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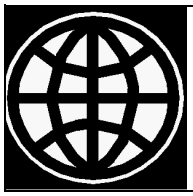

Social Protection Discussion Paper Series

Contractual Savings or Stock Market Development: Which Leads?

Mario Catalan, Gregorio Impavido and Alberto R. Musalem

August 2000

Social Protection Unit
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Contractual Savings or Stock Market Development: Which Leads?

Mario Catalan, Gregorio Impavido and Alberto R. Musalem[†]

The World Bank

Financial Sector Development Department

Financial Sector Vice Presidency

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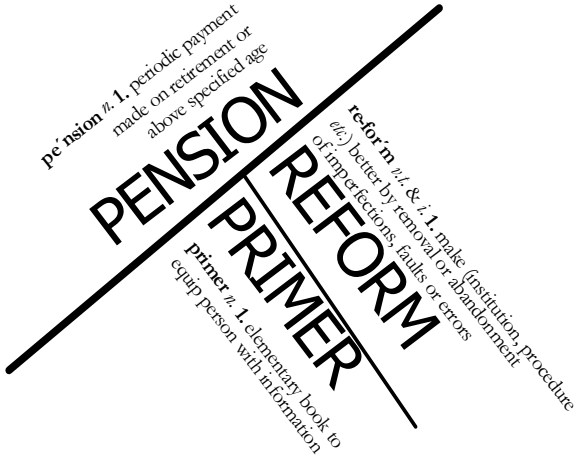

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We appreciate comments received from Asli Demirguc-Kunt, Victor J. Elias, Robert Holzmann, Patrick Honohan, Augusto Iglesias, Estelle James, Robert Palacios, Klaus Schimdt-Hebbel, Thierry Tressel and Dimitri Vittas. The findings, interpretation, and conclusions are the authors' own and should not be attributed to the World Bank, its Executive Board of Directors, or any of its member countries.

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ABSTRACT

This paper studies the relationship between the development of contractual savings (assets of pension funds and life insurance companies) and capital markets. The focus is on the macroeconomic and financial effects of contractual savings' development. New theoretical ideas and empirical results are presented. At the theoretical level, we explain how the growth of the contractual savings sector promotes financial development and economic growth through different channels. We argue that among institutional investors, contractual savings institutions are the most effective at developing capital markets. What is different about contractual savings is that their liabilities are long-term and illiquid assets in asset holders' portfolios. At the empirical level, we analyze Granger causality between contractual savings and both market capitalization and value traded in stock markets for some OECD and other countries. The evidence suggests that the growth of contractual savings cause the development of capital markets.

I Introduction

In the last two decades, there has been a dramatic growth in the assets managed by contractual saving institutions (pension funds and life insurance companies) in developed countries as well as in some developing countries as shown in Table 1. In most countries in the sample, contractual savings share to GDP (deepening) increased several fold during the period. Furthermore, Netherlands, United Kingdom, Switzerland, and South Africa had contractual savings in excess of 100 percent of GDP in 1996. The only country in the sample that experienced a decline in the participation of contractual savings in GDP is Singapore.

Pension reform favoring funding is considered to be one of the policy options that policy-makers face when attempting to develop the contractual savings sector, especially in developing countries. As evidence of the general interest on contractual savings development and its potential effects in the economy, extensive literature on the macroeconomic role of pension funds has been developed and the debate on the benefits of pension reforms has been enriched and intensified in recent years.[1]

Many studies focused on the effect of pension reforms on household saving rate and results are not conclusive. On the one hand, pension reform that relies on voluntary contributions based on expenditure tax treatment as opposed to income tax treatment is expected to have a negligible effect on saving as indicated by the extensive literature available on the inelasticity of saving to the real interest rate.[2] On the other hand, either myopia or liquidity constraints explain why pension reforms based on mandatory contributions could increase the household saving rate. The liquidity constraints are assumed to affect young or low-income individuals who cannot borrow to consume and offset the compulsory saving.[3] However, the effect on national saving will also depend on the government and firms response to pension reform.

Even if the effect of a pension reform on the national savings rate were not significant, other effects could be important. In particular, capital markets development is indicated as one of the main potential consequences of contractual savings development.[4]

This study is part of a larger research project that encompasses various contractual savings and financial sector issues. The purpose of this paper is to analyze the causality between contractual savings and stock markets development. We emphasize the role of pension funds and life insurance companies as financial intermediaries, and we compare

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1 See, for example, Holzmann (1997), Arrau and Schmidt-Hebbel (1993), Feldstein (1974, 1996), Mackenzie, Gerson and Cuevas (1997), Schmidt-Hebbel (1998).

2 See for example, Whitehouse (1999).

3 See, for example, Feldstein (1978), Munnell (1976), Loayza, Schmidt-Hebbel and Serven (2000), Samwick (2000), Smith (1990), Bailliu and Reisen (1997), Schmidt-Hebbel and Servén, eds. (1999).

4 See, for example, Bodie (1990), Davis (1995), Vittas and Skully (1991), Vittas (1998a, 1998b, 1999).

results when different institutions, like non-life insurance companies are considered. The literature is not clear on its assumption regarding causality between contractual savings and capital market development. A one-way or a two-way relationship is assumed, usually interchangeably. In this paper, we address the question of which relationship leads empirically. The evidence, including descriptive statistics as well as Granger causality tests is presented for OECD countries and some other countries such as Chile, Malaysia, Singapore, South Africa, and Thailand. The paper does not present a theoretical framework but explains with clear statements and intuitive examples the way in which we think the growth of the contractual savings sector promotes financial development.

Table 1: Contractual savings ratio to GDP (percent)

Countries	1980	1985	1990	1996
Netherlands	66.90	93.65	108.11	148.19
United Kingdom	38.81	74.77	86.90	141.72
Switzerland	70.00		88.5	131.38
United States	43.01	59.33	69.20	94.80
Canada	30.29	38.08	47.80	64.59
Australia			33.49	57.52
Sweden		23.92	28.63	47.96
Norway	13.15	17.29	25.80	30.02
Belgium		16.42	20.55	27.20
Korea, Rep.	4.06	10.48	19.24	24.36
Germany	12.73	17.63	20.68	23.82
Austria			13.28	21.35
Spain		3.21	9.87	18.78
South Africa	39.27	55.93	78.13	126.01
Singapore		153.36	115.13	93.50
Chile	1.00		29.28	50.61
Malaysia	20.08	35.65	47.18	51.02
Thailand			2.10	4.80

Source: 1998 OECD Institutional Investors Statistical Yearbook and WB institutional investors database.

The paper is organized as follows. Section II, presents the key propositions on the links between contractual savings and capital markets development. Their effects and implications for the economy as a whole are analyzed in terms of growth, term structure of interest rates, capital structure, regulation, and comparative impact on developing versus developed economies. Section III, discusses the role of contractual savings in the structure of the financial sector. In particular, it distinguishes between the effects of contractual savings, mutual funds and non-life insurance development. Section IV, presents a descriptive analysis of the data, which confirms that there is a positive relation between contractual savings and capital markets development. Section V, analyzes the causality between contractual savings and non-life insurance companies and market capitalization or

value traded in stock markets.[5] Finally, Section VI summarizes the results and the main conclusions.

II What is Different About Contractual Savings?

The key point to understanding the macroeconomic role of contractual savings and more specifically, their role as financial intermediaries, is to observe that they have a distinctive characteristic. While banks and open-end mutual funds have mainly short-term liabilities,[6] some contractual savings institutions such as life insurance and close-end pension funds (i.e., employers sponsored pension plans) have long-term liabilities on their balance sheets. Although, an open-end pension fund system (i.e., individual accounts in defined contribution schemes) operate like open-end mutual funds, however, their funds are more stable because they are captive to the industry as a whole. Hence, open-end pension funds are less exposed to systemic risks than are open-end mutual funds. This distinction has important implications. It means that the depositors or investors cannot "run" (withdraw their deposits suddenly and in a large scale) against the assets of the contractual savings institutions where they have claims. In contrast, banks, open-end mutual funds, and to a lesser extent, open-end pension plans face the risk of an unexpected run against their assets that could generate a liquidity problem, and potentially trigger their bankruptcy. As a consequence, the investment and lending strategies of banks, open-end mutual funds, and to a certain extent, open-end pension funds differ from those of other contractual savings institutions. Contractual savings institutions have a natural advantage over banks in financing long-term investment projects and their investment strategies will be more biased towards long-term bonds and the equity markets. Needless to say, banks may still be able to finance long term projects while minimizing term transformation risks by financing such portfolios through the sale of long term bonds to contractual saving institutions.

A dynamic hedging principle is at work, in the sense that financial institutions try to match the maturity structure of their assets and liabilities. Hedged positions help to reduce the risks they face; conversely the lack of hedged positions imply that either reinvestment (short-term assets and long-term liabilities) or refinancing (long-term assets and short-term liabilities) decisions will have to be taken. The ensuing maturity mismatch implies risk taking and can generate cash flow problems in volatile environments.

As will become clear, for a given amount of total savings in the economy, contractual savings growth (for example, a pension reform from a pay-as-you-go to a funded system, a reform that transforms corporate pensions that are based on book reserves to funded schemes outside the firm, or reforms that improve the regulatory and tax environment) are expected to stimulate financial development. This is because from the point of view of household and corporate sectors, there is an important liquidity effect at work. The

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5 Market capitalization (also known as market value) is the share price times the number of shares outstanding. Stocks traded refers to the total value of shares traded during a given period.

6 Strictu sensu, mutual funds and open-end pension funds do not have liabilities since funds belong to plan members and not to the fund managers.

accounts held in the contractual savings sector are completely illiquid from the depositor's point of view. They can only be liquidated in the long-run upon retirement of the beneficiary (either as a lump sum and/or annuity) or upon the occurrence of a particular event (e.g., death, disability); firms have no access to them. Thus, if large deposits are made in contractual savings, this will change the actual portfolio composition of both households and corporations between liquid and illiquid assets to a level below their desired ratio. Therefore, to restore equilibrium, households' and corporations' demand for liquidity has to be satisfied with additional holdings of liquid assets. This could be achieved by a reshuffling of portfolios; for instance, by increasing holdings of deposits in the banking sector, open-end mutual funds, and traded securities, at the expense of some other non-liquid assets that households or corporations could have held (e.g., real estate, non-traded financial instruments). Thus, households' and corporations' behavior will reinforce financial market development, which is associated with contractual savings growth.

However, the illiquidity effect of contractual saving instruments on wealth holders' behavior will be weakened to the extent that plan members can either borrow from the plan, sometimes using accumulated funds as collateral, or simply they can withdraw funds for specific purposes.

It is important to remark that these and next propositions hold even when the total saving of the household and corporate sectors remain constant. Total saving proved to be very insensitive to the variables that are supposed to affect it, so the fact that the propositions do not depend on the change in saving in the economy is remarkable.

Our analysis, although different, is consistent with previous work. Davis (1995) finds that pension fund portfolios have a greater proportion of uncertain capital and long-term assets than the household sector. He also finds that the personal sector tends to hold a much larger proportion of liquid assets. "The implication is that a switch to funding would increase the supply of long-term funds to capital markets and reduce bank deposits, even if savings and wealth do not increase, so long as households do not increase the liquidity of the remainder of their portfolios fully to offset growth of pension funds". This, he explains, is the impact of a pension reform on capital markets and the existence of the liquidity effect. Davis also suggests that there is some evidence that such offsetting to restore liquidity exists.

Furthermore, the growth of contractual savings implies a reallocation of savings from intermediaries with a high probability of facing a run against their assets (banks and open-end mutual funds) towards intermediaries with a low probability of facing a run (pension funds and life insurance companies). This reallocation means that funds are moved towards institutions that invest more heavily in long-term bonds and equity. In addition, of course, there could be an independent effect of the reform on total savings that would cause further financial development.

As an application of the previous statements to the case of pension and life insurance reforms, it is apparent that only an increase in the amount of assets accumulated in the contractual savings sector is necessary to develop the capital markets and that an increase in total savings is not necessary at all. Therefore, pension reforms, which increase the level of funding, will imply a large increase in assets managed by pension funds and thus, a higher

degree of capital market development. Of course, our hypothesis also implies that if a pay-as-you-go system were to be transformed into a partially funded scheme that would be able to accumulate assets at a sustainable pace it would also produce the same financial deepening effect. This would be the case provided reserves are invested in market instruments and are not used as captive sources of finance by governments.[7] Accordingly, contractual savings development would imply a movement towards completing financial market development.

Although funding generates positive externalities through capital market development, this does not mean that forcing a given level of funding through mandatory retirement schemes coincides with the social optimum. In other words, there is an argument for a minimum level of mandated funding to provide a minimum level of benefits, leaving the provision of additional benefits to voluntary arrangements. This minimum funding would be sufficient to address the market failures existing in a fully voluntary scheme. These failures derive from myopia of individuals, who do not necessarily save enough for retirement needs or other contingencies (e.g., death, disability); from the moral hazard of individuals relying on Government retirement income guarantee schemes; and from the adverse selection implicit in the different life expectancy of individuals. Hence, a fully funded mandatory pension system that ensures a minimum level of benefits would maximize social welfare, whilst a mandatory PAYG system that precludes the development of stock markets would not.

The design of pension reform is likely to affect social welfare through this and other channels. For instance, regulations imposed on the portfolio composition of pension funds can severely affect the quantitative impact of contractual savings development on capital markets. As an extreme example, if pension funds were restricted to hold only government bonds, the development of contractual savings should have a minimum or no effect on stock markets and social welfare would be lower.

In order to understand the mechanics of capital market development and its relation to contractual savings and the economy as a whole, let us summarize the most important propositions concerning the macroeconomic role of contractual savings. Conceptually, let us think of an economy with banks as the unique financial intermediaries that is subsequently transformed into an economy with both banks and a large contractual savings sector. The main micro/macroeconomic effects are the following.

II.1 Specialization in the Financial Sector, the Term Structure of Interest Rates, and Growth

The development of the contractual savings sector will initially have a static effect where the banking sector will tend to specialize in financing investment projects with short maturity and the contractual savings institutions funding those investment projects with long maturity. Of course, portfolios will be diversified and a complete specialization will not be

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[7] There is some evidence however, that governments do use partially-funded public pension schemes as sources of captive finance. For a discussion see Iglesias and Palacios (2000).

observed, in the sense that only the shortest-maturity projects are financed by banks and only those with the longest maturity are financed by contractual savings institutions. We would rather observe that the diversified portfolios of banks are more biased towards short-term loans and those of the contractual savings institutions are more biased towards long-term and risky assets but all institutions will have all kinds of assets. Of course, the development of contractual savings will allow banks to become intermediaries between their long term borrowers and contractual saving institutions while undertaking minimum term transformation risks through the issuance of asset backed securities.

Again, regulations could introduce significant distortions. If pension funds and life insurance companies are restricted to holding primarily securities, there could be an important cost associated to the contraction of the banking system. In the last two decades, some academic economists made important contributions to the understanding of the special role that banks play in the financial system.[8] Banks play an important microeconomic role of monitoring. Among other peculiarities, banks finance "difficult" projects requiring intensive monitoring. These "difficult" projects cannot be financed by the issuance of securities because large numbers of small security holders have no incentive to monitor individually. Bank loans and securities are not perfect substitutes and the expansion of contractual savings can have a very important distributional impact on the economy. For instance, if small firms require more monitoring, the contraction of the banking system will make the financing of those firms very expensive and there will be incentives to create corporations. This effect is exacerbated if contractual saving institutions cannot hold loans, but it could exist even if there is no constraint on portfolio holdings because the issuance of demand deposits and loans are complementary activities.[9] These conclusions are sensitive to the condition of the banking sector in an economy. The introduction of a funded pension scheme in an economy where the probability of bank runs is relatively high (i.e., many emerging economies) will have more important effects than in an economy with a relatively low probability of bank runs (i.e., most developed economies). This is because in the latter case, banks would already be allocating a significant proportion of their portfolio in long-term loans.

The development of contractual savings also implies that the long-term interest rate should fall relative to the short-term rate and thus, more long-term projects will be financed. Given the fact that the expected return of long-term investment projects is higher than the returns on short-term investments (a technologically reasonable assumption), a higher growth rate will be observed.

