Contractual Savings, Stock and Asset Markets

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ABSTRACT

This paper analyzes the relationship between the development of contractual savings (pension funds and life insurance) and stock and asset markets. We sketch a three-asset model explaining how the contractual savings sector promotes financial development and what is the impact on asset markets equilibrium. We use panel data for some OECD and developing countries to test the validity of our propositions. We find that institutional investors such as contractual savings institutions and non-life insurance are very effective at developing stock markets. Because of their long-term liabilities, contractual savings portfolios are skewed towards stocks and long term bonds.

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I. Introduction

Contractual savings assets (pension funds and life insurance companies) have become an important component in total financial assets in developed and in some developing countries. Figure 1 shows that contractual savings became the dominant financial asset in several countries, representing 50 percent or more of the system financial assets in 1996.[1] It is remarkable that three developing countries belong to this exclusive club, i.e., South Africa, Chile, and Singapore..[2]

The development of contractual savings can have a profound impact, both direct and indirect, on the development of financial markets. On the one hand, the direct impact is related to the change in the composition of the supply of funds in the economy: the relative supply of long-term funds increases and this is reflected in an increase in the demand for capital market instruments. Accordingly, the development of contractual savings promotes depth and liquidity in capital markets, and it improves the financial structure of enterprises and governments by increasing the equity to debt ratios and by lengthening the maturity of debt. On the other hand, the indirect impact of contractual savings development is related to increased financial innovation and positive spillovers for other financial intermediaries and the corporate sector.

Pension reform that favors funding is considered to be one of the policy options available to policy-makers in order to develop the contractual savings sector, especially in developing countries. General interest in contractual savings development and their potential effects in the economy, is evident by the extensive literature on the macroeconomic role of pension funds which has developed. The debate on the benefits of pension reforms has been enriching and intensifying in recent years.[3]

The literature on the effect of pension reform on the household savings rate is, however, not conclusive. The effect, if any, is considered to be rather small. 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 household savings. This is confirmed by the extensive literature available on the inelasticity of savings to the real interest rate. On the other hand, either myopia or liquidity constraints explain why pension reforms based on mandatory contributions could increase the household savings rate. Liquidity constraints are assumed to affect

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[1] Defined as the aggregation of money, quasi-money and contractual savings assets. Money and quasi-money are liabilities of the consolidated banking system, which are liquid financial assets to the household sector. Clearly, contractual savings institutions financial assets belong to the household sector. Of course, there is some double counting since assets of contractual savings institutions include cash and bank deposits.

[2] The relative size of life insurance and pension funds varies considerably across countries. Life insurance dominates the contractual savings sector in France, Turkey, Sweden, Korea, Norway, Japan, and South Africa while pension funds dominate in Canada, The Netherlands, Chile, United States, Malaysia and Singapore. Countries with balanced shares of life and pension funds are Thailand, United Kingdom, Australia, New Zealand, Portugal, and Switzerland.

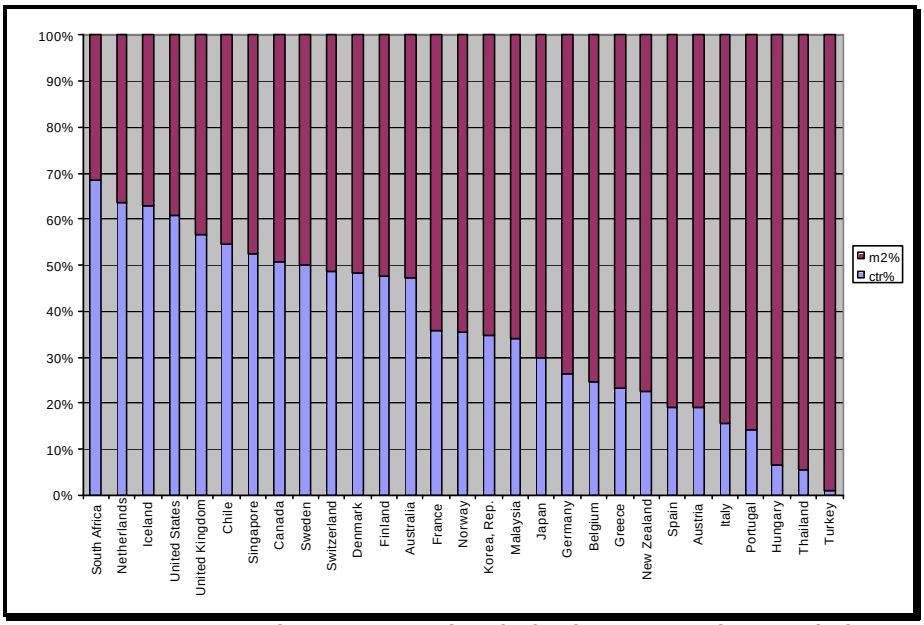
[3] See, for example, Holzmann (1997), Arrau and Schmidt-Hebbel (1993), Feldstein (1974, 1996), Mackenzie, Gerson and Cuevas (1997), Schmidt-Hebbel (1998).

young or low-income individuals who cannot borrow to consume and offset the compulsory savings.[4]

In any case, even if households saving increase, it is difficult to assess whether such an increase is reflected at the national level. This may be due to at least two factors: 1) it is difficult to say whether household savings is or is not offset by government's response, either as a consequence of tax concession or transitional costs of pension reform; and 2) it is difficult to estimate whether at a company level, saving through pension funds is not offset by dissaving elsewhere.[5] Accordingly, capital markets development is pointed out as one of the main potential consequences of contractual savings development.[6]

The purpose of this paper is to analyze the effects of contractual savings and non-life insurance on asset markets, and particularly on stock markets. The focus is on macroeconomics and financial effects of contractual savings development thus, emphasizing the role of pension funds, and life and non-life insurance companies as financial intermediaries. This paper is mainly an empirical study. The evidence of the relationship between contractual savings, non-life insurance and stock markets development is presented for some OECD and developing countries. Finally, we explain how the development of the contractual savings sector promotes financial sector development and economic growth, and mitigates social and financial risks.

Figure 1: Contractual savings in country financial assets (%, 1996)



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

[4] 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).

[5] See Davis (1995).

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

The paper is structured in the following way: Section II discusses the role of contractual savings and the effect of their development on the financial sector, risk management and growth; Section III presents a three-asset model explaining the impact of contractual savings and non-life insurance development on asset market equilibrium; Section IV presents the empirical analysis of the effect of contractual savings and non-life insurance on stock markets using unbalanced panel data for 26 countries. Conclusions and recommendations follow in Section V.

II. The role of contractual savings

Contractual savings intermediaries are institutional investors through which assets are accumulated to provide advanced funding for pension (annuity), unemployment, gratuity, end-of-service indemnity and life insurance benefits. There are also schemes tailored for saving for the down payment of a house, education, weddings, funerals, etc.[7]

Individuals hold financial assets either directly or indirectly through institutional investors that are more efficient at pooling and diversifying risk, managing assets, and processing information. Thus, these institutions fulfill important functions in the financial system, and when they develop, the share of individual wealth held indirectly through institutional investors tends to increase.

The direct impact on capital markets of contractual savings development is related to the different behavior of these institutions from the personal sector yielding a different demand for capital market instruments. In general, contractual savings instruments are illiquid assets in asset-holders' portfolios. These funds are usually available to them only upon the occurrence of particular events (e.g., retirement, death, or disability). Accordingly, some contractual savings institutions (e.g., life insurance, close-end pension plans) and closed-end mutual funds usually adopt long term investment strategies and hold fewer liquid assets in their portfolios than banks and other institutional investors (e.g., non-life insurance, open-end mutual and pension plans). The development of contractual savings could also encourage expansion of banks' long term lending by funding this activity through placements of long term liabilities with contractual savings institutions.

Advanced funding of pension liabilities is a major determinant of contractual savings development and countries around the world are rapidly reforming their pension systems because of progressive aging of societies. The trends that emerge from these reforms are more: 1) funding of current liabilities; 2) private management of assets; 3) defined contribution schemes; and 4) individual responsibility and choice. Life insurance companies develop in parallel with pension funds as annuity providers and as voluntary means to save for the longer run either for retirement, to protect survivors or for precautionary reasons. This industry is especially developed in countries where family networks are weak and per capita income is high.

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[7] For example, due to regulatory arbitrage, in the Philippines, these schemes are provided by specialized intermediaries called pre-need companies.

In this section we discuss, in turn, the impact of contractual savings development on capital markets, their role in mitigating social and financial risks, their impact on economic growth, and the international evidence about portfolio distribution of pension, life and non-life insurance companies.

Contractual savings and capital markets development

The development of contractual savings increases depth and liquidity in stock and bond markets, particularly in long-term bonds. It also fosters financial innovation, competition, efficiency, and it improves regulations, transparency, and corporate governance.

Increased market depth and liquidity.

The development of contractual savings increases the demand for shares and the level of professional fund management, hence, it increases market capitalization, and the value traded both relative to GDP. This can be explained because, for a given stock of assets (and constant saving rate), an increase in contractual savings increases the institutional demand for securities. In addition, since contractual savings are illiquid assets in wealth-holders' portfolios, their development is likely to prompt agents to re-balance their portfolios in order to restore desired levels of liquidity. Thus, asset-holders reduce holdings of illiquid assets they control (e.g., real estate, non-traded financial instruments such as loans and non-negotiable term deposits) in favor of liquid assets (cash, short term deposits and traded financial assets such as bonds and shares). Accordingly, the behavior of wealth-holders is likely to reinforce the demand of contractual savings institutions for market based instruments (traded securities). The result is an increase in financial intermediation relative to GDP, particularly through securities markets.

Contractual savings institutions such as life insurance, closed-end pension plans, and closed-end mutual funds, have the strongest impact on financial markets and supply of long-term funds. This is because plan members cannot run on these institutions and withdraw their funds.

A special case is the development of open-end pension plans. In a system of mandatory pension plans, the industry as a whole is not susceptible to the systemic risks of runs. However, individual pension fund managers are still susceptible to runs, while individual administrators of voluntary plans would be prone to systemic runs just as open-end mutual funds are. Yet, transaction costs may be higher for withdrawals from voluntary pension plans since they are usually associated with tax penalties. Hence, we should expect that these institutions maintain more liquid assets in their portfolios relative to the portfolios of life insurance companies and closed-end pension and mutual funds.

Another factor that determines the impact on capital markets is the accessibility of members to funds before maturity. Some plans offer their members access to funds in special circumstances (e.g., purchase of a home, wedding, education), either through borrowing or withdrawals. This feature introduces some liquidity in contractual savings schemes and reduces the need for wealth-holders to rebalance their own portfolios to

attain the desired level of liquidity. Hence, this weakens the impact of the development of these plans on capital markets.

The development of non-life insurance is likely to have a weaker effect on market capitalization. The positive impact on capital markets of non-life insurance companies' investment policies is likely to be offset (partially, completely, or in excess) by wealth-holders' portfolio decisions. This is because the availability of insurance may reduce wealth-holders' desire to hold liquid assets to cover for contingencies.

Regarding open-end mutual funds, wealth-holders' investments in securities through collective investment vehicles are substitutes for individual portfolios. Furthermore, to the extent that mutual funds portfolio could be more liquid than those held by individuals, the development of mutual funds could well trigger a re-balancing effect that more than offsets mutual funds demand for market securities. Finally, an additional effect to consider is that by improving the quality of information disclosure, fostering financial innovation and competition, increasing marketing and reducing transaction costs, the development of institutional investors encourages wealth-holders to increase the demand for market based instruments.[8]

Innovation, competition and efficiency

Contractual savings development can also be beneficial to product innovation in capital markets by stimulating the use of hedging strategies and derivatives. The enforcement of minimum funding requirements for defined benefit pension plans in the United States, United Kingdom and elsewhere was key in developing immunization techniques and new financial instruments such as zero-coupon bonds, CPI-indexed bonds, collateralized mortgage obligations, as well as index options and futures.[9]

Contractual savings institutions create opportunities for the modernization of securities markets, the development of efficient trading and settlement systems, the adoption of modern accounting, actuarial, auditing and disclosure standards, including the promotion of quality information, and improvement in market infrastructure (e.g., in emerging markets the surge in credit rating agencies). Competition and efficiency in capital markets is furthered through an increased level of professional specialization and the promotion of free entry. For example, contractual savings institutions were instrumental in breaking the cartel of a few investment banks, which dominated the corporate bond market in the United States and operated under rigid hierarchical structures in syndicated issues. Contractual savings institutions had a key role in introducing competitive bidding for corporate issues, abolishing minimum commissions on equity trading and restructuring stock exchanges.[10] Finally, the participation of these institutions in the market induces reduction in transaction costs as new technology is incorporated to handle a larger volume of trade.

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[8] For empirical evidence on causality between institutional investors and stock markets see Catalan, Impavido and Musalem (2000). For a model of firms' information disclosure and the development institutional investors, see Impavido (1998).

[9] See Bodie (1990a), Davis (1995).

[10] See Vittas (1998a) and Chernow (1990).

Regulations

Contractual savings development also promotes improvements in capital market regulation, especially regarding protection of minority shareholders rights, protection against insider information, and conflict of interest. Additionally, in emerging markets, these institutions have active dialogue with regulators aimed at developing a dynamic regulatory framework. For example, in Chile and Brazil, closed-end mutual funds were authorized to allow pension funds investment in the real estate and venture capital sectors.

