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THE LONG AND THE SHORT OF EMERGING MARKET DEBT

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Junio 2010

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Abstract

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JEL Classification Codes: F36, G11, G20, O16

Keywords: debt maturity, maturity structure, asset management, institutional investors, portfolio allocation, pension funds, mutual funds, insurance companies

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1. Introduction

The behavior of investors and the maturity structure of their investments continue to receive much attention. This interest experienced a boost with the emerging market crises of the 1990s, but the need to understand how investors invest, what incentives they face, and how financial institutions and capital markets operate has become even more relevant as financial crises proliferate (Rajan, 2005; and Calomiris, 2008).

Having access to long-term financing allows governments and firms to finance large investments over time, reducing rollover risk and the potential for crises.[1] In fact, several well-known financial crises have been linked to maturity mismatches, especially in emerging economies, which often face a significant degree of short-termism. But the problem is not confined to those countries. Before the US subprime financial crisis erupted in 2007-08, many banks around the world were heavily exposed to maturity mismatches, so the reduction in funding liquidity led to significant stress in the global financial system (Brunnermeier, 2009; Raddatz, 2010). Because of the negative experiences with short-term debt, many developing countries have actively tried for some time to develop markets for long-term lending through various measures that tackle different parts of the financial system. The emergence of a strong institutional investor base has been perceived by many to be a particularly important factor in the development of long-term (and local currency) bond markets, and as a consequence has been at the forefront of the policy advice (Holzmann, 1997; Caprio and Demirguc-Kunt, 1998; Corbo and Schmidt-Hebbel, 2003; BIS, 2007; Borensztein, et al., 2008; and

[1] See, for example, Barro (1997), Eichengreen and Hausmann (1999), Tirole (2003), Borensztein et al. (2005, 2006), and Alfaro and Kanczuk (2006, 2009).

Eichengreeen, 2009).[2] Yet despite these efforts, emerging market debt remains relatively short term.

Given the benefits of long-term debt and the efforts to encourage it, what then explains short-term borrowing in emerging economies? To what extent can maturities be lengthened? Different explanations for this short-term maturity structure have emerged. Traditional arguments focus on the demand side of funds, that is, on the incentives of emerging country borrowers to issue short-term debt to signal to markets their commitment to sound policies and economic management and to limit moral hazard (Calvo, 1988; Blanchard and Missale, 1994; Rodrik and Velasco, 2000; and Jeanne, 2009). But others place more emphasis on the supply side of funds, that is, on the role of investor behavior and incentives within financial institutions, especially since most investment decisions are done through financial intermediaries leading to principal-agent problems that affect portfolio structures. First, investor risk aversion might prompt countries to borrow short term. By lending long term, investors incur the price risk of long-term bonds since they might need to sell those bonds before they mature. The ensuing risk premium charged on long-term debt induces the demand side to borrow short term (Broner et al., 2007). Second, a related investor side explanation for the prevalence of short-term contracts is based on the incentives for managers under the presence of principal-agent problems (Narayanan, 1985; Shleifer and Vishny, 1990; Bebchuk and Stole, 1993; Stein, 2003, 2005; Bolton et al., 2006; and Jin and Kogan, 2008). When portfolio managers are disciplined in the short run by investors, their own managers, and/or regulators following poor performance, they may be unable to take

[2] Other factors often mentioned are the indexing of financial instruments and stable macroeconomic policy.

advantage of long-term arbitrage opportunities that need time to pay off and might be difficult to liquidate on a short-term notice.[3]

Despite the increasing emphasis on the investor side as determinants of maturity choices, little evidence exists on how different types of investors actually structure the maturity of their portfolios. This lack of evidence is mainly due to the difficulty in obtaining data on investors' portfolios. To partially overcome this problem, the literature studies the portfolios of institutions rather than those of households. A growing literature has thus appeared, trying to understand the behavior of investors in emerging economies (especially during crises). This literature focuses almost exclusively on international mutual funds and their investments across countries, ignoring the behavior of the large domestic institutions and the heterogeneity across investor types. Moreover, the literature centers just on equity holding, and therefore is silent on the maturity choices and the large debt holdings permeating investor portfolios.[4] The analysis of portfolio holdings is particularly important because many macroeconomic models implicitly assume that investors hold well-diversified portfolios through representative investors and abstract from frictions between savers and financial intermediaries.