II.2 Development of the Stock Market and Growth

The introduction of a funded pension system in the economy will increase the demand for risky assets and will develop the stock market even when total savings are unchanged. The development of the stock market will be reflected in an increase in market

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8 See Fama, 1985, James C. and Wier P.,1988, and Diamond,1984.

9 See for instance, Kashyap A., Rajan R. and Stein J.C. (1998).

capitalization and value traded as a fraction of the gross domestic product of the economy. This development is usually accompanied by improvements in financial innovation and regulations (including minority shareholders' protection), corporate governance, and overall improvement in financial market efficiency (including reduction in transaction costs), transparency, and competition. All these effects add depth and liquidity to the market and they are extensively discussed in the literature.[10] Ultimately, these effects will result in high rates of long-term growth.[11]

II.3 Improved Financial Structure of Governments, Banks and Firms, and Reduced Sovereign Debt

If there is an increase in the demand for long-term and risky assets, then in equilibrium both the debt/equity ratio of enterprises and the short-term debt/long-term debt ratio of enterprises and governments will fall. This will also be reflected in banks undertaking less term transformation risk. As we argued above, we also expect the substitution of loans for securities to have important implications for the economy.

The 1997 East Asia financial crisis has been, in great part, due to excessive term transformation undertaken by financial institutions, excessive leverage of enterprises and their excessive dependence on short-term debt as opposed to long-term debt and equity finance. This was in part due to the relative scarcity of long-term savings in these economies. Therefore, the development of long-term savings and capital markets would reduce pressures on the banking system, thereby lengthening the maturity of debts and providing more equity-based financing for enterprises.

Furthermore, increasing funding of pension liabilities reduces the implicit government debt. The second potential impact is the development of the market for long-term government bonds. Many developing countries are trying to extend the maturity of the public debt to make their economies less vulnerable to refinancing. Thus, a developed contractual savings sector will increase the set of possibilities of the government having more degrees of freedom to perform an adequate debt management policy.

Accordingly, a developed contractual savings sector contributes to build a more resilient economy, one that would be less vulnerable to interest rate and demand shocks, while creating a more stable business environment, including macroeconomic stability. The result will be a lower country risk premium, hence lower equilibrium interest rates, which increase investments and, ultimately, accelerate growth.

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10 See, for example, OECD, 1997, Davis, 1995, Vittas, 1998, 1999.

11 For discussions on the impact of capital market development on growth see, for example, Levine and Zervos, 1996, and Levine, 1997.

II.4 Linkages Between Contractual Savings and Banking Regulation

We should keep in mind that the banking sector and the pension fund sector can be seen as imperfect substitutes in their role as financial intermediaries, so these sectors should not be regulated without taking into consideration their links. Independent regulation cannot do better than regulation when all the linkages between banks, pension funds, other financial intermediaries, and the productive sector are considered. Because different regulations will affect the portfolio composition of pension funds, especially the fraction of total funds allocated between shares and long-term bonds, the debt-equity ratio of the productive sector will be sensitive to the regulatory regime. For example, if regulations impose a binding maximum weight of equity in the portfolios of pension funds, then these will hold more long-term bonds and loans, and thus, banks will have to be more biased towards short-term loans and firms will be more leveraged.

III The Role of Contractual Savings: Some Simple Numerical Examples

This section provides some intuitive analysis and illustrates with simple examples many of the previous propositions in order to motivate the following analysis of the data.

III.1 The Structure of the Economy and the Role of the Financial Sector

We assume that the household sector owns both financial and non-financial assets. Individuals can hold money, shares, government and corporate bonds (publicly traded and more liquid securities that can be traded in secondary markets), loans, debt, and equity (private and illiquid financial instruments that are non traded in secondary markets), either directly or indirectly through claims on financial intermediaries. These financial intermediaries in turn hold financial assets (and some non-financial assets too). Households and financial intermediaries as a whole hold the primary financial assets: money, shares, government bonds, corporate bonds and loans (Figure 1).

In order to show that the development and relative size of institutional investors changes something in the economy as a whole, we have to prove that the demands for primary financial assets will change either in their composition (shares, government bonds, corporate bonds, loans), in their term structure (long-term, short-term), or in their liquidity.

The following exercise provides helpful intuition for organizing our analysis of the data. To begin with, let us suppose that the economy is composed of banks, a household sector (there are no other financial intermediaries) and a corporate sector. The latter can issue either debt (bonds) or equity to finance their productive activities. The consolidated household-banking sector can hold shares, bonds and non financial-illiquid assets.

Initially, household-banks' total savings are equal to $300 and their portfolio-weights are the same for shares, bonds, and non-financial assets (i.e., 1/3, 1/3, 1/3). This means that the household-banking sector holds $100 in shares, $100 in bonds and $100 in non-financial assets. That is Case A in Table 2.

Figure 1: Households' Asset Portfolio

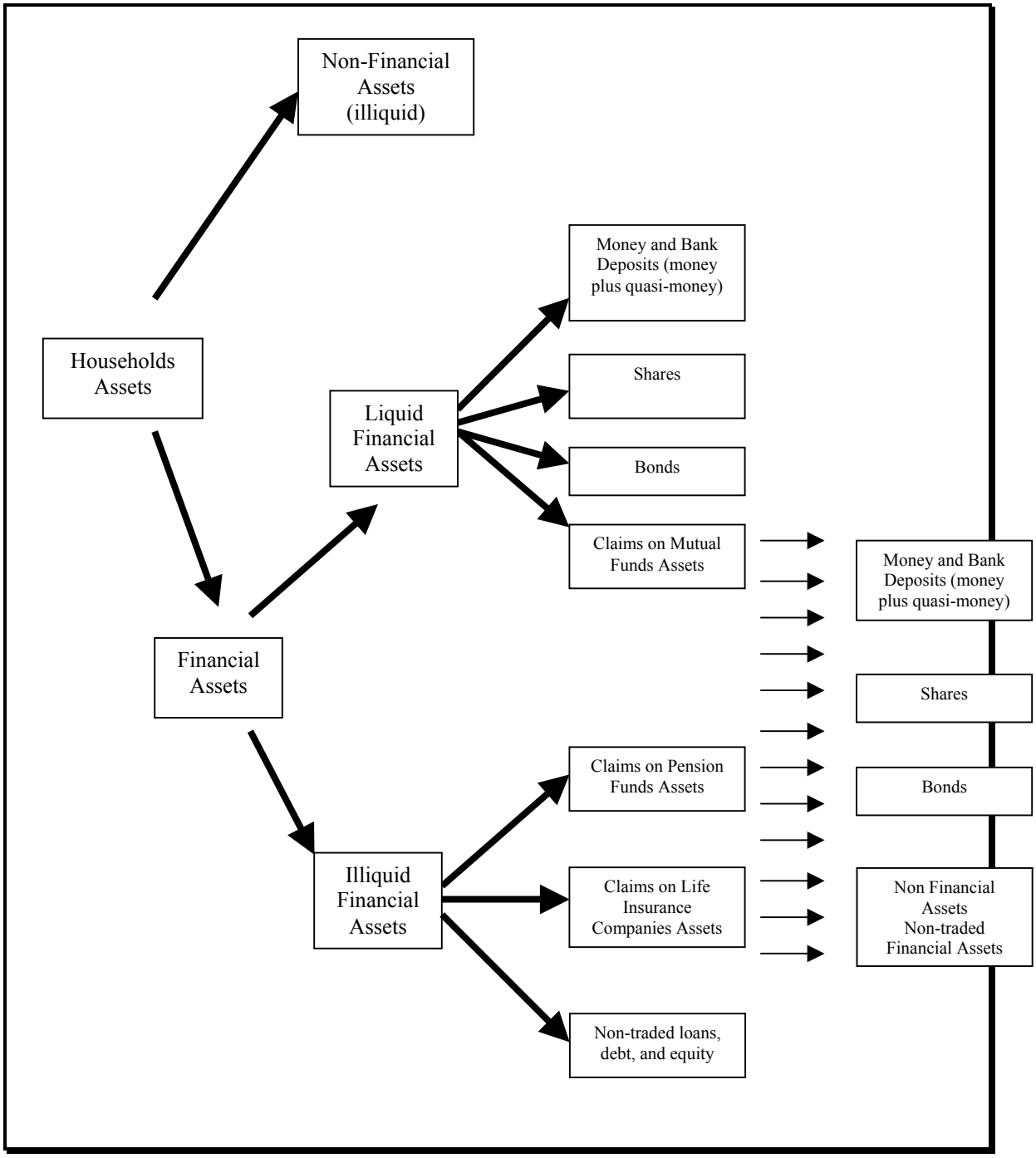

Table 2: Portfolio Composition

	Demand for Assets			Household Sector /1			Contractual Savings			Mutual Funds		
	Shares	Bonds	Non-Fin.	Shares	Bonds	Non-Fin.	Shares	Bonds	Non-Fin.	Shares	Bonds	Non-Fin.
A	100	100	100	100	100	100	0	0	0	0	0	0
B	100	100	100	50	50	50	50	50	50	0	0	0
C	150	100	50	50	50	50	100	50	0	0	0	0
D	100	100	100	0	50	100	100	50	0	0	0	0
E	160	130	10	70	70	10	90	60	0	0	0	0
F	150	100	50	50	50	50	0	0	0	100	50	0

Notes: 1 With banks

Next, suppose that we introduce in the economy a contractual savings sector (e.g., pension funds) and we induce or force the household sector to contribute $150 to contractual savings institutions. Different hypothesis about the investment behavior of pension funds and the reaction of the household sector will imply different results in the composition of the aggregate demand for assets. Let us analyze different possibilities and at the end, we will try to decide which one is the most likely to be observed in reality. We assume that the aggregate amount to be saved is not altered at all in the different scenarios, this helps understand how the effect of contractual savings on financial market development can be independent of the total amount of savings in the economy.

If the portfolio choice of the contractual savings sector were (1/3, 1/3, 1/3) and households maintain their investment policy, there would be no change in the final demand for shares and bonds, that is Case B in Table 2. Next, suppose that the contractual savings sector is more willing to invest in shares than the household sector and its portfolio choice is (2/3,1/3,0), and that households maintain their investment policy, then the total demand for shares will be $150, the total demand for bonds will be $100, and the aggregate demand for non-financial assets will be $50. That is Case C in Table 2.

Of course, it is possible that individuals, knowing that pension funds will invest more intensively in shares on their behalf, adjust their investment strategy in such a way that at the end they hold the same portfolio of assets as before the introduction of the pension fund. That is Case D in Table 2, the portfolio choice of the household sector is (0, 1/3, 2/3).

In order to reach valid conclusions, it is very important to note that individuals care not only about the asset composition held either directly or through intermediaries (contractual savings institutions and mutual funds), but also about the liquidity of the assets they hold. It is important to observe that when households contribute funds to the contractual savings sector, they suffer a big reduction in their liquid assets (in either Case B, C or D). Furthermore, it is necessary to observe that in order to undo what the contractual savings sector is doing on their behalf in terms of asset composition, households should increase the liquidity of their direct portfolio. This is why we think that Case D is very unlikely to be observed in the real world.

Case E is the most likely result of a development of the contractual savings sector. Households try to restore their liquidity positions by selling illiquid assets (non-traded financial and non-financial) and this implies further development of the capital market. Thus, in the case of contractual savings development, the liquidity effect reinforces the effect of the contractual savings bias towards shares to promote capital market development.

In contrast, if there were a reallocation of savings from households to mutual funds, the liquidity effect would not exist (as in Case F in Table 2) or it could even play in the opposite direction because mutual fund portfolios are more biased towards liquid assets. Individuals could try to reduce their own holdings of liquid assets by selling shares and bonds in order to buy illiquid assets - i.e., non-traded financial and non-financial assets. Therefore, from this numerical example we can conclude the proposition described in the next section.

III.2 Differential Impact of Contractual Savings and Mutual Funds on Capital Markets Development

For a given amount of total savings, a reallocation of funds from the consolidated household-banking sector towards either the contractual savings or the mutual funds sector is expected to increase the demand for shares and develop the capital market. The impact of contractual savings development on capital markets is expected to be greater than the impact of mutual funds development because in the former case, the liquidity effect reinforces the aggregate demand for shares.

In addition, if the real world were like Case D in Table 2, we would observe in the data that when the financial assets of contractual savings institutions grow, there is no increase in market capitalization. As we will see, the data shows a strong correlation between the financial assets of contractual savings institutions and market capitalization, supporting the reasonable hypothesis that the development of contractual savings will move the economy from a Case like A to a Case like E in Table 2. (The same basic intuition can be applied to the comparison between short-term and long-term assets instead of shares and bonds).

III.3 Contractual Savings Institutions Bias Towards Long-Term Assets and Shares: A Simple Framework

Pension funds will be more likely to invest in long-term assets and shares than individuals, partly because the large volume of transactions allow them to reduce transaction costs and they can diversify risks more efficiently. Only in this restricted sense, we can say that the pension funds provide similar financial services to those provided by mutual funds. Nonetheless, we should not forget that the nature of these institutions is very different (the savings received by the pension system may be compulsory and a large fraction of the population may be required to contribute, and savings are kept by the institution for long periods of time, etc.) and we expect that their development will produce differential impact on capital markets (volatility, liquidity, etc.).

The most interesting question is why pension funds have an advantage over banks either in financing long-term investment projects (by lending money in the form of loans or by buying long-term corporate, government or collateralized bonds, ignoring the liquidity aspects for the moment) or in investing in equity.

The simple theoretical structure that follows will provide us the intuition for understanding the different investment strategies pursued by banks and pension funds. To take the simplest case, we show that those intermediaries facing a low probability of a run have an advantage when it comes to financing long-term investment projects.

Suppose that an institution (we will see later that it could be a bank or a pension fund) receives a deposit of one dollar at date 0 and promises to pay a deposit rate $i^d = 5$ percent per period to the depositor. At that moment, the institution has to decide whether to lend the money to finance a long-term project (2 periods) or a short-term project (1 period). If the institution finances the long-term project it will receive a return of $i^L = 20$ percent per period at date 2 and if it finances the short-term project it will receive a return of $i^S = 10$ percent per period at date 1.

After the investment decision is taken and before date 1, there is a run against the assets of the institution that occurs with probability P and there is no run with probability 1 – P. If the investment decision of the institution was to finance the long-term project and there is a run, then the institution will be in an illiquid position and will default on its debt, thus it will go bankrupt and will lose its reputation with a loss equal to $-C = -2$.[12] If the long-term project was financed and there is no run, it will get $\left(1+i^L\right)^2 - \left(1+i^d\right)^2 = 0.3375$ at date 2.

If the investment decision of the firm was to finance the short-term project and there is a run, the institution will be liquid and able to pay the depositor, the profit will be $\left(1+i^S\right)^2 - \left(1+i^d\right) = 0.05$. If there is no run, the institution will reinvest for one period and at the end it will get $\left(1+i^S\right)^2 - \left(1+i^d\right)^2 = 0.1075$.

The strategy to be chosen will be the one that maximizes expected profits. The institution will choose to finance the long-term project if and only if the expected profit of that strategy is greater than the expected profit of the alternative one. In our example, the following condition must be satisfied:

$$-2P + (1-P)0.3375 \geq 0.05P + (1-P)0.1075 \;\; \textit{iff} \;\; P \leq 0.1$$

Thus, the inequality holds for a value of P that is lower or equal to 0.10. In other words, the long-term project will be financed by the institution only if the probability of a run is low enough.