Corporate governance.

Finally, the development of contractual savings institutions improves corporate governance. These institutions monitor the companies they invest in and press for improved governance, when appropriate, to ensure that investments produce the highest possible returns. In general, the governance issues they are mostly concerned with are: board independence, executive compensation, and anti-takeover devices. Contractual savings institutions seek that a company's board consist of a substantial majority of independent directors; and that its audit, compensation and nominating committees be composed entirely of independent directors.[11] For example, if the board of a company does not have a majority of independent directors, important decisions on executive compensation, management succession, contest for corporate control and major lawsuits may not be made in the best interests of shareholders. Pension funds also require companies to base executive compensation on a "pay for performance" system, and to provide full and clear disclosure of all significant compensation arrangements. In addition, they usually require that a company's board obtain shareholder approval for actions that could alter the fundamental relationship between shareholders and the board, including any "anti-takeover" measures.[12]

The monitoring of corporate practices and policies often involves developing several corporate performance indicators and taking action on significant deviations from the average performance.[13] The actions can ultimately lead to filing proxy resolutions. However, some institutional investors prefer to first seek changes in companies' practices and policies through constructive dialogue.

Finally, with the intensification of cross-border investments, pension funds end up owning shares of companies in foreign countries. In order to perform monitoring of companies in foreign jurisdictions, pension funds often enter into agreements with "sister" funds in the foreign jurisdiction where they share interests and ask them to perform direct monitoring of companies in this country on their behalf.

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[11] Independent means that the directors do not have significant personal ties, current or past, the companies or its managers.

[12] For further information on corporate governance issues see Monks and Minow (1995).

[13] For example, TIAA-CREF (one of the largest private pension fund in the world) has developed a corporate assessment program to monitor and evaluate the corporate practices and policies of the U.S. companies in its portfolio. It follows 27 corporate indicators to evaluate conformity of each company to good governance practice. These indicators are given weightings, that, when combined, create an average "score" measuring each company's adherence to good governance.

Mitigation of social and financial risks

The primary objective of contractual savings development is the improvement of beneficiaries' management of longevity, death, and other risks. Enterprises and households make use of insurance and pension products to minimize the risk of severe loss from a variety of risks such as death, disability, longevity, or natural disasters. Accordingly, contractual savings instruments protect the insured and their families from falling into poverty. However, the pursuit of this objective generates important positive effects in management of financial risks. The main effects are reduction in: i) portfolio concentration risks; ii) governments' and enterprises' credit risks; iii) debtors' refinancing risks; iv) banks' term transformation risks; v) enterprises' vulnerability to interest rate and demand shocks; and vi) financial markets volatility. Therefore, contractual savings development is a win-win situation since it mitigates social as well as financial risks.

Portfolio concentration risk

By maximizing risk adjusted returns on a large pool of funds, contractual savings institutions tend to have more diversified portfolios than individuals. This includes more investments in foreign securities from markets with low or negative correlation to the performance of the domestic securities market. This function allows individuals to efficiently achieve portfolio risk diversification.

Credit risks

By advancing funding of future contingent liabilities, contractual savings reduce moral hazards and government debt that would result from explicit or implicit guarantees extended to different plans. Thus, increased funding should improve the solvency of enterprises and governments, and therefore, it should reduce their credit risks.

Refinancing risks

By lengthening the maturity of debt, contractual savings reduce borrowers' refinancing risks. For example, the 1997 East Asia financial crisis was, in part, due to excessive reliance on the part of enterprises on short-term credit as opposed to long term.[14] This exposed them to refinancing risks (requiring frequent rollover of their entire stock of debt). Also, the short term average maturity of Mexico's public debt exacerbated the 1995 peso crisis. The increased supply of long-term funds that would have resulted from a developed contractual savings sector would have reduced the exposure of enterprises and governments to this type of risk.[15]

Term transformation risks

The role of contractual savings in reducing risks associated with term transformation is related to the impact of contractual savings development on banks'

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[14] See, for example, Pomerleano (1998).

[15] On these issues see: Elias, Impavido and Musalem (2000), and Impavido, Musalem and Tressel (2000).

activity. On the one hand, banks mobilize primarily short-term deposits and they take term transformation risks by lending part of their portfolios long term. The risk is higher in countries with weak banking systems. In these countries, banks are subject to higher probabilities of runs, which, in turn, could trigger their bankruptcy. On the other hand, contractual savings institutions that have long-term liabilities are better positioned to lend long term. Since their liabilities are less liquid than bank deposits, the risk premium demanded for engaging in long-term lending should be lower than what would be asked by banks. In other words, contractual savings are likely to charge lower long-term interest rates for the same credit risk.

With the development of contractual savings, banks are likely to reduce their exposure to term transformation risks. This could happen in two ways: i) bank portfolios could be biased towards short-term loans, while contractual savings institution portfolios could be biased towards long-term and risky assets, and ii) complementarity between contractual savings and banks would also allow banks to provide more term financing by funding it through the placement of securities in the market. These securities could be bought, for instance, by contractual savings institutions.

The different specialization along the duration dimension of investment projects supports the view, confirmed in the literature, that contractual savings and other financial intermediaries supplying liquid assets are complementary rather than substitute institutions. Available studies on the effect of stock market development on debt-equity ratios found that at low initial levels of stock market development, the development of stock markets increases the debt-equity ratios of the real sector implying that the banking sector expands. For high initial levels of stock market development, further development produces a reduction in the debt-equity ratios. In this later stage of development, an increasing number of larger and/or more mature firms find it optimal to raise equity funding through the stock market, so that the relative importance of bank financing decreases.[16]

Vulnerability to interest rate and demand shocks

Corporate financial structures with excessive leverage (low equity/debt ratio) expose firms to interest rates and demand shocks. Either of these shocks increases debt services relative to revenues in a material way which could worsen enterprises' liquidity, and ultimately, could trigger their bankruptcies. Again, the 1997 East Asia financial crisis was also due, in part, to an excessively leveraged enterprise sector. By increasing the demand for equity, contractual savings can improve the financial structure of enterprises (through higher equity to debt ratio), allowing them to better withstand interest rates and demand shocks.[17]

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16 See Demirgüç-Kunt and Maksimovic (1996), and Demirgüç-Kunt and Levine (1996).

17 On this issue see Impavido, Musalem and Tressel (2000).

Financial markets volatility

Contractual savings institutions have come under criticism for allegedly causing greater market volatility.[18] However, because institutional investors trade more actively, they demand the highest quality of information and analysis possible. This implies that prices tend to converge to fundamental values and that small deviations from these values tend to cause large volume of trade. Furthermore, the participation of institutional investors in the market increases liquidity and lowers volatility. A recent study[19] confirms that contractual savings increase liquidity in equity markets (leads value traded) in a significant number of OECD countries. The same study shows that in a sample of non-OECD countries pension funds do not seem to add liquidity while life insurance and non-life insurance do. Finally, as shown below, contractual savings institutions hold relatively more illiquid portfolios than individuals do because of either pure portfolio allocation strategy or regulatory constraints. This implies that these institutional investors are less likely to engage in substantial portfolio shifts, thereby, contributing to the reduction of financial markets vulnerability.

Economic resilience

By increasing the proportion of long-term funds in the economy, the development of contractual savings promotes the development of financial markets and overall risk management, as discussed above. Therefore, it promotes the development of a more resilient economy, one that would be less vulnerable to interest rate and demand shocks, and it favors the establishment of a more stable macroeconomic and business environment. Accordingly, the country risk premium and the level of domestic interest rates should fall.

Contractual savings and growth

The development of contractual savings promotes growth through several channels: i) potential increase in the national saving rate; ii) development of capital markets; iii) flattened term structure of interest rates; iv) reduction in the country risk premium; v) efficiency gains; vi) improved international allocation of capital; and vii) higher growth induces an increase in saving which further growth.

We already discussed, in the introductory section, the potential positive effect on savings, which, if ever substantial in practice, is likely to increase investment, thus accelerating growth. The increase in market capitalization associated with the development of contractual savings, as it will be seen later, is likely to shift the asset market equilibrium in the economy, generating a lower cost of both equity and debt finance. This is consistent with the decline in the country risk premium. Accordingly, both investment and economic growth are likely to increase. Also, the development of contractual savings translates into an increased supply of long-term finance, which in turn, causes the long-term interest rate to fall relative to the short-term rate. Given that the expected return on long-term investment projects is higher than the returns on short-term investments, a higher economic growth rate should be observed. Also, the

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[18] See Blommestein (1997), Iglesias (1998), and Vittas (1998a).

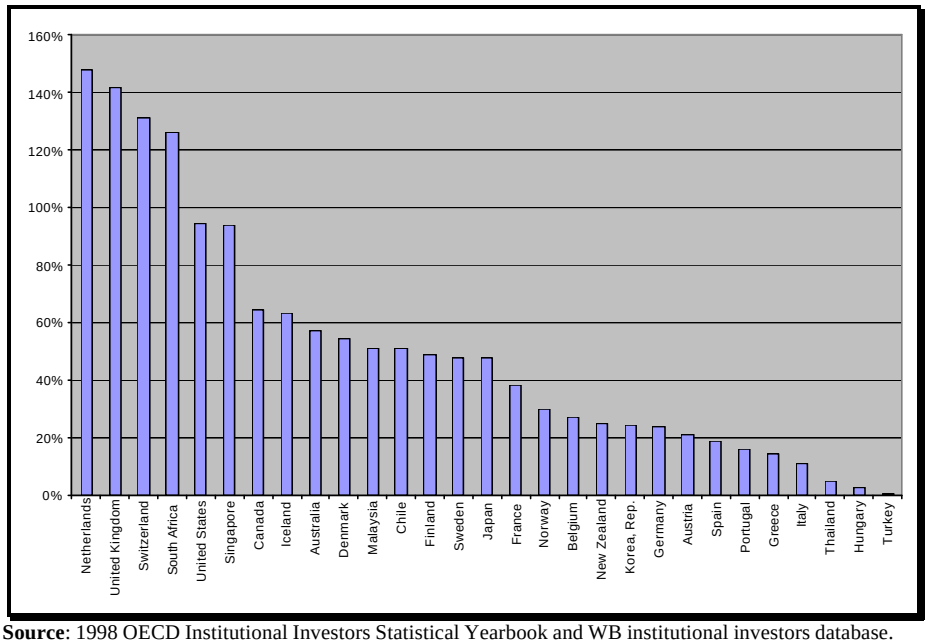
[19] See Catalan, Impavido and Musalem (2000).

efficiency gains resulting from financial innovation and improvement in corporate governance associated with contractual savings development are likely to foster growth. In addition, while maximizing the risk adjusted rate of returns on managed funds, contractual savings institutions diversify their portfolio internationally, thus improving the allocation of capital on a global level, which, in turn, may favor growth in developing economies. Finally, faster growth, inducing a higher savings rate, would further promote growth in a virtuous cycle.[20]

The international evidence

We now turn to study the behavior of contractual savings and non-life insurance institutions' portfolios in some OECD and developing countries. Figure 2 shows the importance of contractual savings around the world in terms of financial assets over GDP in 1996. In countries with long time reformed pension systems and important national provident funds, contractual savings have accumulated large amounts of financial assets (some of them higher than 100 percent of GDP). In countries that have not yet or have recently reformed their pension system, contractual savings are less developed. In addition, in countries where enterprises carry important book reserves on their balance sheets against liabilities resulting from mandated or promised benefits to workers, have not developed their contractual savings sector (e.g., Germany, Italy, Austria, Korea) as countries of comparable level of economic development have.

Figure 2: Contractual savings financial assets (GDP %, 1996)



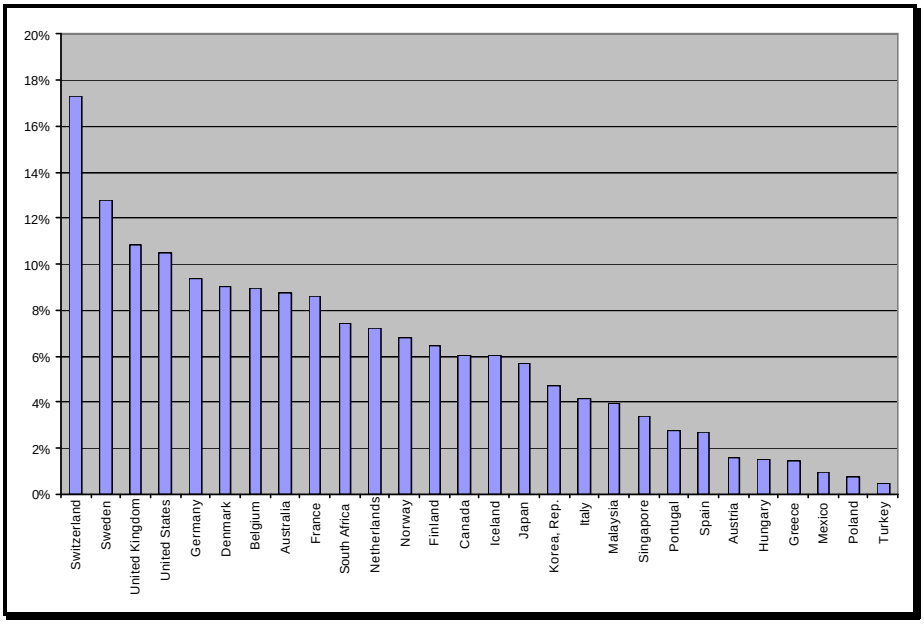
Source: 1998 OECD Institutional Investors Statistical Yearbook and WB institutional investors database.