This paper sheds new light on the behavior of investors regarding long-term assets and the factors underpinning their asset allocation by analyzing unique and rich data on the actual portfolios of the universe of domestic institutional investors. We examine the benchmark emerging market case of Chile, where conditions were set to foster long-term

[3] While the manager incentives mentioned here arise from principal-agent problems, they can certainly affect the appetite for risk and effective rate of risk aversion. But risk aversion might exist beyond these organizational factors.

[4] See, for example, Grinblatt and Keloharjub (2000), Borensztein and Gelos (2003), Edison and Warnock (2004), Kaminsky et al. (2004), Broner et al. (2006), and Hau and Rey (2008). A separate literature studies the maturity structure from the other side, focusing on firm-level evidence. See, for example, Claessens et al. (2000), Bleakley and Cowan (2005, 2008), and Schmukler and Vesperoni (2006).

investments. In particular, we construct the maturity structures of the different types of domestic institutional investors (medium- and long-term bond mutual funds, pension funds, and insurance companies) based on detailed asset-level time-series holdings between 1996 and 2005. We focus most of the analysis on asset-management institutions (mutual and pension funds) and compare them to asset-liability management institutions (insurance companies). As a developed country benchmark, we use US mutual funds. While the latter comparison is not the focus of this particular paper, it serves to quantify the degree of emerging market short-termism using similar type of data.[5]

The approach in this paper has important advantages and allows us to understand in great detail how much emerging market investors hold long-term instruments, what factors might affect their maturity structure decisions, and in particular what role financial intermediation plays in the choice to invest long term. First, the focus on mutual funds and pension funds is not arbitrary. Many countries have promoted the development of these institutional investors as the main vehicle for individuals to channel their savings and to foster long-term instruments for investment and capital markets in general. As a result, the assets held by mutual funds and pension funds have grown substantially and account for most of the domestic savings, especially those destined for the long run.[6] Pension funds are particularly interesting because they might be better equipped than other institutional investors to hold long-term assets since pensioners save for the long run and provide a steady flow of funds. The mutual funds studied in this paper channel

[5] The separate and related important question of why emerging economies have more short-term debt than developed countries is studied elsewhere, as in some of the papers mentioned above.

[6] For example, the assets held by pension funds in 2007 accounted for 17% of GDP in Brazil, 64% in Chile, 4% in Germany, 3% in Korea, 9% in Mexico, 134% in the Netherlands, 7% in Norway, 12% in Poland, 5% in Thailand, 78% in the UK, and 74% in the US. Meanwhile, the assets held by mutual funds in 2007 represented 44% of GDP in Brazil, 12% in Chile, 45% in Germany, 16% in Japan, 34% in Korea, 9% in Mexico, 15% in the Netherlands, 21% in Norway, 12% in Poland, 18% in Thailand, 40% in the UK, and 85% in the US.

voluntary savings in excess of those held by pension funds. They do not act as money market funds. Furthermore, the Chilean institutional investors we analyze are relatively developed and sophisticated, participating in a competitive industry and managing professionally a large pool of assets, so they should be able to take on risk.

Second, the comparison across different kinds of institutional investors is unique and very informative and has mostly been overlooked by the literature. This type of comparison is particularly insightful because it is difficult to identify on theoretical grounds the optimal maturity structure for a given investor; it depends on factors such as the investor's goals, preferences, and the markets in which it participates (Campbell and Viceira, 2002). Comparing the maturity structure of different investors allows us to have benchmarks and test whether one type of investor is significantly more tilted toward the short term. Moreover, the comparison of different financial intermediaries allows us to control for specific sources of variation in the maturity structure across investors and asset classes. In particular, the within-country comparison across investor types helps us understand the role that different factors play in shaping the maturity structure of portfolios, since it allows us to compare the behavior of investors that operate in the same macroeconomic and institutional environment and face the same set of instruments, but have different incentives. This comparison also sheds light on the inner-workings of financial markets and the way in which they provide financing.

Third, Chile is an ideal benchmark case among emerging markets. Chile has a relatively developed capital market with many types of large institutional investors, and its government has made a conscious effort to provide an adequate institutional and macroeconomic framework and to extend the maturity structure of investments. A series

of government reforms targeted both the supply and demand side of funds and are probably unparalleled regarding the potential impact on long-term capital markets.[7] As a result, Chile is likely one of the emerging economies where the ability of investors to invest long term is the greatest.