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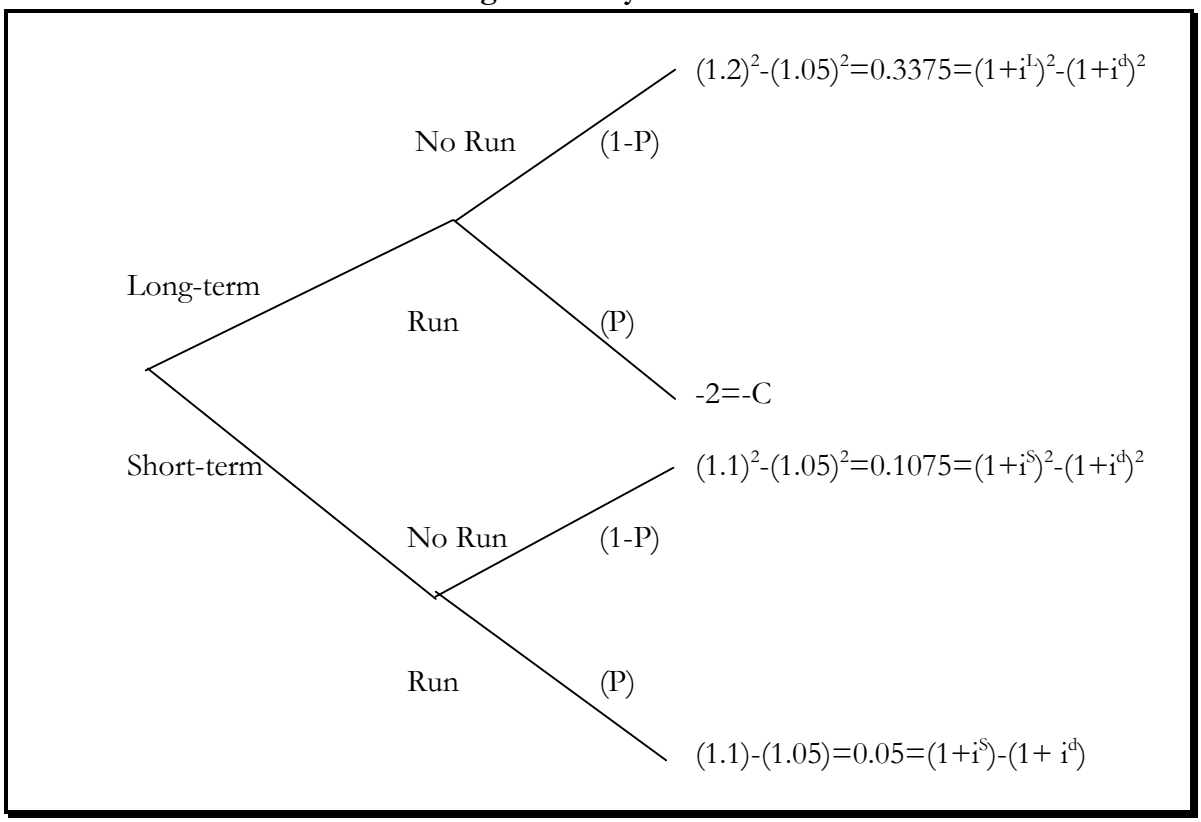
12 This is an arbitrary number that is supposed to represent all the costs of shutting down the institution, including the cost in reputation and the present value of future profits foregone. The message of our story is insensitive to the particular number used.

This example is instructive in several directions. We can think of this institution as being a pension fund if P = 0 (you cannot run against the pension fund) and a bank for P greater than 0. Suppose an economy where P in the banking sector is greater than 0.1, that means that the banks will either finance the long-term project at very high interest rates or not finance it at all, while a pension fund will do it, thus, the introduction of pension funds will have a very important real effect in promoting long-term investment and growth. Now, suppose other economy where P in the banking sector is lower than 0.1, that means that the banks will choose to finance the long-term project, thus the development of the pension fund sector will not generate this type of effect.

Think of the first type of economy as one without a very resilient banking sector where the probability of a bank run is not negligible, and think of the second economy as one with a strong banking sector. We can conclude that the potential benefits of developing the contractual savings sector are greater in economies without very strong banks, at least in terms of financial deepening, the term structure of investment and growth.[13]

Figure 2: Payoff Tree

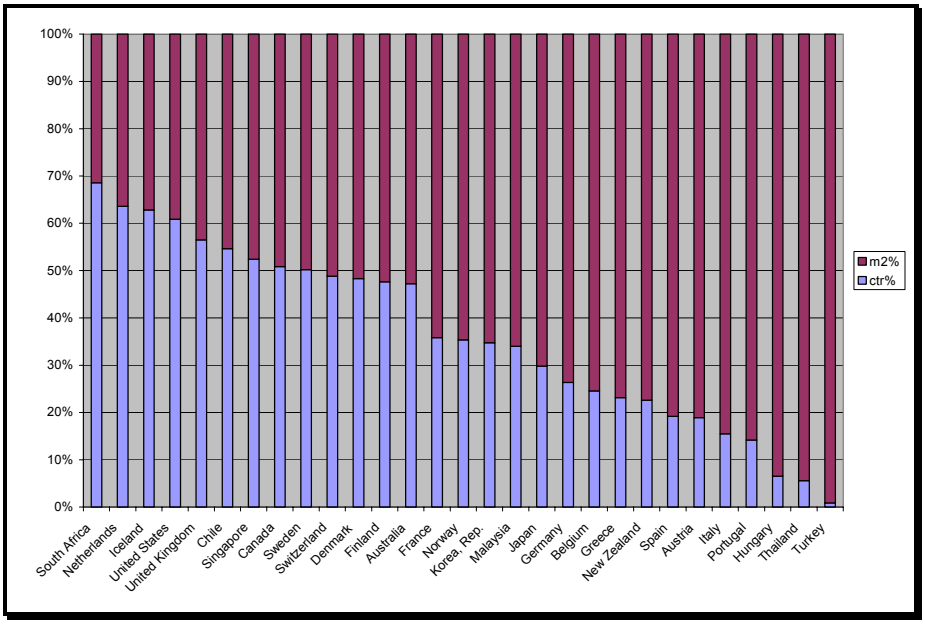


[13] Of course, in this very simple example, the institution is constrained to hold a completely specialized portfolio, but a rigorous model with portfolio diversification can be constructed and a similar parable can be told. Similarly, the basic structure can also be extended to include risky assets.

IV Descriptive Evidence

Figure 3 shows how contractual savings have become the dominant financial asset in several countries. In 1996, they represented 50 percent or more of financial assets (defined as the aggregation of money, quasi-money and contractual savings assets) in 9 out of 29 countries.[14] Furthermore, the same figure shows that non-OECD countries such as South Africa, Chile, Singapore, and Malaysia have a dominant or a very important contractual savings sector.

Figure 3: Contractual savings in system financial assets (%, 1996)



Source: 1998 OECD Institutional Investors Statistical Yearbook and WB institutional investors database.

Figure 4 shows the positive correlation between the financial assets of contractual savings institutions and market capitalization as a fraction of GDP for a cross section of OECD and non-OECD countries in 1996 (the positive relation is very stable for different years). Those countries with a more developed contractual savings sector are also countries with more developed stock markets. Furthermore, Figure 5 indicates a positive relationship between contractual savings development and the liquidity of the capital markets (measured by value traded over GDP).

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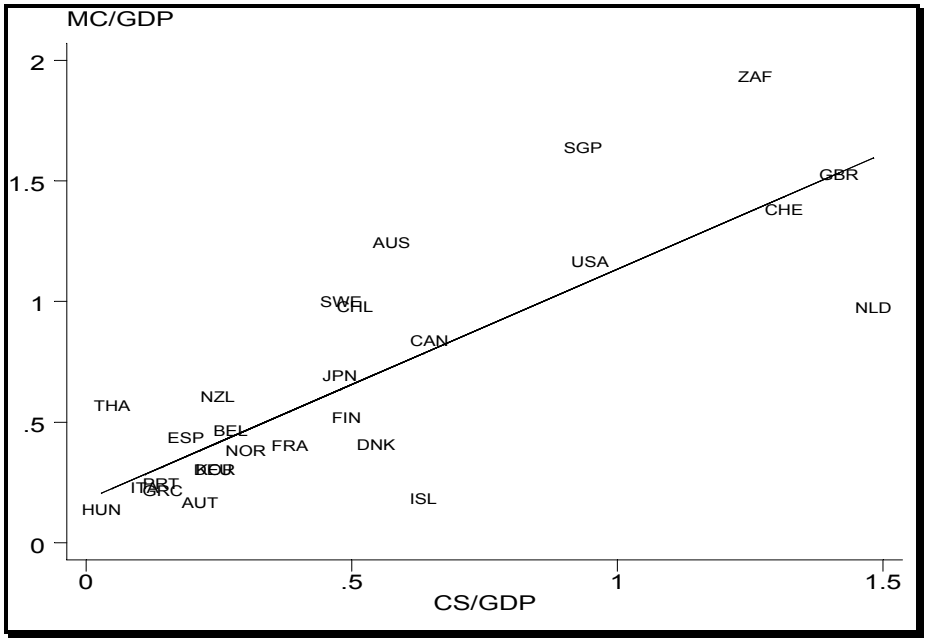
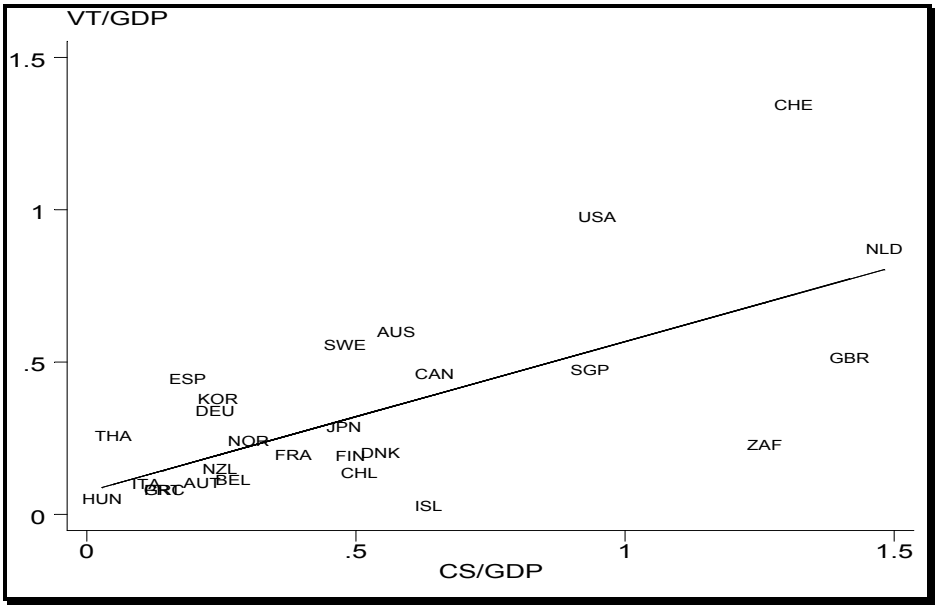
[14] Money and quasi money are liabilities of the consolidated banking system (including the Central Bank), which are liquid financial assets held by the household sector. Clearly, the assets of contractual savings institutions belong to the household sector. Of course, there is some double counting since assets of contractual savings institutions include cash and bank deposits.

Figure 4: Contractual Savings and Market Capitalization, 1996



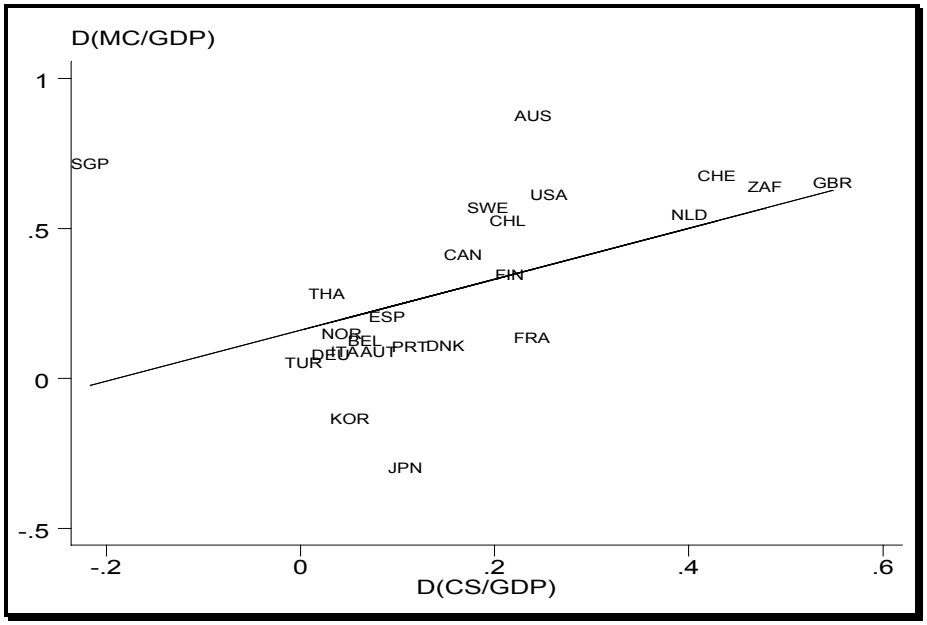
Notes: The fitted line is given by $\hat{y}_t = 0.177 + 0.958x_t$ with a t statistic of 7.314 for the slope. See Table 12 in Appendix 2 for the list of countries. Source: 1998 OECD Institutional Investors Statistical Yearbook and WB institutional investors database.

Figure 5: Contractual Savings and Value Traded, 1996



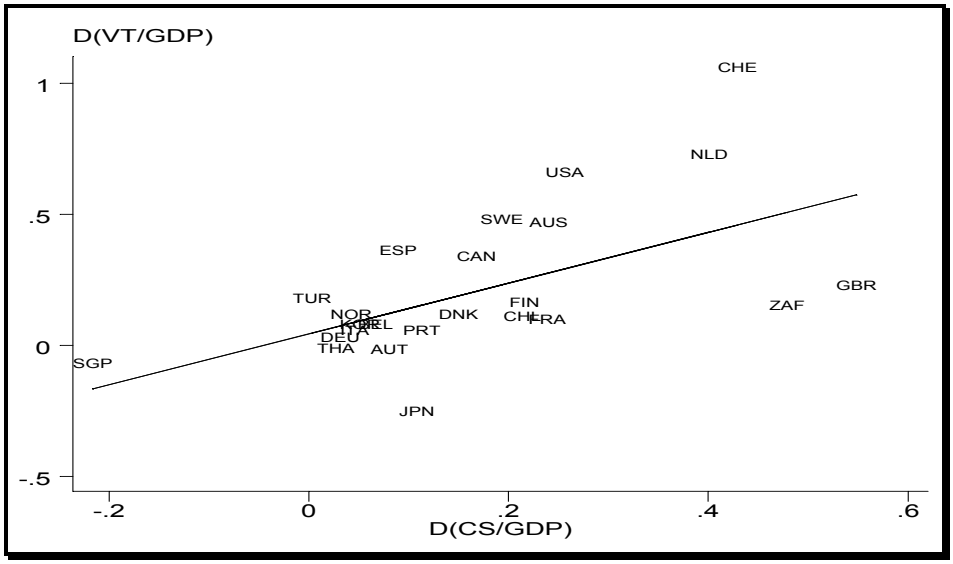
Notes: The fitted line is given by $\hat{y}_t = 0.085 + 0.480x_t$ with a t statistic of 4.650 for the slope. See Table 12 in Appendix 2 for the list of countries. Source: 1998 OECD Institutional Investors Statistical Yearbook and WB institutional investors database.

Figure 6: Changes in Contractual Savings and Market Capitalization, 1990 – 1996



Notes: The fitted line is given by $\hat{y}_t = 0.161 + 0.849 x_t$ with a t statistics of 2.593 for the slope. See Table 12 in Appendix 2 for the list of countries. Source: 1998 OECD Institutional Investors Statistical Yearbook and WB institutional investors database.