Other institutional investors, like non-life insurance companies, mobilize a considerably smaller volume of savings. Figure 3 shows that even in countries with

[20] For discussions on the impact of capital market development on growth see, for example, Levine and Zervos (1996), and Levine (1997).

developed financial markets, the financial assets of these institutions are not more than 18 percent of GDP, while in countries with less developed financial markets, such as Greece, Italy, Turkey, and Hungary, non-life insurance financial assets represent less than 5 percent of GDP in 1996.

Figure 3: Non-life insurance financial assets (GDP %, 1996)



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

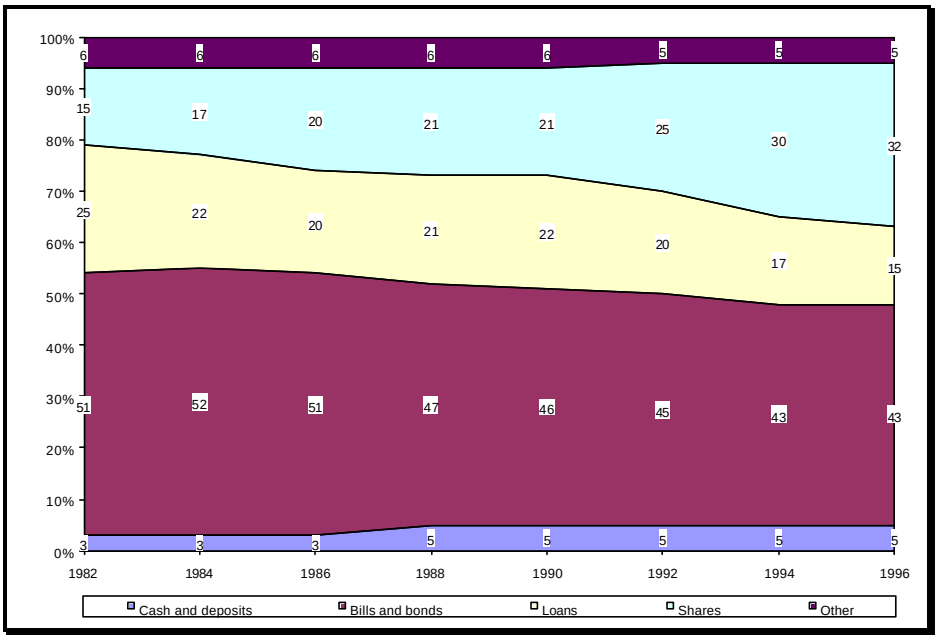
Table 1 shows how the vast majority of personal sector financial assets, across selected countries in 1990, is held in liquid financial assets like cash and deposits. Instead, Figure 4 shows that contractual savings tend to hold a smaller share of financial assets in cash and deposits and a larger share of these assets in stocks, loans, and bonds. Notice how during the 1982-96 period, cash and deposits never exceeded 6 percent of total financial assets. Bills and bonds decreased from about 50 percent to about 43 percent, and shares increased from about 15 percent to around 30 percent at the expense of loans, bills and bonds. It is important to note that loans, which are illiquid financial assets, have declined their participation from about 25 percent in the early period to about 15 in the latter.

Table 1: Asset structure of personal sector, 1990

% of total assets	Equity	Bonds	Loans	Cash and deposits	Contr. Savings
Japan	13	5	0	53	23
France	34	3	0	51	12
Italy	22	18	0	49	12
Germany	6	18	0	48	22
Canada	21	6	2	39	28
Australia	17	13	0	34	36
US	19	10	1	30	33
UK	12	4	0	29	47
Netherlands	6	8	0	29	54

Source: Davis 1995.

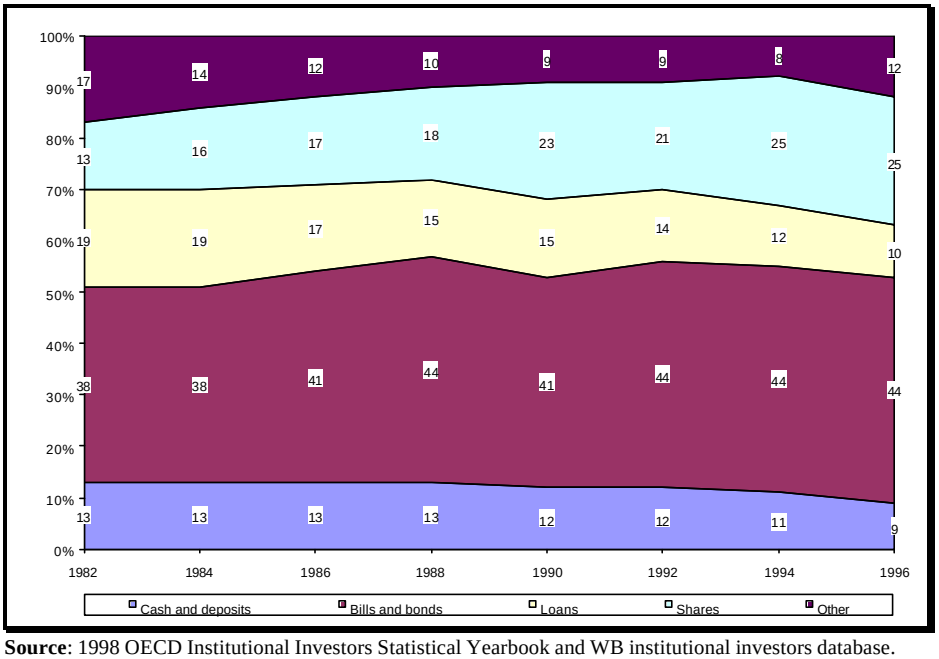
Figure 4: Contractual savings portfolio distribution (%)



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

Non-life insurance companies hold a much larger proportion of liquid financial assets (more cash and deposits and a lower proportion of illiquid loans), as shown in Figure 5.

Figure 5: Non-life insurance portfolio distribution (%)



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

It is important to show the difference in portfolio allocation between countries with common law legal origin and countries with other legal origins. Figure 6 shows the

portfolio distribution of contractual savings for countries with common law legal origin.[21] In 1996, stocks represented 43 percent of total portfolios, bills and bonds 40 percent and loans only 4 percent. Since 1982, the proportion of stocks has more than doubled, the proportion of loans has halved, and the proportion of bills and bonds has decreased by more than one third.

In countries with a non-common law legal origin (Figure 7), contractual savings tend to hold a larger proportion of loans and cash and deposits in their portfolios and a lower proportion of shares, bills and bonds as shown in the next figure. In general, countries whose legal system is based on common law invest primarily in liquid market based instruments (bills, bonds and shares), while countries with other legal systems invest a significant share of their portfolios in illiquid or non-market based instruments (e.g., loans).[22]

A marked difference in portfolio distribution exists also between OECD and non-OECD countries. While contractual savings institutions in OECD countries have an equal share of stocks and bonds in their portfolio (Figure 8), contractual savings institutions in non-OECD countries (Figure 9) have a lower share of stocks (although rapidly increasing) and a much higher share of bonds in their portfolios. In particular, contractual savings institutions in OECD countries tend to invest a larger share of their portfolios in loans and a smaller share in cash and deposits than contractual savings institutions in non-OECD countries.

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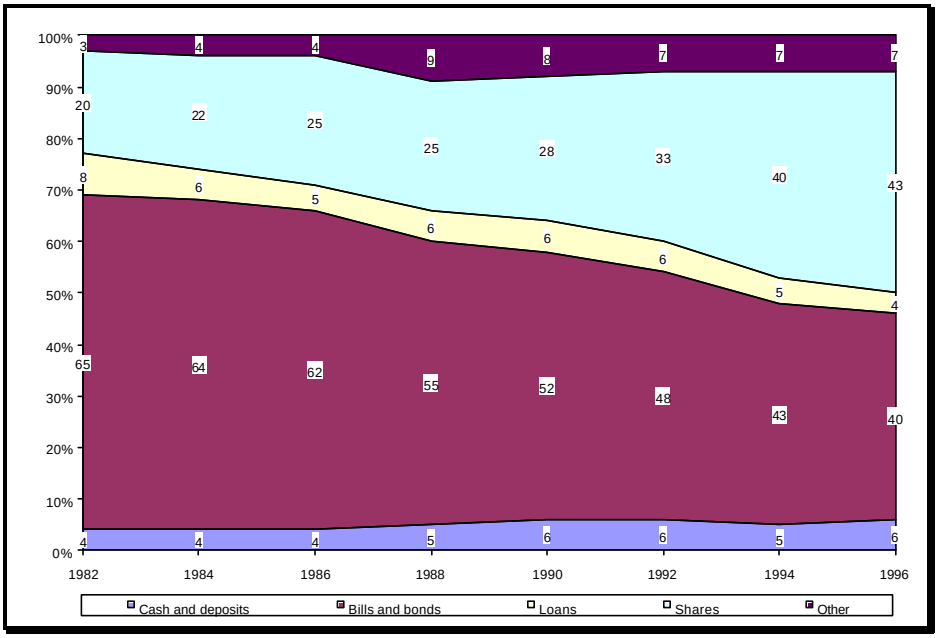
[21] These are: Australia, Canada, UK, Ireland, Malaysia, New Zealand, Singapore, Thailand, USA, and South Africa. Notice that the national provident fund in Singapore cannot invest in stocks by law. Hence, the figure for the share of stocks in contractual savings portfolio would be higher if we were to exclude it from the sample.

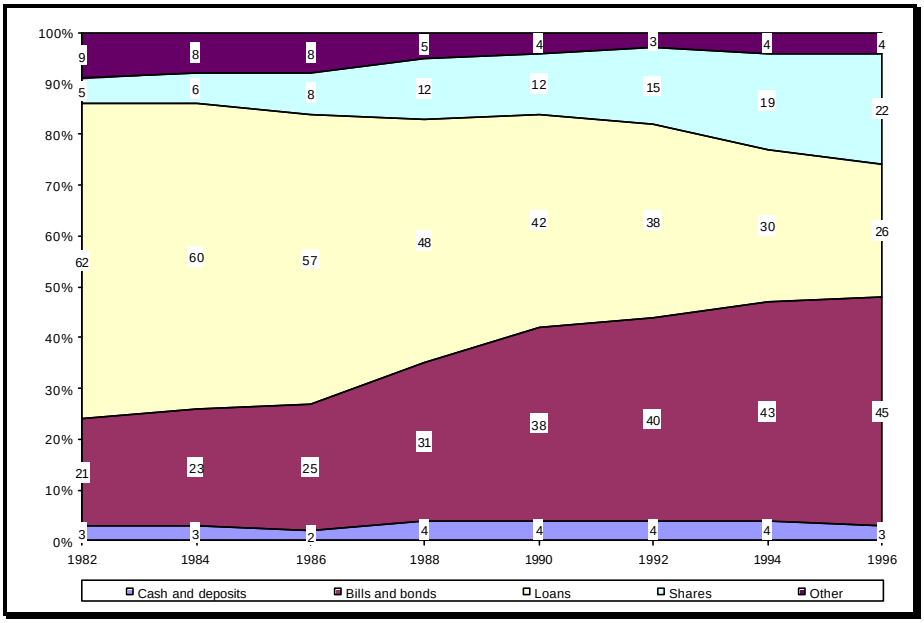
[22] Since La Porta, Lopez-de-Silanes, Shleifer, Vishny (1997), many studies have stressed the differences between countries with Common Law and Civil Law legal origins.

Figure 6: Contractual savings portfolio distribution (%, common law countries)



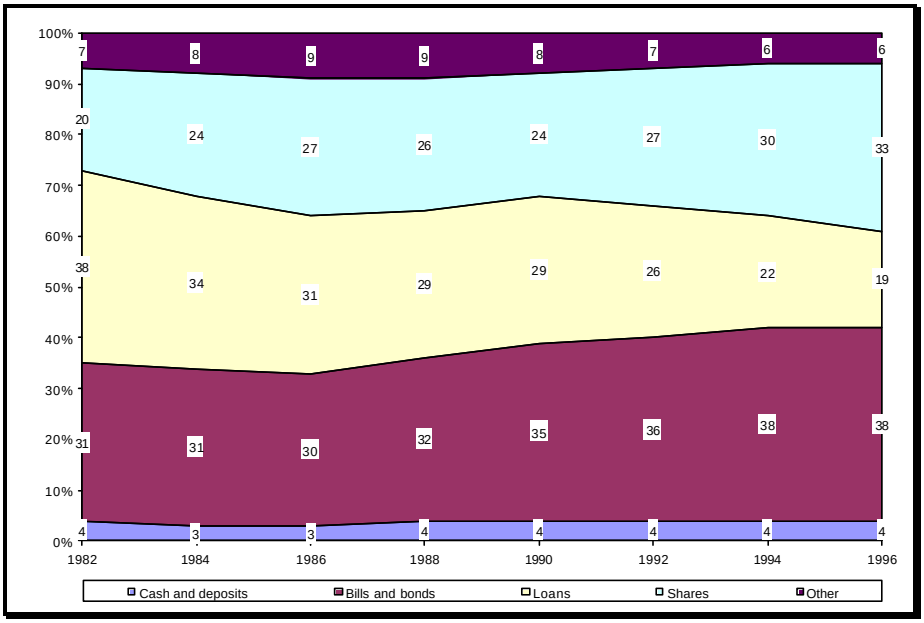
Source: 1998 OECD Institutional Investors Statistical Yearbook and WB institutional investors database.