Fourth, by working with Chile we are able to use a very large and unique data on detailed portfolio holdings of bank deposits, sovereign bonds, and corporate bonds of mutual funds, pension funds, and insurance companies at high frequencies (monthly, and also daily for pension funds), as well as detailed data on the individual biddings at government paper auctions and returns of government bonds at different maturities. Just the main dataset on asset holdings by Chilean investors contain 436,393 observations for mutual funds, 7,501,210 monthly observations for pension funds, and 2,156,576 observations for insurance companies.

The main findings of the paper can be summarized as follows. Asset-management institutions in Chile (both mutual funds and pension funds) hold a large amount of short-term instruments (bank deposits including cash, government paper, and corporate debt) that can eventually be easily liquidated. For example, over the entire sample period, domestic mutual funds hold 38% of their assets up to one year, 59% up to three years, and 73% up to five years, with an average maturity of 3.88 years. Similarly, pension funds hold 34% of their (non-equity) assets up to one year, 60% up to three years, and 79% up to five years, with an average maturity of 3.16 years. As a benchmark, the

[7] On the supply side, Chile was a pioneer in the development of institutional investors and has established relatively early a broad institutional investor base. For further details, see Raddatz and Schmukler (2008). On the demand side, Chile has introduced reforms to foster capital market development, with corporations and the government issuing a wide range of securities. The central bank has also significantly extended the maximum maturity of local currency bonds issued. Moreover, Chile's stable macroeconomic performance since the early 1990s and its long history of issuing inflation-linked instruments have also reduced the risk of long-term assets and have made placements less costly.

maturity structures of Chilean mutual funds and pension funds are substantially and significantly shorter than that of US mutual funds. For example, while mutual funds and pension funds in Chile hold approximately 60% of their portfolio in assets with a maturity of up to three years, US multi-sector mutual funds (investing in a range of government and corporate paper) hold 24% of their portfolios in assets with a maturity of up to three years and have an average maturity that reaches 9.55 years.

We then explore what might be behind the short-termism by studying the role of the supply side of instruments, tactical behavior, risk, and incentives. We find that short-termism is not determined by the supply side of instruments or tactical behavior. Although we do not explicitly model the demand and supply of bonds and the patterns described above are simply equilibrium outcomes of portfolio holdings, data on pension funds suggest that they do not seem to be constrained by the availability of long-term bonds. For example, of the outstanding government and corporate debt, pension funds do not exhaust the supply of long-term instruments. Importantly, data on individual biddings at government paper auctions suggest that pension funds bid less aggressively for long-term instruments, both relative to other instruments and relative to insurance companies. Furthermore, the behavior of pension funds does not seem to be driven by low returns. In fact, the returns on long-term bonds are significantly larger than those of short-term bonds. Regarding tactical behavior, daily data suggest that pension funds do not use their cash and other short-term investments to take advantage of buying opportunities that arise because of fire sales related to crises.

The risk profile of different investment instruments and agency factors that tilt manager incentives seem to play an important role in explaining the short-termism

observed. For example, estimates of returns of government bonds of different maturities suggest that, given the risk-return tradeoff, investors with a short-run horizon have more incentives to invest in short-term instruments relative to investors with a long-term horizon. Namely, while long-term assets yield higher returns at a higher risk, the risk-return relation diminishes as the investment horizon lengthens. This evidence suggests that the preference of mutual and pension funds toward short maturities could be explained by them having short-term investment horizons. Otherwise, the risk-return profile might induce these institutions to invest more long term.

The incentive structure for managers in the context of principal-agent problems seems important to understand their investment horizon.[8] Incentives come from at least two sources: short-run monitoring and the liability structure. The fact that long-term assets are more volatile than short-term ones poses a risk to asset managers with short horizons. Managers are monitored in the short run by the underlying investors that can redeem their shares (as shown by the mutual fund outflows), the regulator (in the case of pension funds) that imposes penalties when a fund deviates from the industry average, and their asset-management companies that tend to set compensation based on performance relative to the peers. Short-term monitoring induces a short-run investment horizon for managers, and thus short-term investments.