Figure 7: Changes in Contractual Savings and Value Traded, 1990 – 1996

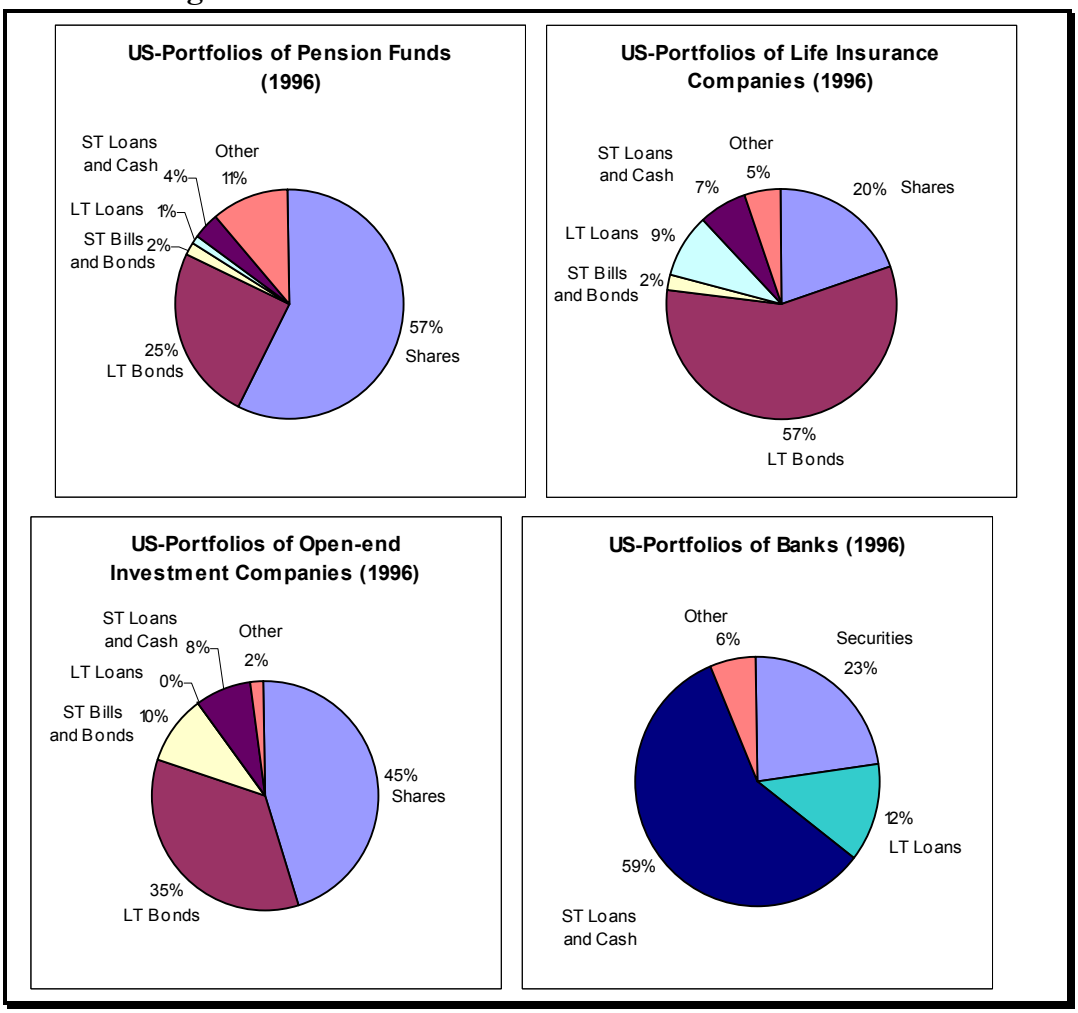


Notes: The fitted line is given by $\hat{y}_t = 0.044 + 0.968 x_t$ with a t statistics of 3.289 for the slope. See Table 12 in Appendix 2 for the list of countries. Source: 1998 OECD Institutional Investors Statistical Yearbook and WB institutional investors database.

Figure 6 explores the relationship between changes in contractual savings as a fraction of GDP and changes in market capitalization over GDP for the same countries between 1990 and 1996. Figure 7 presents a similar relationship between changes in contractual savings and changes in value traded as a fraction of GDP. It is clear that those countries that were able to develop their contractual savings sector also show a higher growth in their stock markets in terms of capitalization and value traded in the same period. The same conclusions are reached with estimates using panel data for 26 countries and with about 300 observations.[15]

Now, let us see whether the data show that contractual savings institutions are more willing to hold risky and long-term assets than other institutional investors and banks. Figure 8 compares the portfolios of US contractual savings institutions with those of the banking sector.

Figure 8: United States Financial Institutions Portfolios



Source: OECD, Institutional Investors Yearbook, 1997, and Federal Reserve, Monthly Bulletins.

15 See Impavido and Musalem, 2000

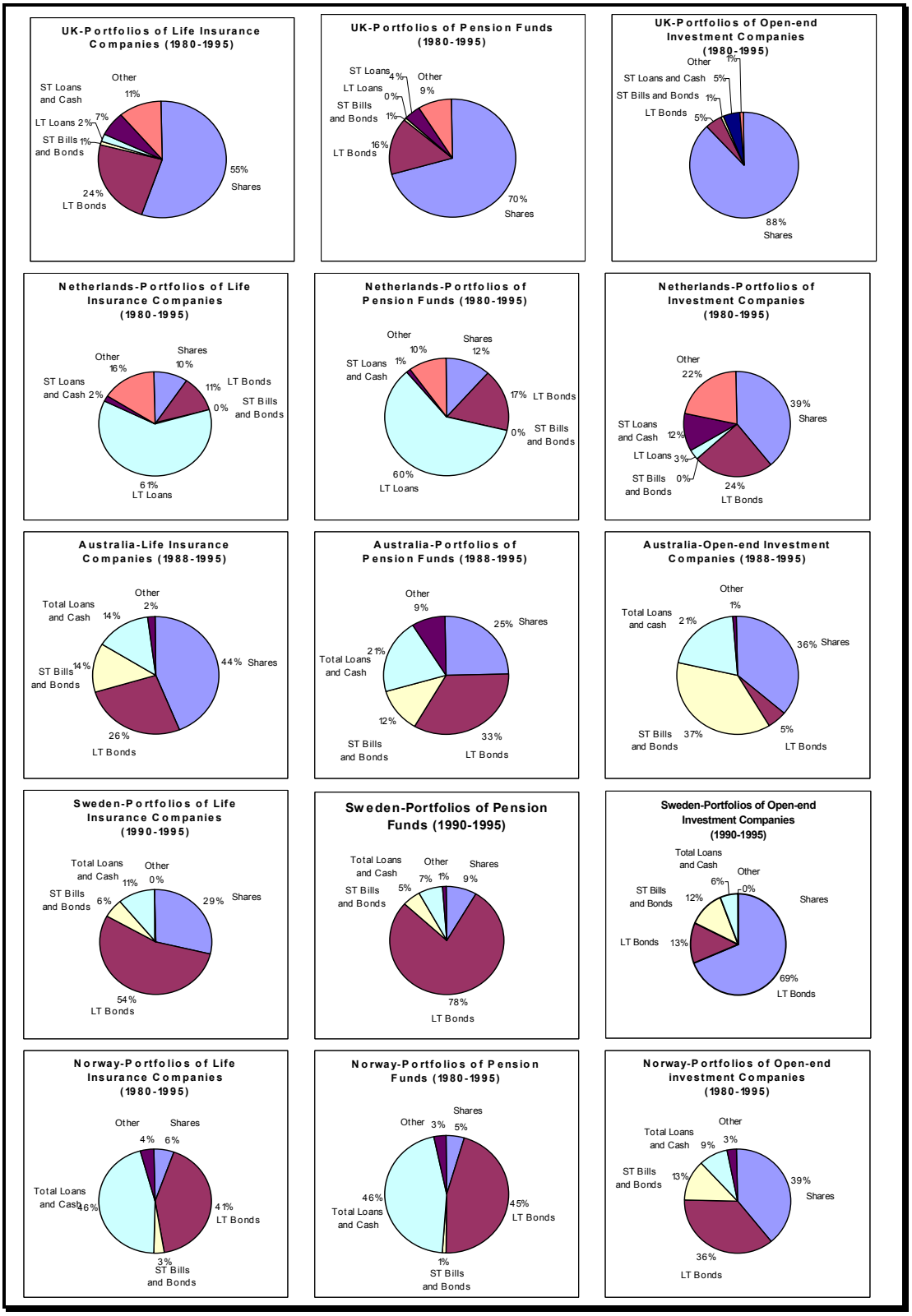
Among the remarkable facts in Figure 8 are the high weight of securities in the portfolios of pension funds (84 percent), life insurance companies (79 percent) and open-end investment companies (90 percent) relative to banks (23 percent), and the low weight of short-term loans and cash in the portfolios of those institutions (4 percent, 7 percent, and 8 percent respectively) relative to banks (59 percent). Pension funds, life insurance companies and open-end investment companies are also heavily invested in long-term bonds. Clearly, US contractual savings institutions hold larger fractions of their total assets invested in traded securities such as stocks and long-term bonds while the assets of the banking sector are invested more heavily in private financial instruments (loans) of short-term maturity.

Finally, Figure 9 shows the average portfolio composition of different institutional investors of some other selected OECD countries. In the United Kingdom, shares and long-term bonds account for 80 percent or more of the portfolios of contractual savings institutions. There is a very high fraction of loans in the portfolios in the Netherlands, but it is also striking that they are almost completely long-term loans. We could be tempted to say that the role of contractual savings institutions in the Netherlands is similar to those of banks in terms of lending strategy, but the financial services provided are absolutely different in terms of maturity structure. In Norway, even when we do not have the maturity structure of loans, the presumption is that a similar story can be told. Sweden and Norway are also examples of our hypothesis that if there are binding restrictions to invest in shares, then long-term bonds and/or loans will be in high demand. Finally, in Australia, contractual savings institutions invest more than 50 percent of their portfolios in shares and long-term bonds; while they represent about 40 percent in other institutional investors' portfolios.

Thus, according to the evidence, if there were a reallocation of assets from the banking sector to the contractual savings sector, there would be a shift in the relative demands for financial instruments. There would be a reduction in the demand for non-traded financial instruments, or in other words, we would observe a reduction in the supply of funds to be lent to firms in the non-corporate sector (i.e., firms that do not issue publicly traded stock and debt), and there would be an increase in the demand for publicly traded financial instruments such as stocks and bonds.

Moreover, the fact that the portfolio weight of long-term bonds is high for contractual savings institutions means that the corporate sector will have additional long-term funds to finance their long-term production plans. As a consequence, the profit opportunities in the corporate sector will induce the entry of new firms that will issue both equity and debt, increasing the market capitalization of the economy, and thus, the market will become more liquid and the value traded in stocks will increase. Finally, the increased volume of transactions will imply a higher demand for money (transaction motive) and overall financial deepening in the economy.

Figure 9: Institutional Investors' Portfolio



Source: OECD, Institutional Investors Yearbook, 1997.

The international evidence suggests some stylized facts about contractual savings institutions. The fraction of investment in either shares or long-term assets (either bonds or loans) tends to be very high. In all the cases, the weight of short-term loans is very low. Obviously, regulations, relative yields, risk and liquidity preferences, and tax treatment could explain the differences in portfolios across these countries. The evidence also suggests that if binding constraints are imposed on the fraction invested in shares, they will try to invest their funds in the closer substitutes such as long-term bonds and long-term loans. The result will be a differential impact on the productive sector of the economy and on the structure of the financial sector.

V Econometric Evidence on Contractual Savings and Capital Markets Development: Which Leads?

This paper has emphasized the direction of causality from contractual savings to market capitalization. In Sections II and III, we argued that if contractual savings are developed then market capitalization would follow. In Section IV, we showed evidence of a positive correlation between these two variables across countries but the causality between them was not studied.

It has been indicated (in the literature) that it is difficult for contractual savings institutions to perform their investment activities effectively in countries whose capital markets are small and illiquid. For instance, the implementation of some active and sophisticated financial strategies require very frequent trading and given the large volume of funds managed by pension funds, the price volatility implied by these strategies would be too high if the stock market is not liquid enough. As Davis (1995) states: "Experience,…, suggests that the successful development of private pensions requires a certain prior level of development of the financial sector." Hence, at least theoretically, the direction of causality could run from market capitalization to contractual savings.

The empirical questions addressed in this section are the following. What happened in each country over time? Does the growth of contractual savings lead to the expansion in market capitalization? Or is it the other way around? Or is it a two-way causation? Or is there no causation in any direction? To answer these questions, we ran Granger causality tests for some OECD and some developing countries. Unfortunately, the number of observations available for each country is not ideal. Hence, the tests presented below provide us with just preliminary answers to our questions. Nevertheless, the results obtained are quite encouraging and deserve to be taken into consideration.

The bivariate Granger causality test analyzes how useful some variables are in forecasting other variables. In this sense, we can say that if variable x is not useful in forecasting y, then x does not Granger-cause y. The test is constructed on the basis of the following OLS regression:

$$y_t = \alpha_0 + \sum_{i=1}^{p} \beta_i y_{t-i} + \sum_{j=1}^{q} \beta_j x_{t-j} + u_t$$

where p and q are chosen so that u_t is white noise. The test conducted is an F test on the q parameters for the variable x. If the regression is run over n observations, the distribution of the test is F(n, n – 2q – 1). Since the above regression is a dynamic regression, the test is only asymptotically valid. Hence, an asymptotic equivalent test distributed as a $\chi^2(q)$ was reported.[16]

In our study we analyze Granger causality tests between four sets of institutions: 1) contractual savings financial assets over GDP (CS); 2) pension funds financial assets over GDP (PF); 3) life insurance financial assets over GDP (LI); and 4) non-life insurance financial assets over GDP (NL); and two capital market development indicators: 1) market capitalization over GDP (MC); and 2) stock value traded over GDP (VT) for 14 OECD and 5 developing countries taken separately and for periods between 1975 and 1997. In each case, we are interested in the causality between each of the four asset variables and market capitalization and value traded in turn. Tables A-D in Appendix 1 present the Granger causality tests for contractual savings, pension funds, life insurance, and non-life insurance, respectively.

Because our panels are relatively short, we decided to limit the length of the two-lag polynomial in order to maximize the number of observations used in the regressions. Hence, we selected p = q = 1. Finally, because all our regressions use less than 30 observations we also reported the Jarque-Bera test for normality of residuals.[17] The importance of this test is that since we cannot invoke the central limit theorem to justify the distribution of the Granger-causality tests, our results critically depend on the normality of the residuals.

As an example for the interpretation of our results, we will describe in detail the case of the causality test between contractual savings (CS) and market capitalization (MC) or contractual savings and value traded (VT) for the United States which are reported in Table 8 of Appendix 1. The Granger regressions were conducted using 17 observations. In the first line, we test the null hypothesis that contractual savings do not Granger-cause market capitalization. Since p = q = 1, we have 3 d.f. that we have to account for and hence, under the null, the F test is distributed with 1 and 14 d.f. The value of the statistics is 0.035 with a p-value of 0.854. Clearly, we cannot reject the null that contractual savings do not Granger-

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16 For a detailed description of Granger causality tests, see Granger (1969) and Hamilton (1994).

17 See Bera and Jarque, 1980.

cause market capitalization. This is confirmed by the asymptotic equivalent test in the following 3 columns, distributed under the null as $\chi^2(1)$. For this second test, the statistics is 0.043 with a p-value of 0.837. Finally, in the last 3 columns we report the Jarque-Bera (JB) normality test. Here, the null hypothesis is that residuals are normally distributed, which cannot be rejected. The statistics for this test is 1.060 which under the null is distributed as a $\chi^2(2)$ and it gives a p-value of 0.59. Since we can infer that residuals are normally distributed we can also infer that the statistics of the Granger tests are distributed as they should be.

The second line of Table 8 in Appendix 1 tests the null hypothesis that market capitalization (MC) does not Granger-cause contractual savings (CS). Again the null cannot be rejected in both tests and residuals are normally distributed. The last two lines for the United States in Table 8 in Appendix 1 give us the results of the causality tests between contractual savings (CS) and value traded (VT). The absence of causality in both directions cannot be rejected and residuals are normally distributed.

In the next sections, we summarize the results reported in the tables in Appendix 1 by using 10 percent significance level as the critical level for rejecting or failing to reject the null hypothesis in each test.

V.1 Granger causality between contractual savings and market capitalization or value traded

For market capitalization we found 7 cases out of 14 OECD countries (United Kingdom, Belgium, Spain, Netherlands, Canada, Finland, Germany), for which the hypothesis that contractual savings do not Granger-cause market capitalization is rejected and the hypothesis that market capitalization does not Granger-cause contractual savings is not rejected. Therefore, for these countries, it appears that Granger causality runs only from contractual savings to market capitalization and not the other way round. For 2 OECD countries (Norway and Portugal), Granger causality between contractual savings and market capitalization seems to run in both direction.[18] Finally, for 5 OECD countries (United States, Australia, Korea, Sweden, and Austria) both null hypotheses can not be rejected. Therefore, for these countries, the variables contractual savings and market capitalization follow independent auto-regressive processes and neither contractual savings cause market capitalization nor does market capitalization cause contractual savings. For developing countries, causality seems to run from contractual savings to market capitalization only in

[18] Although at 5 percent significance level, causality between market capitalization and contractual savings seems to run from contractual savings to market capitalization only for Norway.