Figure 7: Contractual savings portfolio distribution (%, non-common law countries)



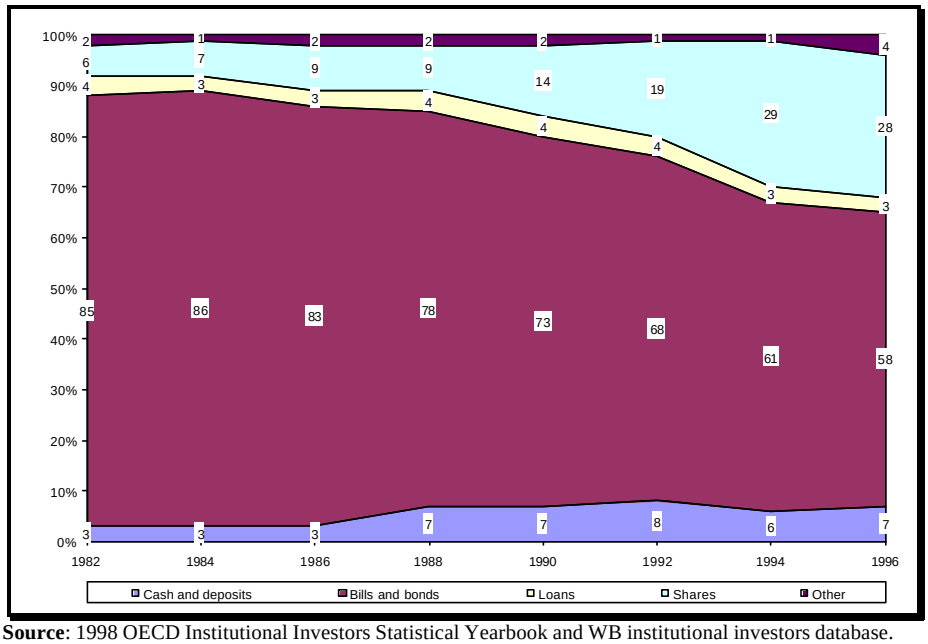
Source: 1998 OECD Institutional Investors Statistical Yearbook and WB institutional investors database.

Figure 8: Contractual savings portfolio distribution (OECD countries)



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

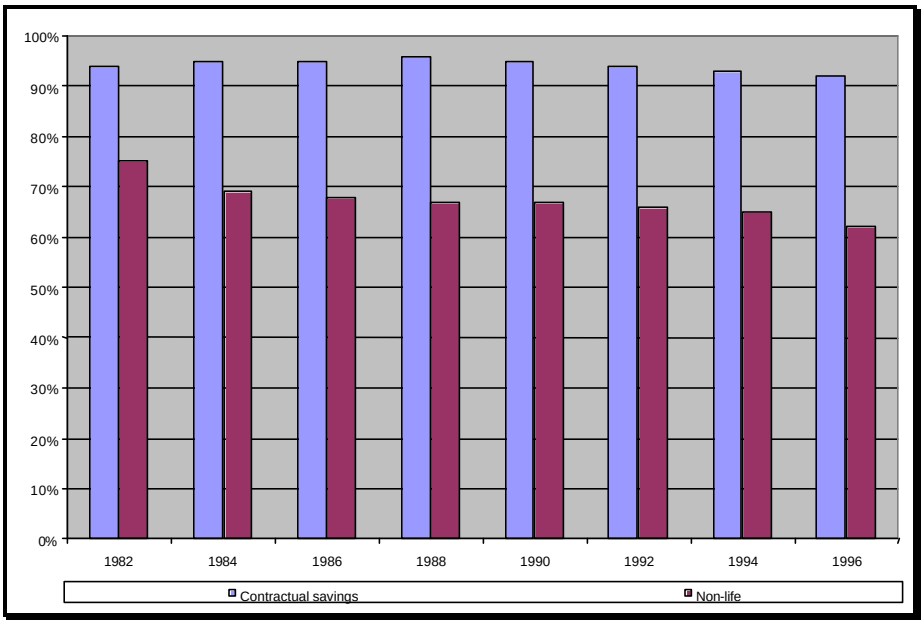
Figure 9: Contractual savings portfolio distribution (non-OECD countries)



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

In general, not only is the portfolio distribution of contractual savings more skewed towards assets such as stocks and bonds, it is also more skewed towards long-term assets. For instance, Figure 10 shows how the share of short term loans in non-life insurance companies' portfolios increased from about 25 percent to almost 40 percent between 1982 and 1996, while for contractual savings it remained well below 10 percent.

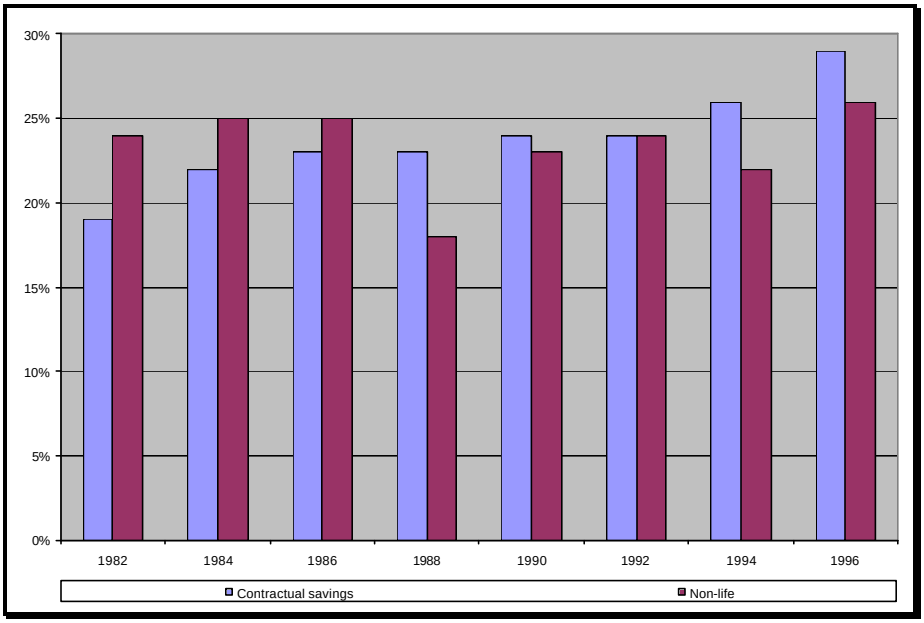
Figure 10: Long-term loan holdings (% loan portfolio)



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

And finally, contractual savings institutions are also increasingly diversifying risk abroad as shown in the next figure while the same cannot be said with certainty for non-life insurance companies.

Figure 11: Foreign shares holdings (% loan portfolio)



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

In summary, factual evidence based on the data collected shows several differences between contractual savings and non-life insurance companies. Contractual savings can be important institutions in the financial sectors of developed and developing

economies alike as their financial assets represent a large proportion of individuals' wealth. Their assets largely exceed the assets of other institutional investors such as non-life insurance companies. Because of their liability structure, contractual savings hold a larger proportion of equity and long-term assets than individual investors and other institutional investors e.g., non-life insurance companies. Hence, contractual savings represents an important channel for mobilizing individual savings in the economy. These savings are invested in long-term, high-return, and riskier assets, which, in turn, promotes the development of capital markets.

III. The model

In this section we present a three-asset model to analyze the effect of the development of contractual savings and non-life insurance companies on stock markets and the equilibrium rate of returns in asset markets.

In the economy, there are three asset markets: the money market, the quasi-money market, and the stock market. Households hold in their portfolio non-interest bearing money (currency and non-remunerated deposits), interest bearing money or quasi-money (remunerated bank deposits, bills, bonds), and shares of firms. They hold them either directly in individual portfolios or indirectly through contractual savings institutions and other institutional investors. We assume that: 1) the three assets (money, quasi-money and stocks) are substitutes; 2) the real rate of returns have the strongest effect on their own asset demand; and 3) the supplies of the three assets in the economy are exogenous or given.

The money market equilibrium

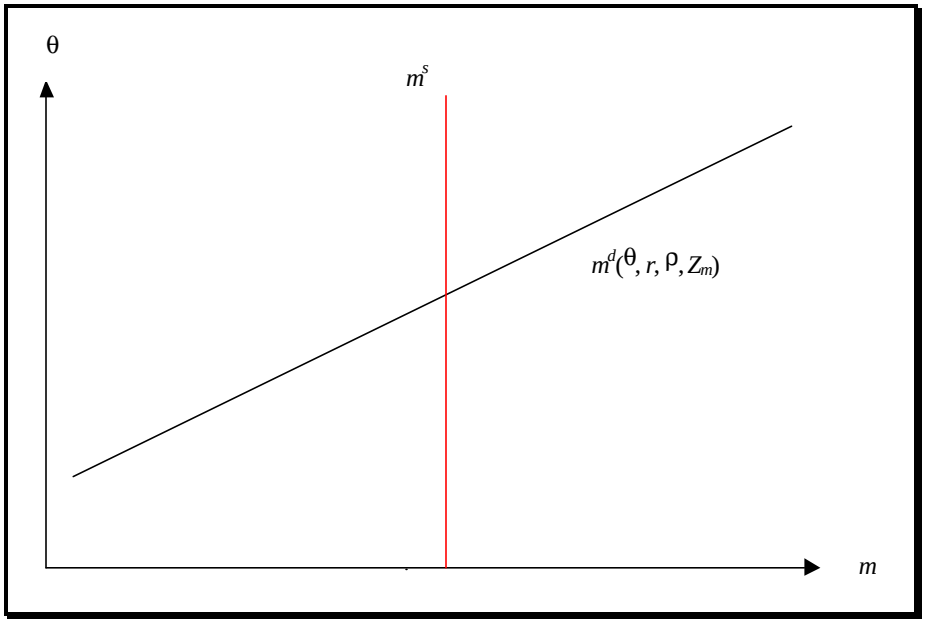
In the money market, the money supply as a ratio to GDP ($\frac{M^s}{Y} = m^s$) is exogenous, whilst the money demand as a share to GDP ($\frac{M^d}{Y} = m^d$) is a positive function of the real rate of return on money (θ), a negative function of the real rate of return on stocks (ρ), a negative function of the real rate of return on quasi-money (r), and a function of a vector (Z_m) of exogenous variables that will be specified later. In equilibrium $m^d = m^s$ and for given all exogenous variables, ρ, and r, the money market determines the real rate of return on money θ. Where $\theta = \frac{1}{1+\pi} - 1$ and p is the rate of inflation.

The money market equilibrium is given by the following

$$\begin{cases} \dfrac{M^s}{Y} = m^s \\ \dfrac{M^d}{Y} = m^d(\theta, r, \rho, Z_m) \\ \dfrac{M^s}{Y} = \dfrac{M^d}{Y} \end{cases}$$

and it is represented in Figure 12 where demand intersects supply. Along the demand curve, wealth-holders demand higher real rate of returns of money θ (or lower inflation rates) in order to hold increasing stocks of money relative to GDP. If the real rate of return on money θ were higher than the rate at which asset holders are willing to hold the existing amount of money relative to GDP, then equilibrium would be restored through an increase in the real rate of returns on financial assets, *r* and ρ, thus prompting asset holders to hold the same amount of money relative to GDP at a higher real rate of return on money θ.