An additional piece of evidence showing the importance of incentives is that the maturity structure of Chilean insurance companies is substantially more tilted toward the long term, with an average maturity of 10.32 years. The main difference between

[8] In this paper, incentives refer to factors that arise because of principal-agent problems when funds are intermediated. Incentives may affect managers' effective risk aversion and tilt their behavior toward the short term (Stein, 2005). But risk aversion can also exist beyond these organizational factors. That is, while incentives are affected by the risk embedded in different instruments, both incentives and risk can be separately important.

insurance companies and mutual and pension funds is that the former have long-term liabilities since investors are promised a defined benefit. In addition, unlike insurance companies, mutual and pension funds are open-end funds from which investors can liquidate their shares on demand. Therefore, insurance companies gain from matching the maturity structure of their assets and liabilities and can take advantage of long-term arbitrage opportunities. Mutual and pension funds, on the other hand, are pure asset managers and have incentives to invest short run, regardless of the ultimate investment horizons of their underlying investors. The evidence from insurance companies reinforces the conclusion that the maturity structure of asset managers is not driven by the supply side of instruments, but that the equilibrium outcome given risk-return and incentives is that mutual funds and pension funds hold the short term of the available assets.

The rest of the paper is organized as follows. Section 2 describes the data. Section 3 characterizes the maturity structure of Chilean institutional investors. Section 4 analyzes the factors that might determine the maturity composition of institutional investors. Section 5 concludes.

2. Data

The main data used in this study consist of asset-level holdings of institutional investors and come from different sources. The data on Chilean mutual funds and insurance companies come from the Superintendency of Securities and Insurance (*Superintendencia de Valores y Seguros, SVS*). The data on Chilean pension funds, the most comprehensive data, come from the Superintendency of Pensions (*Superintendencia de Pensiones, SP*). The data on US mutual funds come from Morningstar. Other type of

data used and described throughout the paper come from the Central Bank of Chile (*Banco Central de Chile*) and other sources. Appendix Table 1 shows a summary of the main data.

The data on Chilean mutual funds contain detailed portfolios of all existing medium- and long-term funds at a monthly frequency during the period September 2002 to December 2005. The database comprises 436,393 observations. It includes information on the type of security, currency denomination, price, units held, and maturity date. In addition to these medium- and long-term funds, there are a similar number of short-term mutual funds providing money market services. We exclude those from the analysis to focus solely on funds established to invest long term.[9]

For pension funds, we use a panel of their portfolio investments in fixed-term assets for each of the existing funds during the period 1996-2005 at monthly and daily frequencies. We perform more detailed analysis for the period 2002-2005, when the investment options expanded to more funds. We use panel data with the amount of deposits (including cash as deposits with a one-day maturity), corporate bonds, and government bonds held by fund per unit of time.[10] At a monthly frequency, there are a total of 7,501,210 observations, representing the portfolio holdings of the funds. The dataset contains information on the holdings of 104,789 different securities for 57 funds

[9] Chilean mutual funds are classified according to the type and investment horizon of their assets. Fixed-income funds include money management funds (with horizons of less than 90 days or less than 365 days) and medium- and long-term funds. We only use the latter two, since the first ones would be tilted toward the short term by construction. In 2008, approximately 60% of the existing funds were categorized as medium- or long-term funds, 12% as money management funds (less than 365 days), and 28% as money management funds (less than 90 days).

[10] Since September 2002, each pension fund administrator (PFA) offers by law five funds with different risk profiles and investments in equity, subject to different portfolio regulations. The PFAs organize their trading desks in different forms that vary over time. For example, some pension fund companies have specialists for each asset class across fund types while others have dedicated managers for each fund, selecting the portfolio in each asset category.

between July 1996 and December 2005. In addition to this monthly dataset, we use in another exercise a subset of a different dataset with daily portfolios of the universe of funds and pension fund administrators (henceforth PFAs) in operation, which contains 201,288,833 observations for 62 funds between July 1996 and July 2008.[11] The daily data have the same fields included in the monthly database.

The data on Chilean insurance companies comprise monthly portfolio holdings from June 2002 to December 2005. The database contains 2,156,576 observations corresponding to the fixed-term assets of 36 insurance companies. Information on security type, maturity date, and currency, among others, are available in this dataset.

The data on the maturity structure of US bond mutual funds come from Morningstar. The available data consist of the fraction of the total portfolio invested at different maturities (up to three years, between three and five years, five and seven years, seven and ten years, ten and 15 years, 15 and 20 years, 20 and 30 years, and above 30 years). We use the universe of 167 US bond mutual funds (multi-sector and short-term mutual funds) operating between 2003 and 2005. Due to limited data availability we use annual data with a total of 3,816 data points.[12]

3. Maturity Structure

We describe the demand for long-term assets by concentrating first on the maturity structure of Chilean mutual funds. Figure 1 plots the fraction of investments in

[11] The difference between the number of funds in the monthly and daily datasets is due to the extended period the daily dataset covers.