Thailand;[19] in both ways for Chile and South Africa; and in neither direction for Singapore and Malaysia.[20]

For value traded, we found 6 OECD countries (United Kingdom, Korea, Norway, Sweden, Finland, and Austria), for which the null hypothesis that contractual savings does not Granger-cause value traded was rejected while the null hypothesis that value traded does not Granger-cause contractual savings could not be rejected. Hence, for these countries causality between contractual savings and value traded seems to run from contractual savings to value traded only. For 2 OECD countries (Netherlands, and Germany) Granger causality from value traded to contractual savings seems to run in both directions.[21] For 6 OECD countries (United States, Belgium, Australia, Spain, Canada, and Portugal), causality between contractual savings and value traded seems to run in neither direction. For 2 non-OECD countries (Chile and Thailand), causality seems to run from contractual savings to value traded only. For Singapore and South Africa, causality seems to run from value traded to contractual savings only. Finally, for Malaysia, there seems to be no causality between contractual savings and value traded in either direction.[22]

V.2 Granger causality between pension funds and market capitalization or value traded

Since the intersection between the data on pension funds and life insurance companies is not complete and Granger causality tests are very sensitive to the number of observations and lags used, we decided to run the same exercise of the previous section for life insurance and pension funds separately. We also explored the causality between market capitalization or value traded and non-life insurance. In a following section, we summarize these results and compare them with the results on life insurance and pension funds.

Results on causality between pension funds and market capitalization or value traded are reported in Table 9 in Appendix 1. For market capitalization, we found 6 cases out of 14 OECD countries (Korea, Spain, Netherlands, Canada, Norway, Sweden, and Finland), for which the hypothesis that pension funds do not Granger-cause market capitalization is rejected and the hypothesis that market capitalization does not Granger-cause pension funds is not rejected. Therefore, for these countries, it appears that Granger causality runs only from pension funds to market capitalization and not the other way round.[23] For Portugal,

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19 Although at 5 percent significance level, causality between market capitalization and contractual savings seems to run from contractual savings to market capitalization only for South Africa.

20 Notice that the results for Malaysia and South Africa should be taken as suspicious as normality test was not always passed at 5 percent significance level.

21 Notice that the results for Germany should be taken as suspicious as normality test was not always passed even at 5 percent significance level.

22 Notice that the results for Singapore and Malaysia should be taken as suspicious as normality test was not always passed at 5 percent significance level.

23 Although at 5 percent significance level, there seems to be no causality between market capitalization and pension funds in either direction for Korea and Sweden.

causality seems to run in both directions.[24] For Belgium, Granger causality between pension funds and market capitalization seems to run from market capitalization to pension funds.[25] Finally, for 4 OECD countries (United States, United Kingdom, Australia, Germany, and Austria), both null hypotheses can not be rejected. Therefore, for these countries the variables pension funds and market capitalization follow independent auto-regressive processes and neither pension funds causes market capitalization nor market capitalization causes pension funds. In Thailand and South Africa, causality seems to run from pension funds to market capitalization. In Chile causality between pension funds and market capitalization seems to run in both directions. In Singapore and Malaysia, causality between pension funds and market capitalization seems to run in neither direction.[26]

For value traded, we found 5 OECD countries (United Kingdom, Belgium, Korea, Norway, Sweden, and Finland), for which only the null that pension funds do not cause value traded could be rejected. Hence, for these countries, it appears that Granger causality runs only from pension funds to value traded and not the other way round. For 3 OECD countries (Australia, Netherlands, and Austria), causality between pension funds and value traded seems to run in both directions. For 5 countries (United States, Spain, Canada, Germany, and Portugal) causality between pension funds and value traded seems to run in neither direction. For the developing countries in our sample, two way causality was found only for Chile while all other countries do not show causality significant in either direction.[27]

V.3 Granger causality between life insurance and market capitalization or value traded

In the case of life insurance, we have longer series as shown in Table 10 in Appendix 1. For market capitalization, we found 9 OECD countries (United Kingdom, Belgium, Netherlands, Canada, Norway, Finland, Germany, Austria, and Portugal) for which causality seems to run from life insurance to market capitalization only. For all other OCED countries, we found no causality in either direction between life insurance and market capitalization. For developing countries the results are mixed: for Thailand, causality seems to run from life insurance to market capitalization;[28] while for South Africa, causality seems to run in both directions;[29] and for Chile, Singapore, and Malaysia, causality between life insurance and market capitalization seems to run in neither direction.

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24 But only from pension funds to market capitalization at 5 percent significance level.

25 Although at 5 percent significance level, no causality between market capitalization and pension funds seems to exist in either direction for Belgium.

26 For South Africa, Thailand, and Malaysia normality test was not always passed and results should be treated with caution.

27 Results for developing countries should be taken with caution as normality test was not always passed.

28 But not at 5 percent significance level.

29 But only from life insurance to market capitalization at 5 percent significance level. Again, results for developing countries should be taken with caution as normality test was not always passed.

For value traded, we found 6 OECD countries (United Kingdom, Korea, Norway, Sweden, Finland, and Portugal) for which causality between life insurance and value traded seems to run from life insurance to value traded only. For the Netherlands and Germany, causality seems to run in both ways. For 5 countries (United States, Belgium, Australia, Spain, and Austria) no causality in either direction was found. For developing countries, we found causality from life insurance to value traded only in Chile, Singapore, and Malaysia. We found a two way causality in Thailand and from value traded to life insurance only in South Africa.

V.4 Granger causality between non-life insurance and market capitalization or value traded

In the case of non-life insurance results are shown in Table 11 of Appendix 1. We found 6 OECD countries (Belgium, Korea, Netherlands, Sweden, Germany, and Austria) for which causality runs from non-life insurance to market capitalization only. We found two countries (Norway and Portugal) for which causality between non-life insurance and market capitalization runs in both directions. We found 5 countries (United States, United Kingdom, Spain, Canada, and Finland) for which no causality was found between non-life insurance and market capitalization. For developing countries, the picture is mixed: for Thailand, we found causality in both directions; for Singapore and Malaysia, we found causality from market capitalization to non-life insurance only; and for Chile and South Africa, we found no causality in either direction.

For value traded, we found 4 OECD countries (United Kingdom, Netherlands, Norway, and Finland) for which causality runs from non-life insurance to value traded only; 3 countries (Sweden, Germany, and Portugal) for which causality runs in both ways; Australia, for which causality seems to run from value traded to non-life insurance only; and 6 countries (United States, Belgium, Korea, Spain, and Austria) with no causality in either direction between non-life insurance and value traded. In developing countries, we found Chile, Malaysia, and South Africa for which causality runs from non-life insurance to value traded only; in Thailand, causality seems to run in both directions; and in Singapore, causality seems to run from value traded to non-life insurance.

V.5 Summary of results

The following table helps summarize the results obtained with the Granger causality tests. The first column in each quadrant (->) reports the number of countries for which we found Granger causality from one of the institutions (contractual savings, pension funds, life insurance, non-life insurance) to one of the market indicators (market capitalization or value traded); the second column reports the number of countries for which causality runs only from one of the markets to one of the institutions (<-); the third column reports the number of countries for which causality runs both ways (<->); and the fourth column reports the number of countries for which no causality was found in either direction (<>).

Table 3: Granger causality tests: summary

		MC				VT			
		–>	<–	<–>	<>	–>	<–	<–>	<>
OECD	CS	7	0	2	5	6	0	2	6
	PF	7	1	1	5	6	0	3	5
	LI	9	0	0	5	6	1	2	5
	NL	6	2	1	5	4	1	3	6
Non-OECD	CS	2	0	1	2	2	2	0	1
	PF	2	0	1	2	0	0	1	4
	LI	1	0	1	3	3	1	1	0
	NL	0	2	1	2	3	1	1	0

There is significant evidence in these data that either causality between institutions and markets does not exist, or if it exists, it is predominantly from institutions to markets only. To a lesser extent, causality simultaneously exists in the two directions between institutions and markets. Furthermore, there is very limited evidence that causality runs from markets to institutions only (the only exception seems to be for non-life insurance in developing countries). Results seem to support the idea that the development of institutional investors is likely to promote the development of market capitalization more than value traded. For developing countries, pension funds seem not to Granger cause value traded development while life and non-life insurance do. Thus, in developing countries pension funds predominantly buy and hold shares.

The following tables allow us to analyze other causality patterns among the countries in our sample. Table 4 lists, by institution, the countries for which we find one way Granger causality from institutions to market capitalization or value traded only; these are indicated with a "1". Table 5 lists, by institution, the countries for which we find a two way Granger causality between institutions and markets. Table 6 lists, by institution, the countries for which we could not find Granger causality between institutions and market on either direction.

When causality exists only from institutions to markets this seems to take place in countries where financial markets are not yet completely developed. In countries with complete and sophisticated financial markets like the United States, no causality is found in either direction. Notice though that results are ambiguous for some countries. For example, in Korea, pension funds and non-life insurance seem to Granger-cause market capitalization while life insurance and in general contractual savings seem not to cause market capitalization. For this country causality is stronger among institutions with respect to value traded. In the United Kingdom, all institutions seem to Granger-cause value traded and only contractual savings and life insurance companies, market capitalization.

Table 4: Granger causality (one way) from institutions to markets only

	MC						VT				
	CS	PF	LI	NL	TOT		CS	PF	LI	NL	TOT
NLD	1	1	1	1	4	FIN	1	1	1	1	4
BEL	1		1	1	3	GBR	1	1	1	1	4
CAN	1	1	1		3	NOR	1	1	1	1	4
DEU	1		1	1	3	CHL	1		1	1	3
FIN	1	1	1		3	KOR	1	1	1		3
THA	1	1	1		3	SWE	1	1	1		3
AUT			1	1	2	MYS			1	1	2
ESP	1	1			2	AUT	1				1
GBR	1		1		2	BEL		1			1
KOR		1		1	2	NLD				1	1
NOR		1	1		2	PRT			1		1
SWE		1		1	2	SGP			1		1
ZAF	1	1			2	THA	1				1
PRT			1		1	ZAF				1	1
AUS					0	AUS					0
CHL					0	CAN					0
MYS					0	DEU					0
SGP					0	ESP					0
USA					0	USA					0
TOT	9	9	10	6		TOT	8	6	9	7	

Notes: See Table 12 in Appendix 2 for the list of countries.

Table 5: Granger causality (two ways) between institutions and markets

	MC						VT				
	CS	PF	LI	NL	TOT		CS	PF	LI	NL	TOT
PRT	1	1		1	3	DEU	1		1	1	3
CHL	1	1			2	NLD	1	1	1		3
NOR	1			1	2	THA			1	1	2
THA				1	1	AUS		1			1
ZAF			1		1	AUT		1			1
AUS					0	CHL		1			1
AUT					0	PRT				1	1
BEL					0	SWE				1	1
CAN					0	BEL					0
DEU					0	CAN					0
ESP					0	ESP					0
FIN					0	FIN					0
GBR					0	GBR					0
KOR					0	KOR					0
MYS					0	MYS					0
NLD					0	NOR					0
SGP					0	SGP					0
SWE					0	USA					0
USA					0	ZAF					0
TOT	3	2	1	3		TOT	2	4	3	4	

Notes: See Table 12 in Appendix 2 for the list of countries.

Table 6: No Granger causality between institutions and markets

	MC						VT				
	CS	PF	LI	NL	TOT		CS	PF	LI	NL	TOT
USA	1	1	1	1	4	ESP	1	1	1	1	4
AUS	1	1	1		3	USA	1	1	1	1	4
MYS	1	1	1		3	BEL	1		1	1	3
SGP	1	1	1		3	CAN	1	1		1	3
AUT	1	1			2	AUS	1		1		2
CHL			1	1	2	MYS	1	1			2
ESP			1	1	2	PRT	1	1			2
GBR		1		1	2	AUT				1	1
KOR	1		1		2	CHL			1		1
SWE	1		1		2	DEU		1			1
CAN				1	1	KOR				1	1
DEU		1			1	SGP		1			1
FIN				1	1	THA		1			1
ZAF				1	1	ZAF		1			1
BEL					0	FIN					0
NLD					0	GBR					0
NOR					0	NLD					0
PRT					0	NOR					0
THA					0	SWE					0
TOT	7	7	8	7		TOT	7	9	5	6	

Notes: See Table 12 in Appendix 2 for the list of countries.

There are other facts that help interpret some of our results. For example, the absence of causality in either direction in Malaysia and Singapore could be explained by the contractual savings regime in these countries as well as financial sector policies. Singapore and Malaysia have centrally managed provident funds, which are not geared at investing in shares. In Malaysia, contractual savings institutions invested in shares from 4 to 7 percent of their financial assets during 1987-93. Singapore only recently has allowed some members to pick private managers and to determine how a portion of their Central Provident Fund balance will be invested.[30] Therefore, there should be no surprise that there is no causality in any direction between contractual savings and stock markets in these countries.

Table 7: Shares of Stocks in Investment Portfolios: Selected Countries

Country	Year	Contractual Savings	Life	Pension Funds
Malaysia	1993	7.01	17.86	5.17
Singapore	1996	5.67	33.50	0.00

Source: WB institutional investors database.

[30] See Asher, 1999.

Another particular case is Chile, where causality for pension funds runs in both directions. This could be explained, in great part, by their investment regulations. When the system was introduced, they were quite draconian, at that time; the Government was mainly interested in preserving assets, hence, pension funds were not allowed to invest in shares.[31] In addition, real interest rates on bonds and bills were very high, hence pension fund portfolios were heavily weighted on government securities. As the system and the market developed, the regulations allowed increasing participation of shares in pension fund portfolios. At the same time, real interest rates were declining thus demand for shares increased fueled by both effects. Obviously, regulation of investment policies of these institutions and after tax rates of return on financial instruments matters.[32] The cautiousness and reactive approach followed by the Chilean authorities resulted in a two-way causality.

The evidence is consistent with the direction of causality emphasized in this paper. Contractual savings promote capital market development in countries where capital markets are relatively small. Of course, in countries where capital markets are already developed, the effect is not as strong and the direction of causality is not as clear. In those countries, we expect reciprocal and weaker effects between both variables. The latter would be, in part, due to the fact that the illiquidity effect of contractual savings, as discussed above, would be diluted in countries with well-developed financial markets.[33]

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31 At the beginning of Chile's pension reform, the investment regulations allowed up to 100 percent in government securities, up to 60 percent in corporate bonds, and up to 70 percent in each of the following categories: mortgage-backed securities, letters of credit or fixed term deposits. As the market developed, regulations were relaxed to allow investments in shares, mutual funds, real estate funds, venture capital funds, securitised credit funds, foreign securities and hedging instruments.

32 See Srinivas, Whitehouse and Yermo, 1999.

33 The direction of causality from contractual savings to capital markets was also accepted in Impavido and Musalem (2000).

VI Summary, Conclusions and Recommendations

Contractual savings are powerful enough to increase the supply of long-term funds and develop the capital markets in an economy. This is because contractual savings institutions have long-term and illiquid liabilities on their balance sheets.

We argued that contractual savings development, in addition to its primary purpose of providing protection to the insured, produces the following effects: a) specialization in the financial sector where the banking system adjusts towards its comparative advantage as contractual savings grow, thus reducing banks exposure to term transformation risks (which may imply that banks could still lend long term but now they could better fund this activity by mobilizing resources from the contractual savings institutions); b) improvement in the financial structure of firms by reducing their leverage and refinancing risks; c) impact on the term structure of interest rates, the stock market and growth; d) reduce the implicit debt from unfunded liabilities of defined-benefit plans; and e) develop the market for long-term government bonds and increase possibilities of public debt management. We also argued that these effects must be stronger in developing countries than in developed ones, due to the instability of banks in developing countries. Therefore, contractual savings mitigate social and financial risks, thus improving the resilience of the economy to shocks, reducing the country risk premium, the level of interest rates, and the cost of capital, thereby promoting growth.

In addition, the growth of contractual savings or either mutual funds or non-life insurance should produce different effects on capital markets. Contractual savings should be more powerful in developing capital markets because of the additional effect on the liquidity of households' and firms' assets.

In the empirical analysis we showed that those countries with more developed contractual savings sectors are also the countries with more developed stock markets, both in terms of market capitalization and value traded. In addition, those countries where the contractual savings sector grew the most are also the countries that experienced the highest growth in market capitalization and value traded.