Figure 12: Money market equilibrium



The quasi-money market equilibrium

In the quasi-money market, the quasi-money supply as a ratio to GDP ($\frac{QM^s}{Y} = qm^s$) is exogenous, whilst the quasi-money demand as a share to GDP ($\frac{QM^d}{Y} = qm^d$) is a positive function of the real rate of return on quasi-money (*r*), a negative function of the real rate of return on stocks (ρ), a negative function of the real rate of return on money (θ), and a function of a vector (Z_{qm}) of exogenous variables that

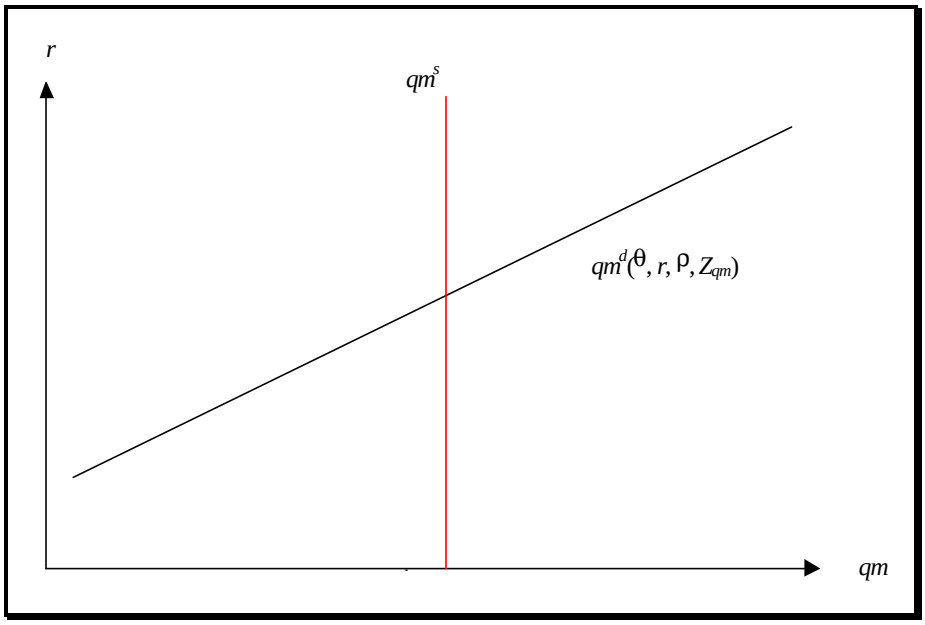
will be specified later. In equilibrium $qm^d = qm^s$ and for given all exogenous variables, ρ, and θ, the quasi-money market determines the real rate of return on quasi-money *r*.

The quasi-money market equilibrium is given by the following

$$\begin{cases} \dfrac{QM^s}{Y} = qm^s \\ \dfrac{QM^d}{Y} = qm^d(\theta, r, \rho, Z_{qm}) \\ \dfrac{QM^s}{Y} = \dfrac{QM^d}{Y} \end{cases}$$

and it is represented in Figure 13 where demand intersects supply. Along the demand curve, wealth-holders hold increasing stocks of quasi-money relative to GDP at higher real rate of returns on quasi-money *r*. If the real rate of return on quasi-money *r* is higher than the equilibrium rate at which asset holders would be willing to hold the given stock then the real rate of return on stocks ρ and the real rate of return on money θ would have to be higher for asset holders to be satisfied in holding the given stock of quasi money at a higher real rate of return on quasi-money *r*.

Figure 13: Quasi-money market equilibrium



The stock market equilibrium

In the stock market, the supply of market capitalization as a ratio to GDP ($\frac{MC^s}{Y} = mc^s$) is exogenous, whilst the market capitalization demand as a share to GDP

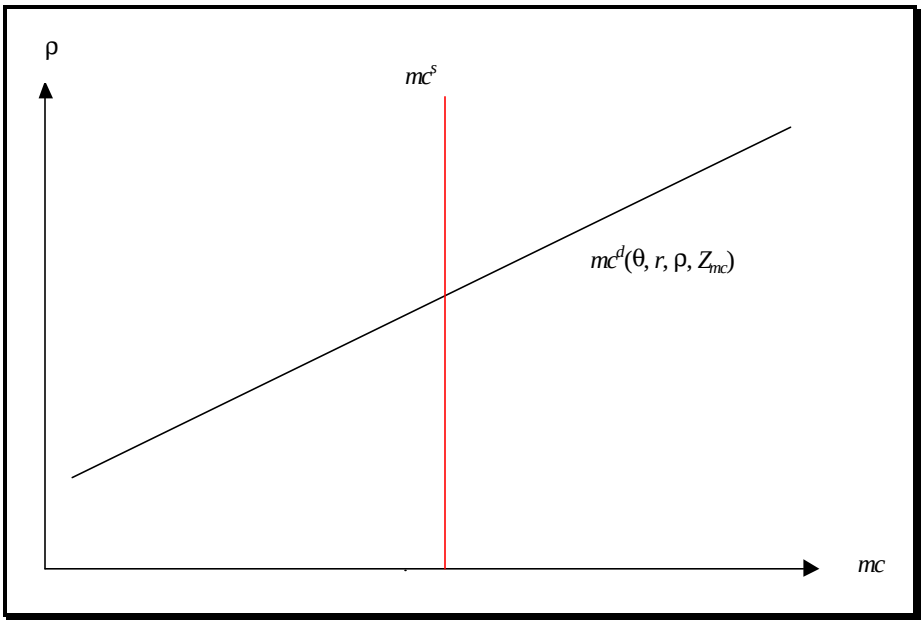
($\frac{MC^d}{Y} = mc^d$) is a positive function of the real rate of return on stocks (ρ), a negative function of the real rate of return on quasi-money (r), a negative function of the real rate of return on money (θ), and a function of a vector (Z_{qm}) of exogenous variables that will be specified later. In equilibrium $mc^d = mc^s$ and for given all exogenous variables, ρ, and θ, the stock market determines the real rate of return on stocks ρ.

The stock market equilibrium is given by the following

$$\begin{cases} \frac{MC^s}{Y} = mc^s \\ \frac{MC^d}{Y} = mc^d(\theta, r, \rho, Z_{qm}) \\ \frac{MC^s}{Y} = \frac{MC^d}{Y} \end{cases}$$

and it is represented in Figure 14 where demand intersects supply. Along the demand curve, wealth-holders hold increasing levels of market capitalization relative to GDP at higher real rate of returns ρ. If the real rate of return on stocks ρ is higher than the equilibrium rate at which asset holders would be willing to hold the given stock then the real rate of return on quasi-money r and the real rate of return on money θ would have to be higher for asset holders to be satisfied in holding the given stock of market capitalization at a higher real rate of return on stocks ρ.

Figure 14: Stock market equilibrium



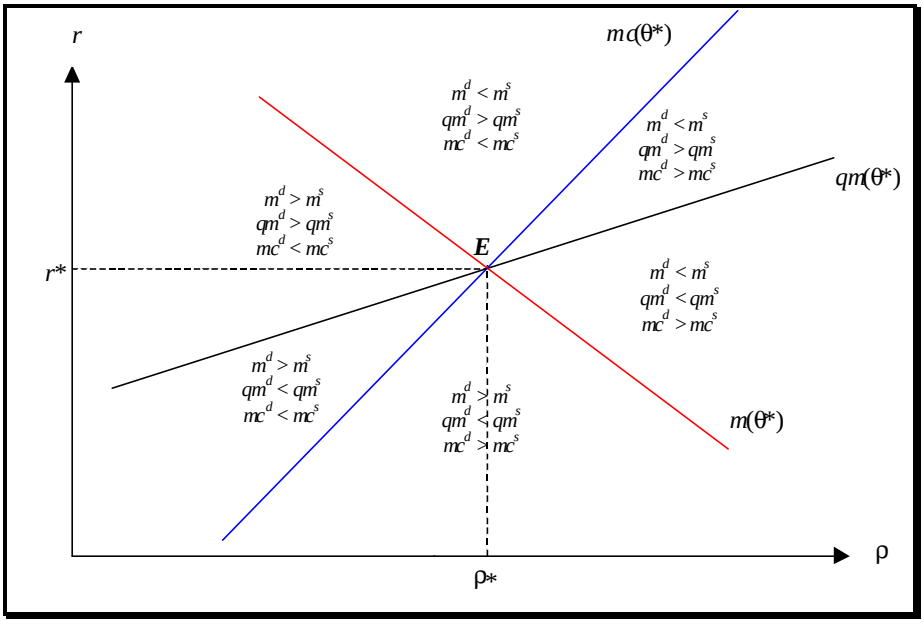
Simultaneous asset market equilibrium

The model so far described can be characterized by the following system where the equilibrium conditions $m^s = m^d$, $qm^s = qm^d$, and $mc^s = mc^d$ have been imposed:

$$\begin{cases} m^s = m^d(\underset{(+)}{\theta}, \underset{(-)}{r}, \underset{(-)}{\rho}, Z_m) \\ qm^s = qm^d(\underset{(-)}{\theta}, \underset{(+)}{r}, \underset{(-)}{\rho}, Z_{qm}) \\ mc^s = mc^d(\underset{(-)}{\theta}, \underset{(-)}{r}, \underset{(+)}{\rho}, Z_{mc}) \end{cases}$$

So far, we have not specified what the other exogenous variables in the model are. Since the objective of this paper is to model the impact of the development of contractual savings and non-life insurance on capital market development, all three Z vectors contain variables relative to such institutions and other market specific variables. In particular, $Z_m = [cs, nl, \pi sm]$, where cs is the value of contractual savings institutions financial assets over GDP, nl is the value of non-life insurance companies financial assets over GDP, and πsm is a measure of dispersion of inflation; $Z_{qm} = [cs, nl, rsm]$, where rsm is a measure of dispersion of the real interest rate; and $Z_{mc} = [cs, nl, vt, pism]$, where vt is the value traded of stocks over GDP, and $pism$ is a measure of dispersion of the stock market price index. Clearly, asset price volatility negatively affects the demand for the respective asset[23] while liquidity of the stock market positively affects the demand for stock market capitalization.

Figure 15: Asset markets equilibrium



[23] Notice that for simplicity we exclude the possibility that volatility in one market directly affects the equilibrium in other markets. As far as volatility is concerned, we allow only for indirect effects through prices. The results derived in the following sections would not be different, at least qualitatively, if this assumption were relaxed.

In equilibrium, when the three markets clear simultaneously, the system determines the real rate of returns on the three assets in the model. This is depicted in the previous figure where we represent the model in the space (ρ, r).

The schedules *m*, *qm*, and *mc* are the loci of ρ and r such that, for a given value of the real rate of return on money, θ, and of the other exogenous variables, the money, quasi-money, and stock markets are respectively in equilibrium. When all three markets clear, the economy is in equilibrium at *E* with an assets real rate of returns vector $p^* = [\rho^*, \theta^*, r^*]$. Below the *m* line financial assets real rate of returns are low which induces an excess demand of money, $m^d > m^s$, while above the *m* line the real rate of returns on financial assets are high which induces an excess supply of money, $m^d < m^s$. Below the *qm* line the real rate of return on quasi-money is low and the real rate of return on stocks is high which generate an excess supply of quasi-money, $qm^d < qm^s$, while above the *qm* line the real rate of return on quasi-money is high and the real rate of return on stocks is low which generate an excess demand of quasi-money, $qm^d > qm^s$. Finally, below the *mc* line the real rate of return on stocks is high and the real rate of return on quasi-money is low which generate an excess demand of stocks, $mc^d > mc^s$, while above the *cm* line the real rate of return on stocks is low and the real rate of return on quasi-money is high which generate an excess supply of stocks, $mc^d < mc^s$.

The slopes of the schedules in the previous figure can be obtained by totally differentiating the equilibrium conditions for each asset market at a given respective asset stock and level of θ. Notice that the locus of the stock market equilibrium, *mc*, is steeper than the locus of the quasi-money market equilibrium, *qm*. This stems from the assumption that each real rate of return has the strongest effect on the demand for its respective asset, or that the direct price effects are stronger than cross price effects. Thus:

$$\left.\frac{dr}{d\rho}\right|_{\bar{\theta},dm=0} < 0\,; \quad \text{and} \quad \left.\frac{dr}{d\rho}\right|_{\bar{\theta},dqm=0} > \left.\frac{dr}{d\rho}\right|_{\bar{\theta},dmc=0} > 0$$

As indicated above, the three locus in Figure 15 are defined for a given value of the real rate of return on money θ. A lower level of θ shifts each of the market equilibrium schedule from their original positions as indicated in Figure 16, that is: the money market shifts inward, the quasi-money shifts down, and the market capitalization shifts to the left. The result would be a new simultaneous equilibrium such as E'. In other words, a decline in the real rate of return of money (a higher rate of inflation) reduces the real rate of returns on financial assets as well.

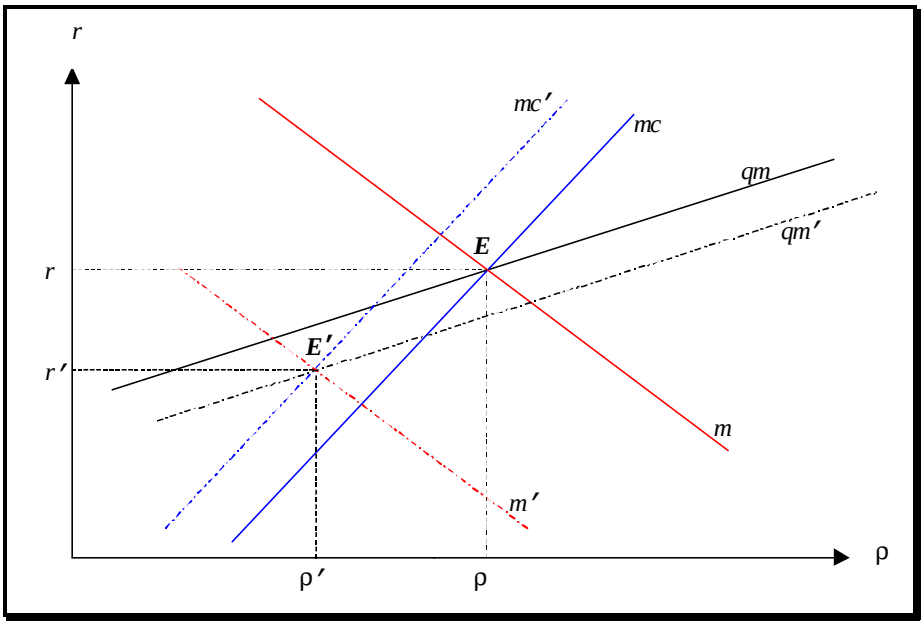
In the following two sections we analyze the impact of the development of contractual savings and non-life insurance on the equilibrium *E*, and more specifically on the capital market.