[12] We use Morningstar's categories to group US bond mutual funds (short-term and multi-sector funds). Short-term bond mutual funds invest in a variety of bonds, from the most creditworthy, such as government bonds, to mortgage and corporate bonds (they may invest in more speculative high-yield and emerging market debt on rare occasions). Multi-sector bond mutual funds are usually more diversified than other types of bond mutual funds, investing in a wide range of foreign and domestic government and corporate bonds. Data are available for 125 short-term mutual funds and 42 multi-sector mutual funds.

fixed-term assets per year-to-maturity, both within each maturity range and accumulated. The figure is built by determining at each point in time (each month) the term to maturity of each instrument in a mutual fund portfolio, measuring the fraction of the value of all assets invested at different terms to maturity, and then averaging these fractions across mutual funds and time. Let $d_{i,t}$ and $w_{i,t}^{\ k}$ denote the term to maturity of asset *i* at time *t*, and the share of fixed-term assets invested in asset *i* at time *t* by fund *k*, respectively. The fraction of fund *k*'s fixed-term assets with term to maturity D is

$$W_{D,k,t} = \sum_i w_{i,t}^{\ k} I(d_{i,t} = D), \tag{1}$$

where *I* denotes an indicator function that takes on the value one if the condition is met. The average fraction of fund k's fixed-term assets invested at maturity D across time is

$$W_{D,k} = \frac{1}{T_k} \sum_{t=1}^{T_k} W_{D,k,t}, \tag{2}$$

where T_k is the number of periods in which mutual fund k is active. Finally, the overall average fraction of fixed-term assets invested at maturity D across mutual funds and months corresponds to

$$W_D = \frac{1}{N} \sum_{k=1}^{N} \frac{T_k}{T} W_{D,k}, \tag{3}$$

where *T* denotes the number of months included in the entire sample period, and N is the number of active mutual funds. The fractions computed correspond to the empirical probability distribution function (PDF) of the term to maturity of a Chilean peso invested by mutual funds in fixed-term assets. The empirical cumulative distribution function (CDF) of the term to maturity can easily be obtained by adding these fractions up to a

given maturity. Finally, in addition to the average CDF, Figure 1 also reports the 25th and 75th percentiles of the CDF across mutual funds.

Figure 1 shows that Chilean domestic mutual funds hold a large fraction of their assets short term. For example, they invest 38% of their portfolio up to one year, 59% up to three years, and 73% up to five years. Moreover, they hold almost all of their securities in assets maturing within 15 years (95%). However, the distributions vary greatly across mutual funds, as shown by the 25th and 75th inter-quartile range across funds, averaged over time: the fraction of the fixed-term portfolio invested up to one year varies between 24% and 50%. Panel B shows that portfolio weights decline exponentially; the highest density is observed at short maturities, after which probabilities systematically decline.

One might expect pension funds to have longer investment horizons. In the end, mutual funds are open-ended investment vehicles subject to redemptions and the investment horizon of their underlying investors is unknown. Moreover, pension funds are at their "accumulation phase," when young pensioners contribute to the funds' growth and outweigh old, retiring pensioners. Therefore, pension funds are receiving constant net inflows and do not need to hold liquid assets to meet cash withdrawals. Furthermore, pension fund investors are saving for retirement, so to the extent that pension fund managers represent the interest of the pensioners their investment horizon should be at least as long as that of mutual fund investors, and probably much longer.

Figure 2 shows the maturity structure of Chilean pension funds for the entire sample period 1996-2005 and for the multi-fund period 2002-2005. In both periods, PFAs are heavily invested in short-term assets. For example, for the entire (multi-fund) period, they invest 24% (34%) up to one year, 45% (60%) up to three years, and 74% (79%) up

to five years. Moreover, they hold almost all of their securities in assets maturing within ten years (98% and 96% for the entire and multi-fund periods, respectively). The distributions do not vary much by PFA as shown by the 25th and 75th inter-quartile range calculated across PFAs and averaged over time. The fraction of the fixed-term portfolio invested up to one year varies only between 21% and 28% during the entire sample period, and between 32% and 37% during the multi-fund period. Even smaller degrees of dispersion are observed at other ranges of the CDFs. Panels A2 and B2 show that the portfolio weights decline exponentially, similarly to the case of mutual funds although presenting a higher degree of volatility.