In the analysis of causality between contractual savings and both market capitalization and value traded, the evidence strongly favors causality from contractual savings to market capitalization, particularly, in countries where capital markets are relatively small and have an enabling regulatory and policy environment. These results are confirmed by differentiating, with contractual savings institutions, between pension funds and life insurance companies. Causality between other institutional investors, like non-life insurance companies, and markets appear to be much weaker.

For OECD countries, the direction of causality from contractual savings to stock markets and liquidity predominates. The small sample of developing countries results are mixed with Chile exhibiting causality in both directions, while Malaysia and Singapore exhibit little if any form of causality between institutions and markets. In these two

countries, the fact that management is public and the governments have severely restricted investments in domestic capital markets is probably responsible for this result.

Countries interested in developing contractual savings are usually confronted with the issue of having underdeveloped capital markets. Hence, sequencing of reforms is important. Our analysis suggests that significant benefits will be derived from developing contractual savings even if capital markets have not reached their appropriate level of development. Initially, contractual savings institutions could invest primarily in government securities, corporate bonds and long-term loans, and to the extent possible, in shares and foreign securities.[34] This would be equivalent to a strategy combining Chile and the Netherlands. The difference is that Chile, at the beginning of its pension reform, did not allow investments in shares, loans or foreign securities while it allowed investments in bank deposits. Such a strategy could work in an environment of fiscal discipline and sound banking supervision. This is why we believe that long-term loans to the private sector offer better prospects as evidenced by the Netherlands. Simultaneously, the authorities should start improving the regulatory framework for capital markets development (bond and stock markets), including regulations on asset-backed securities (e.g., mortgage bonds), futures and derivatives. As the market develops, investment regulations covering contractual savings institutions could become more flexible while moving from non-market based instruments (e.g., loans) to market based securities and ultimately adopting the prudent person rule.

Thus, the strategy advocates a comprehensive approach to contractual savings and capital market development. We believe that it will provide greater benefits than first pursuing capital market development and only then promoting contractual savings. Both should be pursued simultaneously.

Obviously, a successful reform requires an enabling macroeconomic environment, a sound banking system as well as reliable financial sector regulation and supervision, and an appropriate tax treatment.

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[34] Investment in foreign securities provides the potential for risk diversification to the insured (if investments are made in markets which have low or negative correlation with the local market) and could have a direct effect of preventing development of domestic capital markets. However, it signals that the government is committed to having an open capital account which may induce higher capital inflows and an indirect positive effect on capital markets. Hence, the net result could be positive.

VII Appendix 1: Granger causality tests

Table 8: Contractual savings – Granger causality tests

Country	Obs	Granger									JB		
						Stat1	pval1		Stat2	pval2		Stat	pval
United States	17	CS	->	MC	F(1,14)	0.035	0.854	Chi2(1)	0.043	0.837	Chi2(2)	1.060	0.590
	17	MC	->	CS	F(1,14)	0.707	0.414	Chi2(1)	0.859	0.354	Chi2(2)	0.248	0.884
	17	CS	->	VT	F(1,14)	0.494	0.494	Chi2(1)	0.600	0.439	Chi2(2)	2.060	0.357
	17	VT	->	CS	F(1,14)	0.294	0.596	Chi2(1)	0.357	0.550	Chi2(2)	0.301	0.860
United Kingdom	17	CS	->	MC	F(1,14)	4.120	0.062	Chi2(1)	5.000	0.025	Chi2(2)	0.753	0.686
	17	MC	->	CS	F(1,14)	0.108	0.747	Chi2(1)	0.131	0.717	Chi2(2)	0.349	0.840
	17	CS	->	VT	F(1,14)	4.000	0.065	Chi2(1)	4.850	0.028	Chi2(2)	5.630	0.060
	17	VT	->	CS	F(1,14)	0.127	0.727	Chi2(1)	0.154	0.694	Chi2(2)	0.599	0.741
Belgium	16	CS	->	MC	F(1,12)	2.870	0.116	Chi2(1)	3.59	0.058	Chi2(2)	0.286	0.867
	15	MC	->	CS	F(1,12)	0.010	0.922	Chi2(1)	0.013	0.911	Chi2(2)	1.540	0.463
	16	CS	->	VT	F(1,12)	1.750	0.211	Chi2(1)	2.180	0.140	Chi2(2)	2.560	0.278
	15	VT	->	CS	F(1,12)	0.039	0.847	Chi2(1)	0.048	0.826	Chi2(2)	1.510	0.469
Australia	9	CS	->	MC	F(1,6)	0.904	0.378	Chi2(1)	1.360	0.244	Chi2(2)	0.203	0.904
	9	MC	->	CS	F(1,6)	0.117	0.744	Chi2(1)	0.176	0.675	Chi2(2)	1.370	0.503
	9	CS	->	VT	F(1,6)	1.440	0.275	Chi2(1)	2.160	0.141	Chi2(2)	1.270	0.531
	9	VT	->	CS	F(1,6)	0.984	0.359	Chi2(1)	1.480	0.224	Chi2(2)	0.558	0.756
Korea	17	CS	->	MC	F(1,14)	0.007	0.935	Chi2(1)	0.008	0.927	Chi2(2)	4.300	0.117
	17	MC	->	CS	F(1,14)	0.284	0.603	Chi2(1)	0.345	0.557	Chi2(2)	5.820	0.055
	17	CS	->	VT	F(1,14)	3.550	0.081	Chi2(1)	4.310	0.038	Chi2(2)	1.350	0.509
	17	VT	->	CS	F(1,14)	0.356	0.560	Chi2(1)	0.432	0.511	Chi2(2)	2.820	0.245
Spain	13	CS	->	MC	F(1,10)	4.230	0.067	Chi2(1)	5.510	0.019	Chi2(2)	1.590	0.451
	13	MC	->	CS	F(1,10)	0.042	0.841	Chi2(1)	0.055	0.814	Chi2(2)	0.546	0.761
	13	CS	->	VT	F(1,10)	0.644	0.441	Chi2(1)	0.837	0.360	Chi2(2)	1.430	0.489
	13	VT	->	CS	F(1,10)	0.501	0.495	Chi2(1)	0.651	0.420	Chi2(2)	0.196	0.907
Netherlands	17	CS	->	MC	F(1,14)	7.090	0.019	Chi2(1)	8.610	0.003	Chi2(2)	1.400	0.496
	17	MC	->	CS	F(1,14)	0.270	0.612	Chi2(1)	0.327	0.567	Chi2(2)	0.697	0.706
	17	CS	->	VT	F(1,14)	4.280	0.058	Chi2(1)	5.200	0.023	Chi2(2)	0.426	0.808
	17	VT	->	CS	F(1,14)	5.260	0.038	Chi2(1)	6.380	0.012	Chi2(2)	1.790	0.408
Canada	17	CS	->	MC	F(1,14)	3.740	0.074	Chi2(1)	4.540	0.033	Chi2(2)	1.490	0.474
	17	MC	->	CS	F(1,14)	0.001	0.972	Chi2(1)	0.002	0.969	Chi2(2)	0.162	0.922
	17	CS	->	VT	F(1,14)	2.080	0.171	Chi2(1)	2.530	0.112	Chi2(2)	0.437	0.804
	17	VT	->	CS	F(1,14)	0.592	0.454	Chi2(1)	0.719	0.396	Chi2(2)	0.242	0.886
Norway	15	CS	->	MC	F(1,12)	3.880	0.072	Chi2(1)	4.850	0.028	Chi2(2)	0.264	0.877
	15	MC	->	CS	F(1,12)	2.330	0.153	Chi2(1)	2.910	0.088	Chi2(2)	0.528	0.768
	16	CS	->	VT	F(1,13)	4.120	0.063	Chi2(1)	5.070	0.024	Chi2(2)	0.497	0.780
	16	VT	->	CS	F(1,13)	0.000	0.996	Chi2(1)	0.000	0.995	Chi2(2)	0.680	0.712
Sweden	12	CS	->	MC	F(1,9)	1.260	0.291	Chi2(1)	1.680	0.195	Chi2(2)	0.921	0.631
	12	MC	->	CS	F(1,9)	0.012	0.914	Chi2(1)	0.017	0.898	Chi2(2)	0.102	0.950
	12	CS	->	VT	F(1,9)	4.910	0.054	Chi2(1)	6.540	0.011	Chi2(2)	0.273	0.873
	12	VT	->	CS	F(1,9)	0.130	0.727	Chi2(1)	0.173	0.678	Chi2(2)	0.255	0.880
Finland	7	CS	->	MC	F(1,4)	7.600	0.051	Chi2(1)	13.300	0.000	Chi2(2)	0.732	0.832

Country	Obs	Granger									JB		
						Stat1	pval1		Stat2	pval2		Stat	pval
	7	MC	->	CS	F(1,4)	0.033	0.865	Chi2(1)	0.057	0.811	Chi2(2)	0.367	0.832
	7	CS	->	VT	F(1,4)	17.200	0.014	Chi2(1)	30.100	0.000	Chi2(2)	0.302	0.860
	7	VT	->	CS	F(1,4)	0.059	0.820	Chi2(1)	0.103	0.748	Chi2(2)	0.213	0.899
Germany	17	CS	->	MC	F(1,14)	5.680	0.032	Chi2(1)	6.900	0.009	Chi2(2)	1.790	0.408
	17	MC	->	CS	F(1,14)	0.035	0.854	Chi2(1)	0.043	0.836	Chi2(2)	6.040	0.049
	17	CS	->	VT	F(1,14)	8.330	0.012	Chi2(1)	10.100	0.001	Chi2(2)	7.300	0.026
	17	VT	->	CS	F(1,14)	5.240	0.038	Chi2(1)	6.360	0.012	Chi2(2)	10.900	0.004
Austria	6	CS	->	MC	F(1,3)	0.297	0.624	Chi2(1)	0.593	0.441	Chi2(2)	0.365	0.833
	6	MC	->	CS	F(1,3)	0.044	0.847	Chi2(1)	0.088	0.766	Chi2(2)	0.439	0.803
	6	CS	->	VT	F(1,3)	7.190	0.075	Chi2(1)	14.400	0.000	Chi2(2)	0.483	0.785
	6	VT	->	CS	F(1,3)	0.192	0.691	Chi2(1)	0.383	0.536	Chi2(2)	0.560	0.756
Portugal	8	CS	->	MC	F(1,5)	8.320	0.034	Chi2(1)	13.300	0.000	Chi2(2)	0.094	0.954
	8	MC	->	CS	F(1,5)	3.420	0.124	Chi2(1)	5.470	0.019	Chi2(2)	0.635	0.728
	8	CS	->	VT	F(1,5)	1.480	0.278	Chi2(1)	2.370	0.124	Chi2(2)	0.235	0.889
	8	VT	->	CS	F(1,5)	0.077	0.793	Chi2(1)	0.122	0.726	Chi2(2)	4.870	0.087
Chile	9	CS	->	MC	F(1,6)	1.990	0.208	Chi2(1)	2.980	0.084	Chi2(2)	0.392	0.822
	9	MC	->	CS	F(1,6)	5.640	0.055	Chi2(1)	8.460	0.004	Chi2(2)	0.707	0.702
	9	CS	->	VT	F(1,6)	5.120	0.064	Chi2(1)	7.690	0.006	Chi2(2)	1.710	0.426
	9	VT	->	CS	F(1,6)	0.905	0.378	Chi2(1)	1.360	0.244	Chi2(2)	1.120	0.572
Singapore	15	CS	->	MC	F(1,12)	1.590	0.231	Chi2(1)	1.990	0.158	Chi2(2)	4.560	0.102
	15	MC	->	CS	F(1,12)	0.183	0.677	Chi2(1)	0.228	0.633	Chi2(2)	1.190	0.552
	15	CS	->	VT	F(1,12)	0.001	0.944	Chi2(1)	0.001	0.936	Chi2(2)	22.000	0.000
	15	VT	->	CS	F(1,12)	4.640	0.052	Chi2(1)	5.800	0.016	Chi2(2)	0.728	0.695
Malaysia	15	CS	->	MC	F(1,12)	0.897	0.362	Chi2(1)	1.120	0.290	Chi2(2)	1.140	0.564
	15	MC	->	CS	F(1,12)	0.316	0.585	Chi2(1)	0.395	0.530	Chi2(2)	7.910	0.019
	17	CS	->	VT	F(1,14)	0.381	0.547	Chi2(1)	0.463	0.496	Chi2(2)	1.650	0.438
	17	VT	->	CS	F(1,14)	0.003	0.960	Chi2(1)	0.003	0.955	Chi2(2)	7.960	0.019
Thailand	11	CS	->	MC	F(1,8)	3.680	0.091	Chi2(1)	5.060	0.024	Chi2(2)	7.200	0.027
	11	MC	->	CS	F(1,8)	1.450	0.263	Chi2(1)	1.990	0.158	Chi2(2)	3.060	0.216
	11	CS	->	VT	F(1,8)	3.300	0.107	Chi2(1)	4.530	0.033	Chi2(2)	5.380	0.068
	11	VT	->	CS	F(1,8)	0.125	0.733	Chi2(1)	0.172	0.679	Chi2(2)	0.023	0.989
South Africa	19	CS	->	MC	F(1,16)	6.980	0.018	Chi2(1)	8.280	0.004	Chi2(2)	22.600	0.000
	19	MC	->	CS	F(1,16)	2.700	0.120	Chi2(1)	3.200	0.073	Chi2(2)	1.830	0.400
	19	CS	->	VT	F(1,16)	1.300	0.271	Chi2(1)	1.550	0.214	Chi2(2)	0.609	0.737
	19	VT	->	CS	F(1,16)	2.460	0.136	Chi2(1)	2.920	0.087	Chi2(2)	1.520	0.468

Source: WB institutional investors dataset and WDI.