Comparative statics

Contractual savings development

The development of pension funds and life insurance companies can be represented in the model by an increase in the share of financial assets of these institutions over GDP: i.e., $\Delta cs > 0$. As we discussed above, the increase in the demand for financial assets by contractual saving institutions is reinforced by the behavior of individuals due to the re-balancing of their portfolio to restore liquidity. Therefore, the net result must be an increase in the demand of financial assets to GDP ratio in general. When demands for market capitalization, quasi-money and money increase, the *mc* schedule shifts to the left to *mc′*, the *qm* schedule shifts down to *qm′*, and the *m* schedule shifts inward to *m′* in Figure 16. Accordingly, a new simultaneous equilibrium is reached in *E′* where all three markets clear, and asset holders are willing to hold the same stock of shares, quasi-money and money at lower real rate of returns.

Figure 16: Development of contractual savings



Non-life insurance development

The development of non-life insurance companies can be represented in the model similarly to the development of contractual savings by an increase in the share of non-life financial assets over GDP: i.e., $\Delta nl > 0$. We have noticed in previous sections that non-life insurance companies have a portfolio less skewed towards stocks and bonds than contractual savings. Furthermore, their liabilities are more liquid than those of contractual savings. Despite the difference in portfolio distribution and liquidity of liabilities, the initial impact of and increase in *nl* on the equilibrium *E* is similar to the impact of an increase in *cs*, at least qualitatively. When *nl* increases, the demand for liquid assets increases and real rate of returns decrease.

According to the first result, one would infer that a policy aimed at promoting the non-life insurance sector is likely to promote the development of the financial market and foster growth by lowering the cost of equity and debt similarly to the development of contractual savings. Nevertheless, the equilibrium assumes that the behavior of individuals and enterprises does not offset non-life insurance portfolio decisions. When the non-life insurance sector develops, households and enterprises obtain more insurance against a whole variety of risks at a lower cost and feel less exposed to such risks. In particular, they need fewer liquid assets to face unexpected liquidity shocks. As previously noted, households and enterprises, not only care about the asset composition of their portfolios but also about the liquidity of these portfolios. Hence, it must be the case that the development of the non-life insurance sector prompts households to re-balance their portfolios towards less liquid assets. This time, the "re-balancing effect" of households' and enterprises' portfolios counteracts the initial positive impact of the development of non-life insurance on the demand of liquid assets. Accordingly, the final outcome depends on whether the re-balancing effect fully offsets non-life insurance portfolio decisions. In general, we expect that the new equilibrium in the case of non-life insurance development to be to the north east of E' in Figure 16.

According to the framework just proposed, the development of the non-life insurance sector may encourage investment through a reduction in the cost of debt and equity finance *i.f.f.* the "re-balancing effect" of individuals' and enterprises' portfolios does not offset the initial impact on financial markets in the development of the non-life insurance sector. We can conclude that the development of contractual savings is more likely to have stronger effects on reducing the cost of capital, thus fostering growth by developing the financial market and by promoting investment than the development of the non-life insurance.

IV. The estimation

In this section, we develop an empirical model to test the significance of the impact of the development of contractual savings and non-life insurance companies on capital markets. As an indicator of capital market development, we chose stock market capitalization and value traded as ratios to GDP. The data is discussed in the annex.

The empirical model

Among the 26 countries included in our regressions, five are developing countries while all the others are OECD countries.[24]

The system below summarizes the results found in the comparative statics section, where the first derivative of the dependent variables with respect to the regressors was discussed. The first three variables in each demand equation are the return variables and since they are simultaneously determined by the system, they are treated as endogenous; all other variables are assumed to be exogenous. Later we test for the endogeneity of contractual savings and non-life insurance companies as well. Because of the country

[24] See the appendix for a list of the countries included in our regressions.

heterogeneity discussed in the appendix and since we have in our data both OECD and non-OECD countries, we decided to use a random effect model to estimate our system.

$$\begin{cases} m^s = m^d(\underset{(+)}{\theta}, \underset{(-)}{r}, \underset{(-)}{\rho}, \underset{(+)}{cs}, \underset{(-)}{nl}, \underset{(-)}{\pi sm}) \\ qm^s = qm^d(\underset{(-)}{\theta}, \underset{(+)}{r}, \underset{(-)}{\rho}, \underset{(+)}{cs}, \underset{(\pm)}{nl}, \underset{(-)}{rsm}) \\ mc^s = mc^d(\underset{(-)}{\theta}, \underset{(-)}{r}, \underset{(+)}{\rho}, \underset{(+)}{cs}, \underset{(\pm)}{nl}, \underset{(+)}{vt}, \underset{(-)}{pism}) \end{cases}$$

Finally, since the aim of this paper is to analyze the impact of the development of institutional investors, and more specifically of contractual savings on capital market development, we decided to focus on the estimation of the market capitalization demand function only. This implies a choice of a limited information estimator, in particular, the estimator we used is an error components 2 stage least square (EC2SLS) as modified by Baltagi for unbalanced panels.[25] Hence, in the remainder of this section, we will be estimating the following regression[26]

$$mc_{it} = \alpha + \beta_1\theta_{it} + \beta_2 r_{it} + \beta_3\rho_{it} + \beta_4 cs_{it} + \beta_5 nl_{it} + \beta_6 vt_{it} + \beta_7 dum1_i + \beta_8 pism_{it} + v_{it}$$

where the three asset returns are defined in real terms as follows

$$\theta_{it} = \frac{1}{1+\pi_{it}} - 1; \quad r_{it} = \frac{1+i_{it}}{1+\pi_{it}} - 1; \quad \rho_{it} = \frac{E_{it}}{E_{it-1}(1+\pi_{it})} - 1$$

and θ is the real rate of return on money, r is the real rate of interest, ρ is the real rate of growth of earnings, π is the annual inflation rate, i is the nominal bank lending interest rate, E is the total earnings of the stock index for the period, *cs* is the share of financial assets of contractual savings over GDP, *nl* is the share of financial assets of non-life insurance companies over GDP, *vt* is the share of stock value traded over GDP, *dum*1 is a step dummy variable for OECD countries, and *psim* is a measure of dispersion of stock price index.

In the next table, we report two benchmark models, the ordinary least square (OLS) and the error component (EC), and an EC2SLS estimation (Mod1) of the stock market capitalization equation.

The OLS reports the results when data are pooled and returns are not instrumented. The model performs relatively well with an R^2 of 81 percent and all parameters are jointly different from zero. All parameters, with the exception of the parameter for the real interest rate, are significantly different from zero at the 5 percent significance level and have the right sign, i.e., the sign predicted by the model developed in the previous section.

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[25] Contrary to full information methods (or system methods) that incorporate knowledge of all restrictions in the system when estimating each parameter, limited information (or single equation) methods only utilize knowledge of restrictions in the particular equation being estimated (see Baltagi, 1995).

[26] In the appendix, we conduct a detailed analysis of model selection for the choice of the equation that best would fit the data.

Table 2: Market capitalization

	OLS		EC		Mod1		Mod1b	
Variables	**Coeff.**	**P-val.**	**Coeff.**	**P-val.**	**Coeff.**	**P-val.**	**Coeff.**	**P-val.**
q	-1.9616	0.000	-0.5948	0.240	-3.9841	0.000	-3.9881	0.000
r	-0.7433	0.134	-0.3033	0.554	-1.6794	0.077	-1.9141	0.038
r	0.0629	0.047	0.0457	0.081	0.3241	0.001	0.3782	0.000
cs	0.3072	0.000	0.2929	0.000	0.3393	0.000	0.3112	0.000
nl	2.3509	0.000	1.8197	0.039	2.7811	0.000	2.6174	0.000
vt	0.8072	0.000	0.9108	0.000	0.8242	0.000	0.8210	0.000
dum1	-0.6466	0.000	-0.6340	0.000	-0.5854	0.000	-0.5720	0.000
psim	-0.9483	0.003	-0.8804	0.001	-0.8556	0.019	-0.8692	0.023
book							-0.0935	0.061
constant	0.6689	0.000	0.6947	0.000	0.5036	0.000	0.5397	0.000
obs	281		281		281		281	
R2 /1	0.81		0.80		0.76		0.74	
JS /2	146.53	0.000	685.12	0.000	101.33	0.000	91.17	0.000
HS /3	..	..	8.43	0.296	4.24	0.751	4.99	0.661
RE /4	..	..	144.45	0.00	..	..	..	..

Notes: In Mod1 and Mod1b, the instruments are a function of the rate of growth of M2 and real GDP as defined in Footnote 27, the rate of change of the real effective exchange rate, the rate of growth of real per-capita GDP, a measure of dispersion of the real interest rate, and a measure of dispersion of inflation. For a description of the variables used in the regressions, see appendix. /1 The R2 statistics is relevant for the OLS regression only; for the other two regressions we report the squared correlation between fitted and actual values. /2 The joint significance test in the OLS regression is distributed as an F(8,272) while it is distributed as a Chi2(8) in the other three regressions. /3 HS is the Hausmann specification test and it is distributed as a Chi2(7). /4 RE is the test for random effects and it is distributed as a Chi2(1).

The EC regression does not instrument the asset returns. The results show that neither the real rate of return on money nor the real interest rate are significant at the 10 percent level. We also report the Hausmann specification test and a test for random effects. In the test for random effects, we reject that the variance of the individual effects is equal to zero and hence, we reject that the data should be pooled. In the specification test, we cannot reject at the 5 percent significance level that there is significant difference between the random effect and the fixed effect estimators and hence, we cannot reject that the random effect model is misspecified.

In the Mod1 regression, we instrumented the endogenous variables as follows: the rate of inflation (which is included in the real rate of return of money) with the rate of growth of money plus quasi-money less the rate of growth of real GDP with the idea that prices, and hence inflation, respond to excess demand for money;[27] the real interest rate with the rate of change of the real effective exchange rate, following real interest parity;[28] and the real rate of return on stocks with the rate of growth of real per-capita GDP, with the idea that investments in richer countries yield higher returns due to more developed

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[27] Since the return on money is defined as $\theta = (\frac{1}{1+\pi} - 1)$ we transformed the rate of inflation by the rate of growth of M2 ($^{*}M2/M2$) less the real growth of GDP ($^{*}Y/Y$), as follows: $(1+\frac{\dot{M}2}{M2}-\frac{\dot{Y}}{Y})^{-1}-1$.

[28] We also tried to instrument the real interest rate using data on budget deficits assuming that countries with larger Government financing needs would have higher real interest rates and although results did not change, we had a significant loss in the number of observations. Hence, we decided not to use this variable as an instrument.

infrastructure.[29] In this regression, the p-values of the parameter for the three asset returns are markedly improved and now, all variables are significantly different from zero and with the right sign.

The estimates obtained in model Mod1 in Table 2 suggest that the real rate of returns on money and quasi-money, and the volatility of stock prices negatively affect the demand for stock market capitalization, while the real rate of return on stocks, as well as the liquidity of the stock market, the development of contractual savings and non-life insurance companies, positively affect the demand for stock market capitalization. Also, the intercept of the model seems to be shifting downwards for OECD countries, and this shift (captured by the parameter for dum1) is significantly different from zero. This does not necessarily mean that non-OECD countries have, other things being equal, a higher capitalization over GDP than OECD countries. In these types of models, the intercept has no economical interpretation as it represents only a scaling factor. Hence, the parameter for dum1 can also be interpreted as a scaling factor.

In the Mod1b regression, we added a dummy for countries in which corporations adopt book reserve systems for the defined benefit liabilities related to their employees. The adoption of book reserves implies self-funding, and therefore, reduces financial intermediation. As expected, the coefficient for the dummy variable has a negative sign and is also significantly different from zero at the 10 percent level.

Endogeneity issues

So far, we have assumed that the three asset returns are endogenous in the model. Now we wonder if there is sufficient correlation between the disturbances to warrant estimation by instrumental variables. In order to test if indeed we should be using instrumentation to achieve consistency, we used a variant of the Durbin-Wu-Hausman (DWH) test to test for endogeneity of the three asset returns.[30] The next table reports the test for each variable independently and in the last row, for joint endogeneity. The null hypothesis is that variables are exogenous against an alternative that they are endogenous. Individually, we cannot reject the null at 5 percent significance level for any of the returns, while we reject the null that the three asset returns are jointly exogenous at 5 percent significance level. Hence, we can conclude that regression Mod1 in Table 2 yields consistent estimates of the parameters, while the simple error component regression (EC) does not.

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[29] See Appendix I for a correlation matrix between instruments and endogenous variables.

[30] The test is constructed by augmenting the base regression with the fitted values of the instrumenting regression (see Davidson and MacKinnon, 1993). The null is that the variable, or set of, considered is exogenous and a test on the significance of the augmented variables is then conducted.