Figure 3 compares Chilean mutual and pension funds.[13] The distributions of both types of institutional investors differ at very short and very long maturities, but otherwise are very similar. For example, Panel C shows that both pension and mutual funds hold around 60% of their fixed-term assets at a maturity of up to three years, and above that maturity pension funds are slightly more short-term investors relative to mutual funds: pension funds hold 79% of their assets up to five years and 88% up to seven years, while mutual funds hold 73% and 80% up to that maturity, respectively. These small differences are not statistically significant. As shown in Panel D Columns (ii) to (viii), for most of the reported maturity cuts, standard t-tests cannot reject the hypotheses that the average fraction of assets held by pension funds and mutual funds are equal. As a result, the average maturities of assets held by pension funds (3.16 years) and mutual funds (3.88 years) are not very different (even in statistical terms), as shown in Column (i).

[13] We compare mutual and pension funds during the multi-fund period (September 2002 to December 2005). Although pension fund data are available for a longer time period, the rest of the paper (with the exception of Figure 6) uses pension fund data for only the multi-fund period to have a comparable sample period across all investor types.

However, because of the differences observed at maturities shorter than six months and longer than 15 years (Columns ii and vii), a two-sample goodness-of-fit test for functional-data (henceforth KS test) rejects the hypothesis that the observed maturity structures of pension funds and mutual funds are generated by the same underlying distribution (Column ix).[14] In unreported results, when we compare the maturity structures at monthly frequency with a coarser distribution (as the one used in Figure 4), the hypothesis that the maturity structures of these two types of investors are generated by the same distribution cannot be rejected at conventional levels.

Although the maturity structures of Chilean mutual and pension funds look short term, it is helpful to compare them to that of other institutional investors that can serve as benchmarks. To do so, we analyze the maturity structure of US fixed-income mutual funds. US funds provide a useful benchmark of how funds operating in a developed capital market (with a different set of investment opportunities) behave. To compare Chilean mutual and pension funds to US mutual funds, we present the maturity structures grouped within eight large bins, determined by the availability of US mutual fund data from Morningstar.

[14] This test was proposed by Cuesta-Albertos et al. (2006), and consists on applying a standard two-sample Kolmogorov-Smirnov (KS) test to the random projections of each set of functional data; in our case the samples of maturity structures of all pension funds and mutual funds, respectively. We start by forming two groups of vectors of length M corresponding to the time-average maturity structures of all individual pension and mutual funds $W_{D,k} = (1/T)\sum_t W_{D,k,t}$, discretized by month, with M corresponding to the longest maturity observed (in months). Each of these vectors is projected on a random direction $h \in \mathbb{R}^M$, obtaining two samples of random projections (one for each type of investor) of sizes n_1 and n_2, the number of pension funds and mutual funds respectively. The standard two-sample Kolmogorov-Smirnov test is then applied to these samples. The process is repeated M times using different random directions, and the resulting set of p-values is adjusted for false discovery rate under dependency as in Benjamini and Yekuteli (2001). The p-value reported in the table corresponds to the minimum of the adjusted p-values, which indicates the level of confidence with which at least one of the M hypotheses can be rejected. An alternative statistic proposed by Cuesta-Albertos et al. (2007), based on the fraction of rejections among the M hypotheses, yields similar conclusions (not reported).

Figure 4 shows that Chilean mutual and pension fund holdings are much more tilted toward the short term than those of US mutual funds. This is even the case when comparing pension funds to US short-term mutual funds. For example, while pension funds hold 60% of their fixed-term instruments in assets with maturity of up to three years, US multi-sector and short-term mutual funds hold, respectively, 24% and 48% of their portfolio in assets with that maturity. The differences persist throughout the distribution. For example, Chilean pension funds hold 79% in assets up to five years, while US mutual and short-term funds hold only 37% and 64%, respectively, at that horizon. While Chilean pension funds practically do not hold assets with a term to maturity above 15 years, both US multi-sector and short-term mutual funds hold, respectively, 22% and 20% of their portfolio in assets with a term to maturity above 15 years, with some instruments surpassing a maturity of 30 years. All these differences result in a much longer average maturity for US multi-sector and short-term mutual funds (9.55 and 7.76 years, respectively) than for Chilean pension funds and mutual funds (3.16 and 3.88 years, respectively).