Table 9: Pension funds – Granger causality tests

Country	Obs	Granger										JB		
						Stat1	pval1		Stat2	pval2		Stat	pval
United States	17	PF	->	MC	F(1,14)	0.023	0.883	Chi2(1)	0.027	0.868	Chi2(2)	0.983	0.612
	17	MC	->	PF	F(1,14)	1.170	0.298	Chi2(1)	1.420	0.234	Chi2(2)	0.432	0.806
	17	PF	->	VT	F(1,14)	0.664	0.429	Chi2(1)	0.807	0.369	Chi2(2)	2.100	0.351
	17	VT	->	PF	F(1,14)	0.397	0.539	Chi2(1)	0.483	0.487	Chi2(2)	0.386	0.824
United Kingdom	17	PF	->	MC	F(1,14)	1.070	0.319	Chi2(1)	1.300	0.255	Chi2(2)	0.067	0.967
	17	MC	->	PF	F(1,14)	0.098	0.759	Chi2(1)	0.119	0.730	Chi2(2)	0.324	0.851
	17	PF	->	VT	F(1,14)	4.010	0.065	Chi2(1)	4.870	0.027	Chi2(2)	3.500	0.174
	17	VT	->	PF	F(1,14)	0.618	0.445	Chi2(1)	0.751	0.386	Chi2(2)	0.456	0.796
Belgium	15	PF	->	MC	F(1,12)	0.053	0.823	Chi2(1)	0.066	0.798	Chi2(2)	0.464	0.793
	15	MC	->	PF	F(1,12)	2.250	0.160	Chi2(1)	2.810	0.094	Chi2(2)	1.060	0.589
	15	PF	->	VT	F(1,12)	12.200	0.006	Chi2(1)	14.000	0.000	Chi2(2)	0.491	0.782
	15	VT	->	PF	F(1,12)	1.970	0.186	Chi2(1)	2.470	0.116	Chi2(2)	1.200	0.549
Australia	9	PF	->	MC	F(1,6)	0.960	0.365	Chi2(1)	1.440	0.230	Chi2(2)	0.371	0.831
	9	MC	->	PF	F(1,6)	0.756	0.418	Chi2(1)	1.130	0.287	Chi2(2)	0.409	0.815
	9	PF	->	VT	F(1,6)	2.100	0.198	Chi2(1)	3.140	0.076	Chi2(2)	0.320	0.852
	9	VT	->	PF	F(1,6)	2.560	0.161	Chi2(1)	3.840	0.050	Chi2(2)	0.181	0.913
Korea	17	PF	->	MC	F(1,14)	2.370	0.146	Chi2(1)	2.870	0.090	Chi2(2)	2.370	0.306
	17	MC	->	PF	F(1,14)	0.553	0.469	Chi2(1)	0.671	0.413	Chi2(2)	1.560	0.459
	17	PF	->	VT	F(1,14)	3.150	0.097	Chi2(1)	3.830	0.050	Chi2(2)	0.328	0.849
	17	VT	->	PF	F(1,14)	0.494	0.494	Chi2(1)	0.600	0.439	Chi2(2)	1.490	0.474
Spain	17	PF	->	MC	F(1,14)	4.980	0.043	Chi2(1)	6.040	0.014	Chi2(2)	3.510	0.173
	17	MC	->	PF	F(1,14)	1.440	0.251	Chi2(1)	1.740	0.187	Chi2(2)	3.470	0.176
	17	PF	->	VT	F(1,14)	0.283	0.603	Chi2(1)	0.343	0.558	Chi2(2)	2.510	0.285
	17	VT	->	PF	F(1,14)	0.153	0.702	Chi2(1)	0.185	0.667	Chi2(2)	2.680	0.261
Netherlands	17	PF	->	MC	F(1,14)	4.370	0.055	Chi2(1)	5.300	0.021	Chi2(2)	3.180	0.204
	17	MC	->	PF	F(1,14)	1.090	0.313	Chi2(1)	1.330	0.249	Chi2(2)	0.925	0.630
	17	PF	->	VT	F(1,14)	2.690	0.123	Chi2(1)	3.270	0.071	Chi2(2)	0.499	0.779
	17	VT	->	PF	F(1,14)	5.760	0.031	Chi2(1)	7.000	0.008	Chi2(2)	1.660	0.437
Canada	17	PF	->	MC	F(1,14)	4.190	0.060	Chi2(1)	5.080	0.024	Chi2(2)	1.530	0.464
	17	MC	->	PF	F(1,14)	1.070	0.318	Chi2(1)	1.300	0.254	Chi2(2)	0.790	0.674
	17	PF	->	VT	F(1,14)	2.230	0.158	Chi2(1)	2.700	0.100	Chi2(2)	0.451	0.798
	17	VT	->	PF	F(1,14)	0.085	0.775	Chi2(1)	0.103	0.748	Chi2(2)	0.464	0.793
Norway	15	PF	->	MC	F(1,12)	7.110	0.021	Chi2(1)	8.890	0.003	Chi2(2)	2.390	0.303
	15	MC	->	PF	F(1,12)	0.483	0.500	Chi2(1)	0.603	0.437	Chi2(2)	0.322	0.851
	16	PF	->	VT	F(1,13)	6.370	0.025	Chi2(1)	7.840	0.005	Chi2(2)	0.367	0.832
	16	VT	->	PF	F(1,13)	0.655	0.433	Chi2(1)	0.806	0.369	Chi2(2)	1.690	0.429
Sweden	12	PF	->	MC	F(1,9)	2.500	0.148	Chi2(1)	3.340	0.068	Chi2(2)	1.250	0.563
	12	MC	->	PF	F(1,9)	0.147	0.710	Chi2(1)	0.196	0.658	Chi2(2)	0.064	0.969
	12	PF	->	VT	F(1,9)	2.500	0.148	Chi2(1)	3.340	0.068	Chi2(2)	0.450	0.799
	12	VT	->	PF	F(1,9)	0.655	0.439	Chi2(1)	0.873	0.350	Chi2(2)	0.406	0.816
Finland	13	PF	->	MC	F(1,10)	3.870	0.077	Chi2(1)	5.030	0.025	Chi2(2)	0.308	0.857
	13	MC	->	PF	F(1,10)	0.162	0.696	Chi2(1)	0.210	0.647	Chi2(2)	0.397	0.820
	16	PF	->	VT	F(1,13)	7.760	0.015	Chi2(1)	9.560	0.002	Chi2(2)	0.459	0.795
	16	VT	->	PF	F(1,13)	0.069	0.797	Chi2(1)	0.085	0.770	Chi2(2)	0.254	0.881

Country	Obs	Granger									JB		
						Stat1	pval1		Stat2	pval2		Stat	pval
Germany	17	PF	->	MC	F(1,14)	0.020	0.889	Chi2(1)	0.025	0.876	Chi2(2)	1.020	0.601
	17	MC	->	PF	F(1,14)	0.012	0.915	Chi2(1)	0.014	0.905	Chi2(2)	2.820	0.244
	17	PF	->	VT	F(1,14)	1.210	0.289	Chi2(1)	1.470	0.225	Chi2(2)	1.280	0.527
	17	VT	->	PF	F(1,14)	0.233	0.637	Chi2(1)	0.283	0.595	Chi2(2)	2.730	0.256
Austria	6	PF	->	MC	F(1,3)	0.796	0.438	Chi2(1)	1.590	0.207	Chi2(2)	0.401	0.818
	6	MC	->	PF	F(1,3)	0.000	0.986	Chi2(1)	0.001	0.979	Chi2(2)	0.599	0.741
	6	PF	->	VT	F(1,3)	3.800	0.146	Chi2(1)	7.600	0.006	Chi2(2)	0.696	0.706
	6	VT	->	PF	F(1,3)	10.300	0.049	Chi2(1)	20.500	0.000	Chi2(2)	0.644	0.725
Portugal	8	PF	->	MC	F(1,5)	8.600	0.033	Chi2(1)	13.800	0.000	Chi2(2)	0.255	0.880
	8	MC	->	PF	F(1,5)	2.110	0.206	Chi2(1)	3.380	0.066	Chi2(2)	0.715	0.699
	8	PF	->	VT	F(1,5)	1.460	0.281	Chi2(1)	2.340	0.126	Chi2(2)	0.346	0.841
	8	VT	->	PF	F(1,5)	0.038	0.853	Chi2(1)	0.061	0.805	Chi2(2)	1.580	0.453
Chile	16	PF	->	MC	F(1,13)	7.020	0.020	Chi2(1)	8.640	0.003	Chi2(2)	2.170	0.337
	16	MC	->	PF	F(1,13)	5.450	0.036	Chi2(1)	6.700	0.010	Chi2(2)	0.593	0.743
	16	PF	->	VT	F(1,13)	12.000	0.004	Chi2(1)	14.800	0.000	Chi2(2)	12.600	0.002
	16	VT	->	PF	F(1,13)	4.260	0.060	Chi2(1)	5.240	0.022	Chi2(2)	0.304	0.859
Singapore	16	PF	->	MC	F(1,13)	1.070	0.321	Chi2(1)	1.310	0.252	Chi2(2)	5.670	0.059
	16	MC	->	PF	F(1,13)	0.019	0.893	Chi2(1)	0.023	0.879	Chi2(2)	0.850	0.654
	22	PF	->	VT	F(1,19)	0.127	0.725	Chi2(1)	0.148	0.701	Chi2(2)	40.900	0.000
	22	VT	->	PF	F(1,19)	1.990	0.175	Chi2(1)	2.300	0.129	Chi2(2)	1.060	0.590
Malaysia	15	PF	->	MC	F(1,12)	0.973	0.343	Chi2(1)	1.220	0.270	Chi2(2)	1.120	0.571
	15	MC	->	PF	F(1,12)	0.144	0.711	Chi2(1)	0.180	0.671	Chi2(2)	7.040	0.030
	17	PF	->	VT	F(1,14)	0.427	0.524	Chi2(1)	0.519	0.471	Chi2(2)	1.620	0.445
	17	VT	->	PF	F(1,14)	0.049	0.828	Chi2(1)	0.060	0.807	Chi2(2)	7.530	0.023
Thailand	13	PF	->	MC	F(1,10)	4.460	0.061	Chi2(1)	5.800	0.016	Chi2(2)	11.300	0.004
	13	MC	->	PF	F(1,10)	0.317	0.586	Chi2(1)	0.412	0.521	Chi2(2)	0.584	0.747
	13	PF	->	VT	F(1,10)	2.040	0.184	Chi2(1)	2.650	0.104	Chi2(2)	5.680	0.058
	13	VT	->	PF	F(1,10)	1.130	0.312	Chi2(1)	1.480	0.225	Chi2(2)	1.090	0.581
South Africa	19	PF	->	MC	F(1,16)	6.970	0.018	Chi2(1)	8.280	0.004	Chi2(2)	22.900	0.000
	19	MC	->	PF	F(1,16)	0.118	0.735	Chi2(1)	0.141	0.708	Chi2(2)	0.110	0.946
	19	PF	->	VT	F(1,16)	1.430	0.249	Chi2(1)	1.700	0.193	Chi2(2)	0.686	0.710
	19	VT	->	PF	F(1,16)	0.255	0.620	Chi2(1)	0.303	0.582	Chi2(2)	0.077	0.962

Source: WB institutional investors dataset and WDI.

Table 10: Life insurance – Granger causality tests

Country	Obs	Granger										JB		
						Stat1	pval1		Stat2	pval2			Stat	pval
United States	17	LI	->	MC	F(1,14)	0.070	0.795	Chi2(1)	0.085	0.770	Chi2(2)		1.230	0.541
	17	MC	->	LI	F(1,14)	0.050	0.826	Chi2(1)	0.061	0.805	Chi2(2)		0.834	0.659
	17	LI	->	VT	F(1,14)	0.163	0.692	Chi2(1)	0.198	0.656	Chi2(2)		2.120	0.347
	17	VT	->	LI	F(1,14)	0.228	0.640	Chi2(1)	0.277	0.599	Chi2(2)		0.673	0.714
United Kingdom	17	LI	->	MC	F(1,14)	5.470	0.035	Chi2(1)	6.640	0.010	Chi2(2)		0.045	0.978
	17	MC	->	LI	F(1,14)	0.001	0.977	Chi2(1)	0.001	0.974	Chi2(2)		0.560	0.756
	17	LI	->	VT	F(1,14)	3.520	0.082	Chi2(1)	4.270	0.039	Chi2(2)		6.480	0.039
	17	VT	->	LI	F(1,14)	0.000	0.992	Chi2(1)	0.000	0.991	Chi2(2)		0.578	0.749
Belgium	16	LI	->	MC	F(1,13)	4.670	0.050	Chi2(1)	5.750	0.017	Chi2(2)		0.229	0.892
	16	MC	->	LI	F(1,13)	0.128	0.726	Chi2(1)	0.157	0.692	Chi2(2)		3.900	0.142
	16	LI	->	VT	F(1,13)	0.715	0.413	Chi2(1)	0.157	0.692	Chi2(2)		4.910	0.086
	16	VT	->	LI	F(1,13)	0.311	0.586	Chi2(1)	0.383	0.536	Chi2(2)		4.200	0.123
Australia	17	LI	->	MC	F(1,14)	0.098	0.758	Chi2(1)	0.120	0.730	Chi2(2)		0.419	0.811
	17	MC	->	LI	F(1,14)	0.003	0.960	Chi2(1)	0.003	0.955	Chi2(2)		4.520	0.104
	17	LI	->	VT	F(1,14)	1.090	0.315	Chi2(1)	1.320	0.251	Chi2(2)		0.707	0.702
	17	VT	->	LI	F(1,14)	0.298	0.594	Chi2(1)	0.361	0.548	Chi2(2)		2.110	0.348
Korea	17	LI	->	MC	F(1,14)	0.064	0.804	Chi2(1)	0.077	0.781	Chi2(2)		4.480	0.106
	17	MC	->	LI	F(1,14)	0.824	0.379	Chi2(1)	1.000	0.317	Chi2(2)		2.870	0.238
	17	LI	->	VT	F(1,14)	3.140	0.098	Chi2(1)	3.810	0.051	Chi2(2)		1.360	0.505
	17	VT	->	LI	F(1,14)	0.029	0.868	Chi2(1)	0.035	0.852	Chi2(2)		1.490	0.474
Spain	13	LI	->	MC	F(1,10)	0.386	0.549	Chi2(1)	0.501	0.479	Chi2(2)		2.230	0.328
	13	MC	->	LI	F(1,10)	0.185	0.676	Chi2(1)	0.240	0.624	Chi2(2)		0.424	0.809
	13	LI	->	VT	F(1,10)	0.110	0.747	Chi2(1)	0.143	0.706	Chi2(2)		6.810	0.033
	13	VT	->	LI	F(1,10)	1.560	0.239	Chi2(1)	2.030	0.154	Chi2(2)		0.634	0.728
Netherlands	17	LI	->	MC	F(1,14)	7.380	0.017	Chi2(1)	8.970	0.003	Chi2(2)		0.276	0.871
	17	MC	->	LI	F(1,14)	0.020	0.891	Chi2(1)	0.024	0.878	Chi2(2)		1.940	0.379
	17	LI	->	VT	F(1,14)	6.190	0.026	Chi2(1)	7.510	0.006	Chi2(2)		0.190	0.909
	17	VT	->	LI	F(1,14)	4.150	0.061	Chi2(1)	5.040	0.025	Chi2(2)		0.051	0.975
Canada	17	LI	->	MC	F(1,14)	2.880	0.112	Chi2(1)	3.490	0.062	Chi2(2)		1.310	0.520
	17	MC	->	LI	F(1,14)	1.860	0.195	Chi2(1)	2.250	0.133	Chi2(2)		0.063	0.969
	17	LI	->	VT	F(1,14)	1.750	0.207	Chi2(1)	2.130	0.145	Chi2(2)		0.411	0.814
	17	VT	->	LI	F(1,14)	3.590	0.079	Chi2(1)	4.360	0.037	Chi2(2)		0.006	0.997
Norway	15	LI	->	MC	F(1,12)	2.530	0.138	Chi2(1)	3.160	0.075	Chi2(2)		0.179	0.914
	15	MC	->	LI	F(1,12)	2.120	0.171	Chi2(1)	2.650	0.103	Chi2(2)		0.529	0.768
	16	LI	->	VT	F(1,13)	3.200	0.097	Chi2(1)	3.940	0.047	Chi2(2)		0.755	0.686
	16	VT	->	LI	F(1,13)	0.036	0.853	Chi2(1)	0.044	0.834	Chi2(2)		0.658	0.720
Sweden	12	LI	->	MC	F(1,9)	1.150	0.312	Chi2(1)	1.530	0.216	Chi2(2)		0.900	0.637
	12	MC	->	LI	F(1,9)	0.036	0.853	Chi2(1)	0.048	0.826	Chi2(2)		0.108	0.947
	12	LI	->	VT	F(1,9)	5.020	0.052	Chi2(1)	6.690	0.010	Chi2(2)		0.293	0.864
	12	VT	->	LI	F(1,9)	0.167	0.692	Chi2(1)	0.222	0.637	Chi2(2)		0.287	0.866
Finland	7	LI	->	MC	F(1,4)	9.050	0.040	Chi2(1)	15.800	0.000	Chi2(2)		0.418	0.811
	7	MC	->	LI	F(1,4)	0.006	0.940	Chi2(1)	0.011	0.916	Chi2(2)		0.274	0.872
	7	LI	->	VT	F(1,4)	6.300	0.066	Chi2(1)	11.000	0.001	Chi2(2)		0.768	0.681
	7	VT	->	LI	F(1,4)	0.066	0.810	Chi2(1)	0.116	0.734	Chi2(2)		0.321	0.852