Table 3: Endogeneity of asset returns

H0	Distribution	Statistics	p-value
q **exog.**	Chi2(1)	1.90	0.1682
r **exog.**	Chi2(1)	2.67	0.1020
***r* exog.**	Chi2(1)	0.02	0.8800
jontly exog.	Chi2(3)	9.46	0.0288

Contractual savings and non-life insurance companies financial assets are treated as exogenous variables in the Mod1 model. We also explored the possibility that a two-way relationship exists between the development of contractual savings and/or non-life insurance companies and the development of capital markets. On the one hand, as discussed above, institutional investors promote the development of capital markets. On the other hand, capital market development may well be the *condicio sine qua non* for institutional investors to develop. In other words, without a well functioning market, institutions like pension funds and life insurance companies cannot develop.

We looked into the data collected for any support to this proposition and Table 4 reports the relevant regressions. In the first regression, we instrumented contractual savings only, in the second regression, we instrumented non-life insurance companies only, and in the third regression, we jointly instrumented contractual savings and non life insurance companies.

Table 4: Market capitalization – EC2SLS

	Mod2		Mod3		Mod4	
Variables	**Coeff.**	**P-val.**	**Coeff.**	**P-val.**	**Coeff.**	**P-val.**
q	-2.2002	0.016	-3.3769	0.000	-2.5068	0.002
R	-1.0053	0.505	0.1916	0.862	-0.4423	0.788
r	0.1841	0.028	0.2634	0.002	0.1923	0.019
Cs	0.3513	0.006	3.0739	0.005	0.3414	0.003
Nl	2.5156	0.036	0.3320	0.000	2.8635	0.063
Vt	0.8886	0.000	0.8845	0.000	0.9002	0.000
dum1	-0.6131	0.000	-0.6135	0.000	-0.6202	0.000
psim	-0.8455	0.005	-0.7897	0.021	-0.8121	0.013
Constant	0.5675	0.001	0.4070	0.002	0.5026	0.007
Obs	281		271		271	
R2 /1	0.80		0.78		0.80	
JS /2	85.68	0.000	90.55	0.00	77.88	0.000
HS /3	1.82	0.969	2.66	0.9145	2.20	0.948

Notes: In Mod2 the instruments are: a function of the rate of growth of M2 and real GDP as defined in footnote 27, the rate of change of the real effective exchange rate, the rate of growth of real per-capita GDP, a measure of dispersion of the real interest rate, a measure of dispersion of inflation, and the share of older than 65 population over total population. In Mod3 the instruments are: a function of the rate of growth of M2 and real GDP as defined in Footnote 27, the rate of change of the real effective exchange rate, the rate of growth of real per-capita GDP, a measure of dispersion of the real interest rate, a measure of dispersion of inflation, and the sum of import plus export over GDP. In Mod4 the instruments are: a function of the rate of growth of M2 and real GDP as defined in Footnote 27, the rate of change of the real effective exchange rate, the rate of growth of real per-capita GDP, a measure of dispersion of the real interest rate, a measure of dispersion of inflation, the share of older than 65 population over total population, and the share of imports plus exports over GDP. For a description of the variables used in the regressions, see appendix. /1 The R2 statistics reported is the squared correlation between fitted and actual values. /2 The joint significance test is distributed as a Chi2(8) in all three regressions. /3 HS is the Hausmann specification test and it is distributed as a Chi2(7).

The results of the test for endogeneity are reported in Table 5. We again used the Durbin-Wu-Hausman test previously described and under the alternative we instrumented: 1) contractual savings with the share of population aged 65 or more over total population, assuming that countries with more mature demographics have larger institutional investors; and 2) non-life insurance companies with the sum of exports and imports over GDP, assuming that more open countries have more developed non-life insurance business due to higher demand for trade related insurance. The null hypothesis that contractual savings and non-life insurance companies are independently or jointly exogenous cannot be rejected at the usual 5 and 10 percent significance levels. Clearly, we must conclude that in the model, we present and with the available data, contractual savings and non-life insurance companies should be treated independently and jointly as exogenous.

Table 5: Endogeneity of institutional investors

H0	Distribution	Statistics	p-value
cs exog.	Chi2(1)	0.16	0.6932
nl exog.	Chi2(1)	2.27	0.1327
jontly exog.	Chi2(2)	1.98	0.1408

Market capitalization: alternative specifications

In this last part of this section, we would like to present alternative formulations of regression Mod1 appearing in Table 2. In the model previously presented, we used the ratio of financial assets to GDP of institutional investors as representing their own development without consideration at their portfolio composition. However, because of regulatory constraints, tax treatment, their own and plan member portfolio decisions, the composition of portfolio of different institutional investors may have a role in development of stock markets. In order to determine if the different portfolio distributions of contractual savings and non-life insurance companies has a different impact on stock market capitalization, we substitute the financial assets of contractual savings and non-life insurance companies over GDP (*cs* and *nl*) with the share of stocks in the portfolios of these two sets of institutions (*cssh* and *nlsh*).

Table 6: Market capitalization – portfolio distribution

Variables	Mod5 Coeff.	P-val.
q	-1.6290	0.072
r	-1.1447	0.335
r	0.0861	0.273
cssh	0.8245	0.000
nlsh	5.2434	0.031
vt	0.8793	0.000
dum1	-0.6998	0.000
psim	-0.8647	0.006
constant	0.8267	0.000
obs	229	
R2 /1	0.85	
JS /2	89.41	0.000
HS /3	2.02	0.959

Notes: In Mod5 we used the same instruments as in Mod1. /1 The R2 statistics reported is the squared correlation between fitted and actual values. /2 The joint significance test is distributed as a Chi2(8). /3 HS is the Hausmann specification test and it is distributed as a Chi2(7).

This is done in regression Mod5 in the Table 6. Although the sample size is now smaller with only 23 countries and 229 observations, results are directly comparable to Mod1. In fact, similarly to what was obtained in Mod1, the portfolio distribution of contractual savings and non-life insurance companies has also a positive and significant impact on market capitalization at almost any significance level.

Contractual savings and value traded

The model we presented focused on one dimension of stock market development: market capitalization. In this section, we would like to present preliminary results on the impact of contractual savings and non-life insurance development on stock value traded. The issue we would like to explore is whether the different natures of liabilities between contractual savings and other institutional investors has any influence on the choice of markets these institutions are active. In other words, whether there is any evidence in the data collected to support the assertion that contractual savings, because of their more illiquid liabilities, should be more active in the primary market when it comes to buying and holding long term securities, whilst more liquid institutions like mutual funds and non-life insurance companies are more active in the secondary market. Thus, whether there is evidence supporting the idea that contractual savings have a stronger impact on market capitalization while non-life insurance companies have a stronger impact on value traded.

We already found in the paper that both contractual savings and non-life insurance companies have a significant impact on market capitalization. In this section, we explore whether the same relationship between the two types of institutions exists with respect to value traded as well. In order to analyze these propositions, we modeled the impact of the development of institutional investors in terms of financial assets over GDP on the liquidity of capital markets expressed by stock value traded over GDP. Like

our previous analysis, we considered the interactions of different asset markets and hence, the real return on money and quasi-money also appear in our regressions. We expect that the higher the real rate of return of money (the lower the inflation rate), the higher the availability of liquidity would be for transactions purposes, hence, value traded should increase. On the other hand, a higher real rate of return on quasi money dries out liquidity from the market, increasing the cost of financing; hence, it reduces value traded. Finally, we also expect that a higher real rate of return on stocks would bring an increase in value traded. Nevertheless, this time we treated these variables as exogenous. Results are reported in the following table.

Table 7: Value traded

	OLS		EC		OLS1		EC1	
Variables	**Coeff.**	**P-val.**	**Coeff.**	**P-val.**	**Coeff.**	**P-val.**	**Coeff.**	**P-val.**
q	12.7098	0.000	13.7175	0.000	15.7683	0.000	12.9980	0.000
r	-6.0395	0.001	-4.5166	0.010	-9.3095	0.000	-6.1822	0.001
r	-0.0168	0.883	0.0565	0.498	-0.0771	0.535	0.0632	0.492
cs	0.6724	0.000	0.2576	0.343				
nl	6.9300	0.001	18.4098	0.000				
cssh					1.4336	0.000	1.2312	0.010
nlsh					16.3281	0.009	41.6533	0.000
dum1	-0.5675	0.001	-1.2801	0.000	-0.6013	0.000	-0.9269	0.007
constant	-1.2782	0.000	-1.1523	0.003	-0.5320	0.015	-0.9060	0.011
obs	285		285		233		233	
R2 /1	0.43		0.39		0.44		0.39	
JS /2	35.15	0.000	263.93	0.000	29.94	0.000	206.17	0.000

Notes: /1 The R2 statistics reported is the squared correlation between fitted and actual values for EC and EC1. /2 The joint significance test is distributed as an F(6, 278) in OLS, as an F(6, 226) OLS1, and as a Chi2(6) in EC and in EC1.

OLS is our base regression for value traded where the log of value traded over GDP[31] is regressed on the real return on money (θ), the real of return on quasi-money (r), the real rate of return on stocks (ρ), the share of contractual savings financial assets over GDP (cs), the share of non-life insurance financial assets over GDP (nl), and a step dummy for OECD countries (dum1). Notice that the price variables real rate of return on money and real rate of interest on quasi-money, and the institutional investors' variables have all the expected sign and are significant. On the other hand, the real rate of return on stocks is not significant. EC is an error component model where we take into account of country heterogeneity. Notice that now cs is not significant.

OLS1 and EC1 repeat the exercise just carried out where we substituted the shares of financial assets of contractual savings and non-life insurance companies over GDP with the proportion of stock held by these institutions over total financial assets. In this second formulation, the portfolio distribution of both contractual savings and non-life insurance companies has a positive impact on value traded.

The data seems to indicate that the development of both contractual savings and non-life insurance companies represented by the share of financial assets over GDP has a positive effect on market capitalization, as discussed above. The same cannot be said for

[31] The log-linear functional form was preferred to a linear functional form on the basis of preliminary tests on functional form.

value traded where the impact of the share of financial assets over GDP of contractual savings seems to be insignificantly different from zero. However, the data indicate that the weight of shares in the portfolio composition of both contractual savings institutions and non-life insurance companies has a positive effect both on market capitalization as well as value traded.

V. Conclusions

Contractual savings are powerful instruments for increasing the supply of long-term funds in the economy They represent a large share of financial assets in many economies. Contractual savings are considered illiquid assets by asset holders (they are available only upon retirement, disability or death of the insured), thus fund managers maximize the risk adjusted returns on these funds with less concern over maturity constraints. Hence, their development has a strong, positive impact on capital market development. Our analysis indicates that the development of institutional investors, both contractual savings and non-life insurance, would have the highest impact on the development of capital markets when regulations allow investments in shares in an important way. A dynamic insurance and contractual savings sector promotes capital market development, as measured by two standard indicators: increasing both the share of market capitalization to GDP and the volume traded to GDP. The later, in turn, further increases market capitalization. Market capitalization would then increase directly as a result of institutional investors development as well as indirectly through higher market liquidity, as measured by increased value traded.

An important policy conclusion is that the robustness of the effect of contractual savings development on capital markets hinges on the design of contractual savings plans. The less liquid contractual savings in the hand of asset holders, the stronger this effect. To the extent that these funds are easily accessed by asset-holders, the re-balancing effect is lost and the impact on capital market development would be diminished.

Our results are promising in that they support the idea that contractual savings development plays a unique role in developing capital markets, in reducing the cost of capital (both equity and debt finance) including the reduction in the country risk premium due to improved resilience of governments, banks and enterprises to shocks, and in reducing the spread between long and short term interest rates. All these effects promote investments and growth. Furthermore, contractual savings institutions (as with all collective investment instruments) bring a number of other benefits : a higher level of professional specialization in the market, increased funding of riskier (and higher yielding) projects, economies of scale and scope, reduction of transactions costs, a promotion of financial innovation, and an improvement in corporate governance and information disclosure. This, in turn, should improve resource allocation and growth. Our analysis does not discuss the effects of contractual savings development on the saving rate.

However, we should not lose sight of the main purpose for developing contractual savings. This is to provide adequate protection to the insured. Therefore, forcing

excessive insurance coverage on the population simply to develop contractual savings may have negative welfare implications.

Although funding for contingent liabilities 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 pay-as-you-go system (PAYG) 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 holding only government bonds, the development of contractual savings would have minimum or no effect on stock markets and social welfare would be lower. Furthermore, the availability of contractual savings as captive funds may reduce fiscal control.

Finally, the development of a sound contractual savings and non-life insurance sector requires an enabling macroeconomic environment, a sound banking system, a reliable financial sector regulation and supervision, and appropriate tax treatment, accounting, auditing and disclosure standards.

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Appendix I

The data

In this section we describe the data used in our regressions. Table 8 shows some overall summary statistics of the dataset used. The panel is unbalanced with a maximum of 17 annual observation for any one country. The distribution of the individual length of each panel T_i shows that 5 percent of the countries are observed 6 years or less, 50 percent of the countries are observed 10 years or less, and 75 percent of the countries are observed 16 years or less. More specifically, the participation pattern reveals that 6 countries (23 percent of the distribution) are observed over the whole sample while only one country (Ireland) is observed in 1995 only.

