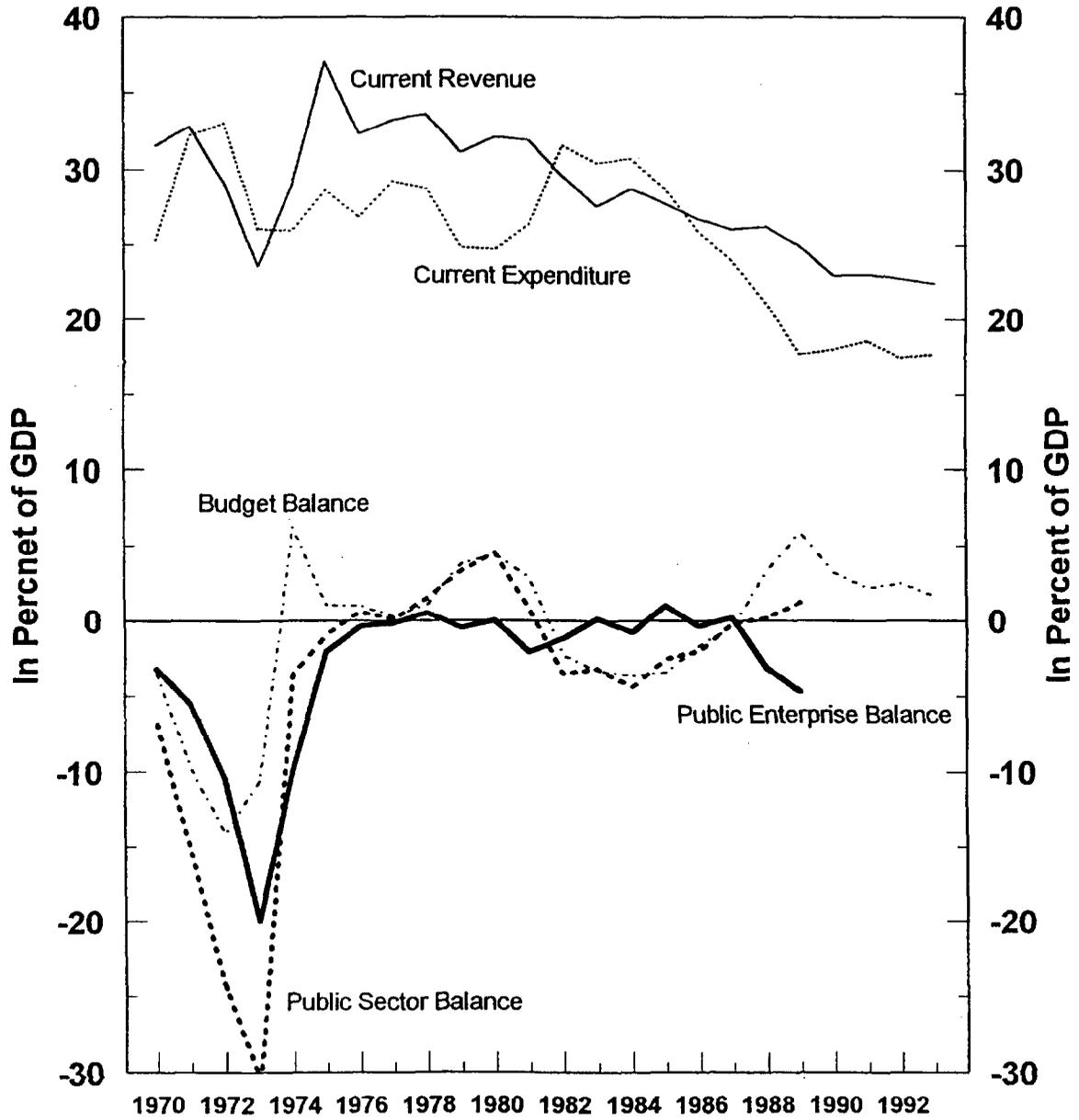


Figure 9. Fiscal Performance, 1970-93



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