Country	Obs	Granger									JB		
						Stat1	pval1		Stat2	pval2		Stat	pval
Germany	17	LI	->	MC	F(1,14)	6.310	0.025	Chi2(1)	7.660	0.006	Chi2(2)	1.910	0.384
	17	MC	->	LI	F(1,14)	0.053	0.821	Chi2(1)	0.064	0.800	Chi2(2)	8.680	0.013
	17	LI	->	VT	F(1,14)	6.960	0.019	Chi2(1)	8.450	0.004	Chi2(2)	8.480	0.014
	17	VT	->	LI	F(1,14)	5.990	0.028	Chi2(1)	7.270	0.007	Chi2(2)	12.800	0.002
Austria	10	LI	->	MC	F(1,7)	2.730	0.142	Chi2(1)	3.900	0.048	Chi2(2)	0.986	0.611
	10	MC	->	LI	F(1,7)	0.055	0.821	Chi2(1)	0.079	0.778	Chi2(2)	0.223	0.894
	10	LI	->	VT	F(1,7)	0.642	0.449	Chi2(1)	0.917	0.338	Chi2(2)	0.449	0.799
	10	VT	->	LI	F(1,7)	0.222	0.652	Chi2(1)	0.317	0.574	Chi2(2)	0.097	0.953
Portugal	17	LI	->	MC	F(1,14)	4.470	0.053	Chi2(1)	5.430	0.020	Chi2(2)	0.515	0.773
	17	MC	->	LI	F(1,14)	0.279	0.605	Chi2(1)	0.339	0.560	Chi2(2)	4.000	0.135
	17	LI	->	VT	F(1,14)	5.070	0.041	Chi2(1)	6.160	0.013	Chi2(2)	1.500	0.472
	17	VT	->	LI	F(1,14)	0.885	0.363	Chi2(1)	1.080	0.300	Chi2(2)	2.140	0.343
Chile	9	LI	->	MC	F(1,6)	0.352	0.575	Chi2(1)	0.528	0.467	Chi2(2)	0.946	0.623
	9	MC	->	LI	F(1,6)	0.847	0.393	Chi2(1)	1.270	0.260	Chi2(2)	0.597	0.742
	9	LI	->	VT	F(1,6)	2.430	0.170	Chi2(1)	3.650	0.056	Chi2(2)	2.590	0.273
	9	VT	->	LI	F(1,6)	0.674	0.443	Chi2(1)	1.010	0.315	Chi2(2)	0.509	0.775
Singapore	15	LI	->	MC	F(1,12)	1.770	0.208	Chi2(1)	2.210	0.137	Chi2(2)	10.700	0.004
	15	MC	->	LI	F(1,12)	0.105	0.751	Chi2(1)	0.132	0.717	Chi2(2)	0.153	0.926
	15	LI	->	VT	F(1,12)	3.570	0.083	Chi2(1)	4.470	0.035	Chi2(2)	10.400	0.006
	15	VT	->	LI	F(1,12)	0.468	0.507	Chi2(1)	0.585	0.444	Chi2(2)	0.170	0.918
Malaysia	19	LI	->	MC	F(1,16)	1.180	0.293	Chi2(1)	1.400	0.236	Chi2(2)	4.020	0.134
	19	MC	->	LI	F(1,16)	0.603	0.449	Chi2(1)	0.716	0.397	Chi2(2)	3.480	0.175
	21	LI	->	VT	F(1,18)	4.510	0.048	Chi2(1)	5.260	0.022	Chi2(2)	27.900	0.000
	21	VT	->	LI	F(1,18)	0.008	0.929	Chi2(1)	0.010	0.922	Chi2(2)	3.360	0.186
Thailand	11	LI	->	MC	F(1,8)	2.060	0.189	Chi2(1)	2.830	0.092	Chi2(2)	4.780	0.091
	11	MC	->	LI	F(1,8)	0.049	0.830	Chi2(1)	0.067	0.795	Chi2(2)	8.810	0.012
	11	LI	->	VT	F(1,8)	3.980	0.081	Chi2(1)	5.470	0.019	Chi2(2)	8.550	0.014
	11	VT	->	LI	F(1,8)	9.580	0.015	Chi2(1)	13.200	0.000	Chi2(2)	0.415	0.813
South Africa	21	LI	->	MC	F(1,18)	5.400	0.032	Chi2(1)	6.300	0.012	Chi2(2)	14.100	0.001
	21	MC	->	LI	F(1,18)	2.410	0.138	Chi2(1)	2.810	0.094	Chi2(2)	3.320	0.190
	22	LI	->	VT	F(1,19)	1.400	0.252	Chi2(1)	1.620	0.203	Chi2(2)	0.776	0.678
	22	VT	->	LI	F(1,19)	2.820	0.109	Chi2(1)	3.270	0.071	Chi2(2)	4.540	0.103

Source: WB institutional investors dataset and WDI.

Table 11: Non-life insurance – Granger causality tests

Country	Obs	Granger											
						Stat1	pval1		Stat2	pval2		JB Stat	JB pval
United States	17	NL	->	MC	F(1,14)	0.058	0.814	Chi2(1)	0.070	0.791	Chi2(2)	0.449	0.799
	17	MC	->	NL	F(1,14)	0.017	0.900	Chi2(1)	0.020	0.887	Chi2(2)	0.115	0.944
	17	NL	->	VT	F(1,14)	0.344	0.567	Chi2(1)	0.418	0.518	Chi2(2)	2.840	0.241
	17	VT	->	NL	F(1,14)	0.340	0.569	Chi2(1)	0.413	0.521	Chi2(2)	0.101	0.951
United Kingdom	17	NL	->	MC	F(1,14)	2.160	0.164	Chi2(1)	2.620	0.106	Chi2(2)	1.530	0.464
	17	MC	->	NL	F(1,14)	0.793	0.388	Chi2(1)	0.963	0.326	Chi2(2)	1.740	0.418
	17	NL	->	VT	F(1,14)	4.800	0.046	Chi2(1)	5.830	0.016	Chi2(2)	5.410	0.067
	17	VT	->	NL	F(1,14)	0.673	0.426	Chi2(1)	0.817	0.366	Chi2(2)	2.090	0.352
Belgium	15	NL	->	MC	F(1,12)	4.480	0.056	Chi2(1)	5.600	0.018	Chi2(2)	0.220	0.896
	14	MC	->	NL	F(1,11)	0.027	0.873	Chi2(1)	0.034	0.853	Chi2(2)	8.590	0.014
	15	NL	->	VT	F(1,12)	2.040	0.179	Chi2(1)	2.550	0.110	Chi2(2)	0.037	0.982
	14	VT	->	NL	F(1,11)	0.417	0.532	Chi2(1)	0.531	0.466	Chi2(2)	6.470	0.039
Australia	9	NL	->	MC	F(1,6)	0.244	0.639	Chi2(1)	0.365	0.545	Chi2(2)	0.875	0.646
	9	MC	->	NL	F(1,6)	4.870	0.069	Chi2(1)	7.300	0.007	Chi2(2)	0.172	0.918
	9	NL	->	VT	F(1,6)	0.000	0.993	Chi2(1)	0.000	0.991	Chi2(2)	5.300	0.071
	9	VT	->	NL	F(1,6)	8.320	0.028	Chi2(1)	12.500	0.000	Chi2(2)	0.441	0.802
Korea	17	NL	->	MC	F(1,14)	3.150	0.098	Chi2(1)	3.830	0.050	Chi2(2)	3.790	0.150
	17	MC	->	NL	F(1,14)	1.290	0.275	Chi2(1)	1.570	0.210	Chi2(2)	0.219	0.896
	17	NL	->	VT	F(1,14)	0.164	0.691	Chi2(1)	0.200	0.655	Chi2(2)	0.400	0.819
	17	VT	->	NL	F(1,14)	1.310	0.272	Chi2(1)	1.590	0.208	Chi2(2)	0.595	0.743
Spain	13	NL	->	MC	F(1,10)	0.095	0.764	Chi2(1)	0.124	0.725	Chi2(2)	3.400	0.183
	13	MC	->	NL	F(1,10)	0.227	0.644	Chi2(1)	0.295	0.587	Chi2(2)	5.140	0.077
	13	NL	->	VT	F(1,10)	0.040	0.846	Chi2(1)	0.052	0.820	Chi2(2)	4.010	0.135
	13	VT	->	NL	F(1,10)	0.738	0.410	Chi2(1)	0.960	0.327	Chi2(2)	12.100	0.002
Netherlands	16	NL	->	MC	F(1,13)	13.600	0.003	Chi2(1)	27.000	0.000	Chi2(2)	0.065	0.968
	16	MC	->	NL	F(1,13)	0.129	0.725	Chi2(1)	0.159	0.690	Chi2(2)	1.030	0.598
	16	NL	->	VT	F(1,13)	6.930	0.021	Chi2(1)	8.520	0.004	Chi2(2)	1.980	0.371
	16	VT	->	NL	F(1,13)	0.310	0.587	Chi2(1)	0.381	0.537	Chi2(2)	5.360	0.068
Canada	17	NL	->	MC	F(1,14)	2.040	0.175	Chi2(1)	2.480	0.116	Chi2(2)	0.283	0.868
	17	MC	->	NL	F(1,14)	0.937	0.350	Chi2(1)	1.140	0.286	Chi2(2)	1.240	0.538
	17	NL	->	VT	F(1,14)	0.561	0.466	Chi2(1)	0.681	0.409	Chi2(2)	0.137	0.934
	17	VT	->	NL	F(1,14)	1.060	0.321	Chi2(1)	1.290	0.256	Chi2(2)	0.578	0.749
Norway	15	NL	->	MC	F(1,12)	8.390	0.013	Chi2(1)	10.500	0.001	Chi2(2)	0.273	0.872
	15	MC	->	NL	F(1,12)	3.200	0.099	Chi2(1)	4.000	0.045	Chi2(2)	0.615	0.735
	16	NL	->	VT	F(1,13)	4.180	0.062	Chi2(1)	5.150	0.023	Chi2(2)	0.579	0.749
	16	VT	->	NL	F(1,13)	0.004	0.953	Chi2(1)	0.004	0.947	Chi2(2)	0.970	0.616
Sweden	12	NL	->	MC	F(1,9)	3.860	0.081	Chi2(1)	5.140	0.023	Chi2(2)	0.268	0.875
	12	MC	->	NL	F(1,9)	0.573	0.468	Chi2(1)	0.764	0.382	Chi2(2)	1.030	0.599
	12	NL	->	VT	F(1,9)	12.100	0.007	Chi2(1)	16.100	0.000	Chi2(2)	1.250	0.534
	12	VT	->	NL	F(1,9)	12.100	0.007	Chi2(1)	16.100	0.000	Chi2(2)	6.100	0.047
Finland	8	NL	->	MC	F(1,5)	1.440	0.284	Chi2(1)	2.310	0.129	Chi2(2)	0.760	0.684
	8	MC	->	NL	F(1,5)	0.005	0.947	Chi2(1)	0.008	0.930	Chi2(2)	4.880	0.087
	8	NL	->	VT	F(1,5)	2.450	0.178	Chi2(1)	3.920	0.048	Chi2(2)	0.650	0.722
	8	VT	->	NL	F(1,5)	0.090	0.776	Chi2(1)	0.145	0.704	Chi2(2)	3.840	0.147

Country	Obs	Granger									JB		
						Stat1	pval1		Stat2	pval2		Stat	pval
Germany	17	NL	->	MC	F(1,14)	17.700	0.001	Chi2(1)	21.500	0.000	Chi2(2)	2.570	0.276
	17	MC	->	NL	F(1,14)	1.590	0.228	Chi2(1)	1.930	0.165	Chi2(2)	4.870	0.088
	17	NL	->	VT	F(1,14)	9.860	0.007	Chi2(1)	12.000	0.001	Chi2(2)	14.500	0.001
	17	VT	->	NL	F(1,14)	7.510	0.016	Chi2(1)	9.120	0.003	Chi2(2)	3.010	0.222
Austria	10	NL	->	MC	F(1,7)	5.950	0.045	Chi2(1)	8.500	0.004	Chi2(2)	0.013	0.994
	10	MC	->	NL	F(1,7)	0.000	0.994	Chi2(1)	0.000	0.992	Chi2(2)	0.222	0.895
	10	NL	->	VT	F(1,7)	0.575	0.473	Chi2(1)	0.822	0.365	Chi2(2)	0.506	0.776
	10	VT	->	NL	F(1,7)	0.963	0.359	Chi2(1)	1.380	0.241	Chi2(2)	1.050	0.593
Portugal	9	NL	->	MC	F(1,6)	6.180	0.047	Chi2(1)	9.260	0.002	Chi2(2)	0.490	0.783
	9	MC	->	NL	F(1,6)	2.210	0.187	Chi2(1)	3.320	0.068	Chi2(2)	2.670	0.263
	9	NL	->	VT	F(1,6)	7.180	0.037	Chi2(1)	10.800	0.001	Chi2(2)	0.047	0.977
	9	VT	->	NL	F(1,6)	2.270	0.183	Chi2(1)	3.400	0.065	Chi2(2)	0.322	0.851
Chile	9	NL	->	MC	F(1,6)	0.011	0.920	Chi2(1)	0.016	0.898	Chi2(2)	0.971	0.615
	9	MC	->	NL	F(1,6)	0.725	0.427	Chi2(1)	1.090	0.297	Chi2(2)	3.430	0.180
	9	NL	->	VT	F(1,6)	43.100	0.001	Chi2(1)	64.700	0.000	Chi2(2)	0.667	0.716
	9	VT	->	NL	F(1,6)	0.000	0.998	Chi2(1)	0.000	0.997	Chi2(2)	3.100	0.212
Singapore	15	NL	->	MC	F(1,12)	0.011	0.919	Chi2(1)	0.013	0.908	Chi2(2)	8.270	0.016
	15	MC	->	NL	F(1,12)	4.290	0.061	Chi2(1)	5.360	0.021	Chi2(2)	0.477	0.788
	15	NL	->	VT	F(1,12)	0.457	0.512	Chi2(1)	0.572	0.450	Chi2(2)	24.300	0.000
	15	VT	->	NL	F(1,12)	7.200	0.020	Chi2(1)	9.000	0.003	Chi2(2)	0.446	0.800
Malaysia	19	NL	->	MC	F(1,16)	0.049	0.827	Chi2(1)	0.058	0.809	Chi2(2)	5.150	0.076
	19	MC	->	NL	F(1,16)	3.090	0.098	Chi2(1)	3.670	0.055	Chi2(2)	0.648	0.723
	21	NL	->	VT	F(1,18)	8.830	0.008	Chi2(1)	10.300	0.001	Chi2(2)	34.600	0.000
	21	VT	->	NL	F(1,18)	0.142	0.711	Chi2(1)	0.165	0.685	Chi2(2)	0.758	0.685
Thailand	5	NL	->	MC	F(1,2)	12.400	0.072	Chi2(1)	31.100	0.000	Chi2(2)	0.628	0.731
	5	MC	->	NL	F(1,2)	3.520	0.201	Chi2(1)	8.810	0.003	Chi2(2)	0.948	0.622
	5	NL	->	VT	F(1,2)	15.200	0.060	Chi2(1)	38.000	0.000	Chi2(2)	0.399	0.819
	5	VT	->	NL	F(1,2)	9.960	0.087	Chi2(1)	24.900	0.000	Chi2(2)	0.232	0.890
South Africa	21	NL	->	MC	F(1,18)	2.190	0.156	Chi2(1)	2.560	0.110	Chi2(2)	3.560	0.169
	21	MC	->	NL	F(1,18)	0.924	0.349	Chi2(1)	1.080	0.299	Chi2(2)	0.183	0.912
	21	NL	->	VT	F(1,18)	6.520	0.020	Chi2(1)	7.610	0.006	Chi2(2)	0.127	0.938
	21	VT	->	NL	F(1,18)	0.556	0.465	Chi2(1)	0.649	0.421	Chi2(2)	0.141	0.932

Source: WB institutional investors dataset and WDI.

VIII Appendix 2: Data

Data on financial assets of pension funds, life, and non-life insurance companies for OECD countries come from OECD 1997 and 1998 Institutional Investors Statistical Yearbooks. For non-OECD countries the sources are the following:

a) data for Chile, were specially assembled by Central Bank of Chile at our request.

b) data for Thailand was obtained from the Association of Provident Funds and the Annual Report of the Department of Insurance in the Ministry of Commerce.

c) data for South Africa is published in the Federal Reserve Bank quarterly bulletin.

d) data for Malaysia is published in the insurance annual report and the EPF annual report by Bank Negara.

e) data for Singapore is published in the yearbook of statistics by the Department of Statistics.

All other variables come from the World Development Indicators database.

Stock Market Value Traded: Stocks traded refers to the total value of shares traded during the period. Data are in current local currency.

Stock Market Capitalization: Market capitalization (also known as market value) is the share price times the number of shares outstanding. Listed domestic companies refer to the number of domestically incorporated companies listed on the country's stock exchanges at the end of the year. Data are in current local currency.

Table 12: List of countries

AUS	Australia	ISL	Iceland
AUT	Austria	ITA	Italy
BEL	Belgium	JPN	Japan
CAN	Canada	KOR	Korea, Rep.
CHE	Switzerland	NLD	Netherlands
CHL	Chile	NOR	Norway
DEU	Germany	NZL	New Zealand
DNK	Denmark	PRT	Portugal
ESP	Spain	SGP	Singapore
FIN	Finland	SWE	Sweden
GBR	United Kingdom	THA	Thailand
GRC	Greece	USA	United States
HUN	Hungary	ZAF	South Africa

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