Table 8: Participation pattern in the panel

```
      id:  2, 3, ..., 40                                  n =         26
    year:  1981, 1982, ..., 1997                         T =         17
           Delta(year) = 1; (1997-1981)+1 = 17
           (id*year uniquely identifies each observation)

Distribution of T_i:   min      5%     25%       50%       75%     95%     max
                         1       6       7        10        16      17      17

     Freq.  Percent    Cum. |  Pattern
 ----------------------------+------------------
        6     23.08   23.08 |  11111111111111111
        3     11.54   34.62 |  .........1111111.
        2      7.69   42.31 |  .........11111111
        2      7.69   50.00 |  .......1111111111
        2      7.69   57.69 |  ........11111111.
        2      7.69   65.38 |  .111111111111111.
        1      3.85   69.23 |  ...1111111111111.
        1      3.85   73.08 |  ........111111111
        1      3.85   76.92 |  ...........111111
        1      3.85   80.77 |  1111111111111111.
        1      3.85   84.62 |  ......1111111....
        1      3.85   88.46 |  .....11111111111.
        1      3.85   92.31 |  ..........111111.
        1      3.85   96.15 |  ..............1..
        1      3.85  100.00 |  ..........1111111
 ----------------------------+------------------
       26    100.00         |  XXXXXXXXXXXXXXXXX
```

Table 9 reports the distribution of countries[32] in the panel. There are 228 country-years of data belonging to OECD countries (ctype = 1) accounting for 81 percent of the overall distribution while the other 19 percent of the overall distribution belongs to developing countries[33] (ctype =2,3). The between column repeats the breakdown in terms of countries: data is collected for 21 OECD countries and 5 developing countries.

[32] See Table 12 for a list of the countries in the dataset.

[33] Developing countries are included in the dataset if they have private pension funds or important national provident funds.

Table 9: Data distribution by country

ctype	Overall Freq.	Overall Percent	Between Freq.	Between Percent	Within Percent
1	228	81.14	21	80.77	100.00
2	25	8.90	2	7.69	100.00
3	28	9.96	3	11.54	100.00
Total	281	100.00	26 (n = 26)	100.00	100.00

Table 10 describes the variables used in the estimations and their source.

Table 10: Description of variables used in the estimations

Variable	Description	Source[1]
ax2sm	**s.d./mean of real deposit interest rate** The annual standard deviation and means were calculated using monthly data.	IFS
ax3sm	**s.d./mean of annual inflation (CPI)** The annual standard deviation and means were calculated using monthly data.	IFS
book	**Dummy = 1 for countries with book reserves** (Austria, Germany, Italy, and Korea)	
cs	**Contractual savings financial assets (% GDP)** The sum of cash and deposits, bills and bonds, loans, shares and other financial assets on the balance sheet of contractual savings. GDP at market prices in current local currency was used for the ratio.	OECD; WDI; and national sources
cssh	**Contractual savings portfolio share in stocks** The value of stocks as a percentage of total financial assets.	OECD; WDI; and national sources
dum1	**Dummy = 1 for OECD countries** OECD countries as of 1999.	
ec5rg	**Rate of change of real GDP** Average annual growth rate in real GDP.	WDI
ec5rpg	**Rate of change of per-capita real GDP** Average annual growth rate in per-capita real GDP.	WDI
mc	**Market capitalization (% GDP)** 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.	WDI
ec15p	**Share of 65+ population on total population**	WDI
vt	**Value traded of listed shares (% GDP)** Stocks traded refers to the total value of shares traded during the period.	WDI
ec22n	**Rate of change of money and quasi-money** Average annual growth rate in money and quasi money.	WDI
ec22n3	Defined as 1/(1 + ec22n - ec5rg) – 1	WDI
ec23g	**Rate of change of real effective exchange rate** Average annual growth rate in real effective exchange rate (> 0 indicates depreciation, < 0 indicates appreciation).	WDI
r	**Real return on quasi-money** Real interest rate on lending for all countries except for Austria, for which the real lending rate was estimated using the banking spread for 1998.	WDI
psim	**s.d./mean of stock market price index** The annual standard deviation and means were calculated using monthly data.	Datastream
r	**Real return on stocks** Defined as (1 + Eq)/(1 + infl) – 1, where Eq is the	Datastream

Variable	Description	Source[1]
	Defined as (1 + Eg)/(1 + infl) – 1, where Eg is the rate of growth of earnings and infl is the annual CPI inflation.	
infl	**Annual inflation** Average annual CPI inflation.	WDI
q	**Real return on money** Defined as 1/(1 + infl) – 1.	WDI
nl	**Non-life insurance financial assets (% GDP)** The sum of cash and deposits, bills and bonds, loans, shares and other financial assets on the balance sheet of non-life insurance companies. GDP at market prices in current local currency was used for the ratio.	OECD; WDI; and national sources
nlsh	**Non-life insurance portfolio share in stocks** The value of stocks as a percentage of total financial assets.	OECD; WDI; and national sources
open	**Shares of imports and exports over GDP** Sum of imports and exports of goods and services	WDI

Notes: **(1)** The source refers to the variables argument of the transformation in derived variables. IFS stands for International Financial Statistics, published by the International Monetary Fund, OECD for Organization for Economic Co-operation and Development, and WDI for World Development Indicators, published by the World Bank.

When national sources were used, the following would provide further details:

a) data on assets of insurance and pension funds for Chile, were specially assembled by Central Bank of Chile at our request.

b) data on assets of insurance and pension funds 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 on assets of insurance and pension funds for South Africa is published in the Federal Reserve Bank quarterly bulletin.

d) data on assets of insurance and pension funds for Malaysia is published in the insurance annual report and the EPF annual report by Bank Negara.

e) data on assets of insurance and pension funds for Singapore is published in the yearbook of statistics by the Department of Statistics.

Table 11 reports various summary statistics relative to the variables described in the previous table. For each variable, this table reports a decomposition into overall (x_{it}), between ($\bar{x}_i$), and within ($x_{it} - \bar{x}_i + \bar{\bar{x}}$)[34] summary statistics.

As an example, the description the stock market capitalization expressed in percent of GDP (*mc*), may be helpful in interpreting the information provided in the table. The variable has 281 country-years observations and it ranges from a minimum of 0.46 percent of GDP to a maximum of 343 percent of GDP. It has an overall mean and standard deviation of 0.58 and 0.47, respectively. The overall and within statistics are calculated over 281 country-years of data, while the between statistics are calculated over 26 countries. The between statistics tell us that the minimum average market

[34] The global mean $\bar{\bar{x}}$ being added back to make results comparable.

capitalization for all countries is 11 percent of GDP while the maximum average[35] market capitalization for all countries if 138 percent of GDP. Hence, we can infer that, on average, there is a large difference in market capitalization across countries. The within statistics tell us that the largest negative deviation from the country average is – 26 percent,[36] while the largest positive deviation from the country's average is 263 percent. Hence, we can infer that there is a strong variability of market capitalization over time and within each country.

Table 11: Summary statistics of variables used in the estimations

Variable		Mean	Std. Dev.	Min	Max	Observations
ax2sm	overall	.0860585	.0848969	0	.6288298	N = 281
	between		.0675029	.0299764	.3165355	n = 26
	within		.0661822	-.0830116	.5411115	T = 10.8077
ax3sm	overall	.1181012	.3948712	-1.65893	5.826483	N = 281
	between		.0880735	-.0191701	.449289	n = 26
	within		.3829176	-1.521658	5.495295	T = 10.8077
book	overall	.1459075	.3536433	0	1	N = 281
	between		.3679465	0	1	n = 26
	within		0	.1459075	.1459075	T = 10.8077
cs	overall	.4901788	.3807752	.0281827	1.724605	N = 281
	between		.3384334	.0417177	1.208705	n = 26
	within		.1484202	-.0654467	1.007559	T = 10.8077
dum1	overall	.8113879	.3918981	0	1	N = 281
	between		.4019185	0	1	n = 26
	within		0	.8113879	.8113879	T = 10.8077
ec5rg	overall	.0286977	.0354459	-.085302	.1674965	N = 281
	between		.0266883	.000332	.0943472	n = 26
	within		.027285	-.0891023	.1565392	T = 10.8077
ec5rpg	overall	.0201447	.0334086	-.09041	.1478054	N = 281
	between		.023193	-.0094581	.0793933	n = 26
	within		.0269344	-.0934634	.1424766	T = 10.8077
mc	overall	.5869054	.47689	.0461379	3.432964	N = 281
	between		.3883594	.1190198	1.383302	n = 26
	within		.2778364	-.2651203	2.636568	T = 10.8077
ec15p	overall	.1216774	.0416599	.0329907	.1786749	N = 281
	between		.0424325	.037507	.1760508	n = 26
	within		.005185	.1065815	.1367739	T = 10.8077
vt	overall	.2338378	.2678456	.0123681	2.394216	N = 281
	between		.1734132	.0409591	.6872099	n = 26
	within		.2153907	-.2085879	2.110027	T = 10.8077
ec22n	overall	.0950908	.0875292	-.0995114	.8933107	N = 281
	between		.0513535	.0298194	.2142169	n = 26
	within		.0738162	-.0531137	.8235819	T = 10.8077
ec22n3	overall	-.0575371	.0618834	-.4557502	.1620688	N = 281
	between		.0324148	-.1305301	-.0113687	n = 26
	within		.0530206	-.4045907	.1204875	T = 10.8077
ec23g	overall	.0011021	.0565726	-.241041	.1806286	N = 281
	between		.0132984	-.0217625	.0363336	n = 26
	within		.0553967	-.2251831	.1795586	T = 10.8077

[35] This is the within average: i.e., the average over time within each country.

[36] Notice that the minimum of the within country market capitalization is negative as deviations from each country's average can very easily be negative.

Variable		Mean	Std. Dev.	Min	Max	Observations
ec3r	overall	.0643083	.0269305	-.0366201	.1809006	N = 281
	between		.0225198	.0324581	.1190658	n = 26
	within		.0187271	-.0181828	.1492912	T = 10.8077
idx01sm	overall	.083251	.0428999	.0209741	.3119199	N = 281
	between		.0194621	.0576911	.1338146	n = 26
	within		.0387739	.0010703	.2868749	T = 10.8077
ρ	overall	.1243001	.4032044	-.7989287	2.259785	N = 281
	between		.4335365	-.087638	2.259785	n = 26
	within		.3703066	-1.029138	1.959293	T = 10.8077
infl	overall	.0485868	.0405193	-.013857	.2602901	N = 281
	between		.0328683	.01436	.1364229	n = 26
	within		.0258566	-.0264838	.172454	T = 10.8077
θ	overall	-.0450033	.0346609	-.2065319	.0140518	N = 281
	between		.027955	-.1171332	-.0140112	n = 26
	within		.0222196	-.1344021	.014324	T = 10.8077
nl	overall	.0570105	.0310268	.0048655	.1732577	N = 281
	between		.0330569	.0055556	.158735	n = 26
	within		.0126768	.021716	.1188603	T = 10.8077
open	overall	.7936877	.7496512	.1631121	4.0675	N = 271
	between		.6629057	.1809424	3.621481	n = 26
	within		.0842189	.4461019	1.239707	T = 10.4231

Table 12 lists the countries used in the regressions.

Table 12: Countries used in the regressions

Country code and name		Country code and name	
AUS	Australia	IRL	Ireland
AUT	Austria	ITA	Italy
BEL	Belgium	JPN	Japan
CAN	Canada	KOR	Korea, Rep
CHE	Switzerland	MYS	Malaysia
CHL	Chile	NLD	Netherlands
DEU	Germany	NOR	Norway
DNK	Denmark	PRT	Portugal
ESP	Spain	SGP	Singapore
FIN	Finland	SWE	Sweden
FRA	France	THA	Thailand
GBR	United Kingdom	USA	United States
GRC	Greece	ZAF	South Africa

Finally, Table 13 shows the correlation matrix (with p-values on each second line) of the instruments (column) and endogenous variables (row) used in our regressions.

Table 13: Correlation matrix between instruments and endogenous variables

	r	*r*	q	**cs**	**nl**
ec23g	-0.0903	-0.0079	-0.0807	-0.0119	0.0243
	0.1310	0.8949	0.1773	0.8428	0.6854
ec22n3	0.1387	-0.0615	0.5009	0.0069	0.1954
	0.0201	0.3044	0.0000	0.9085	0.0010
ec5rpg	0.2590	-0.0416	0.2579	0.0103	-0.2198
	0.0000	0.4876	0.0000	0.8642	0.0002
ax2sm	0.0640	-0.0107	-0.1021	0.0857	-0.0271
	0.2848	0.8587	0.0876	0.1518	0.6511
ax3sm	0.0175	0.0282	0.0977	0.0505	0.0532
	0.7704	0.6381	0.1023	0.3989	0.3739
ec15p	-0.0001	0.2443	0.3329	-0.2775	0.4109
	0.9992	0.0000	0.0000	0.0000	0.0000
open	0.0674	-0.0865	0.2394	0.4126	-0.1563
	0.2685	0.1554	0.0001	0.0000	0.0100