The distributions in Figure 4 are statistically different at all conventional significance levels. Standard t-tests reported in Columns (i) to (vii) of Panels D show that, at almost all maturity cuts and in terms of average maturities, Chilean pension and mutual funds are shorter than both US multi-sector and short-term mutual funds at a 1% significance level. Consistently, the KS tests show that the hypothesis that the two distributions compared in each panel are identical can easily be rejected.

4. What Drives the Maturity Structure?

This section analyzes potential factors that may contribute to short-termism and studies to what extent they might play a role in determining the maturity structure of Chilean institutional investors. By relying on different types of evidence, we focus on four factors: (a) instrument availability, (b) rebalancing (tactical behavior), (c) risk of investment instruments, and (d) managerial incentives.

4.A. Instrument Availability

It is possible that mutual and pension funds purchase short-term instruments because long-term ones are not available. Since emerging markets tend to borrow short term and most of the holdings are in domestic bonds, mutual and pension funds' fixed-term investments could simply be constrained by the availability of long-term instruments due to borrower decisions. To study the role of the supply side of instruments we analyze unique data on bonds held relative to bonds outstanding and bids at government bond auctions.

Figure 5 shows the total amount of bonds issued by the government at different maturities between 1998 and 2008 and the fraction of those issuances purchased by pension funds. The figure contains separate panels per currency: nominal Chilean peso, indexed (inflation-linked) Chilean peso (also known as UF), and US dollar. The figure shows that in all cases pension funds purchase significantly less than the total amounts issued. On average, pension funds purchase 3% of issuances in Chilean pesos, 40% of government issuances in inflation-indexed pesos, and 15% of issuances in US dollars. Also, within each denomination, the fraction of long-term issuances purchased by

pension funds is not much larger than that of short-term issuances. Even when looking at inflation-indexed bonds, the share of bonds with maturities above ten years purchased by pension funds is only 41% (compared to 39% for indexed bonds with less than ten years of maturity). This observation is relevant because government bonds are considered relatively safe investments.[15]

Regarding corporate debt, there is no information on the amount of issuances purchased by PFAs. However, we have data on the amount of corporate debt held by PFAs as a proportion of the outstanding corporate debt and their average maturities. Table 1 shows that PFAs hold on average 40% of outstanding corporate debt, declining from 58% in 1997 to 28% in 2004. PFA's holdings are tilted toward issues with shorter maturities. While the average maturity of the outstanding debt is about 13 years, the average maturity of the debt held by PFAs is only five years.[16] Again, this type of information suggests that PFAs have not been constrained to expand their holdings of long-term bonds.[17]

While the evidence above helps us explore whether any type of institutional investor is exhausting the supply of long-term instruments, borrower decisions to issue

[15] Although PFAs and other Chilean institutional investors could extend the maturity of their holdings in domestic bonds, instrument availability can mechanically explain part of the differences observed with the US because the longest maturity available in Chile is shorter than that available in the US. Nevertheless, the documented differences in maturity structure between Chilean and US institutional investors are too large to be fully explained by the availability of instruments at the long end of the maturity structure. If we remove all investments beyond 20 years from the portfolios of US mutual funds and re-calculate the maturity structure up to 20 years only, US multi-sector mutual funds remain longer than Chilean funds and Chilean PFAs and mutual funds display a maturity structure similar to that of US *short-term* mutual funds.

[16] While there is no information on the amount of corporate debt issuances purchased by PFAs, we use data on the corporate debt holdings of PFAs as a proportion of the outstanding corporate debt (from Braun and Briones, 2008) and information on the average maturities of PFA corporate debt holdings compared to the average maturity of outstanding corporate debt (from the Chilean Superintendency of Pensions and the Superintendency of Securities and Insurance).

[17] With respect to the banking system, the proportion of certificate deposits held by PFAs has been very stable, oscillating between 25% and 30%. But banking sector information is less relevant to assess the extent to which PFAs might be constrained by instrument availability because banks can accept any amount of deposits.

securities likely depend on the demand for different maturities and what we observe is an equilibrium outcome of supply and demand of instruments of different maturities. To complement the preceding analysis, and shed more light on the underlying demand of different institutional investors for securities with different maturities, we use unique data on auctions of government paper. The dataset consists of detailed information on biddings for government bonds (in pesos, inflation-indexed pesos, and US dollars of maturity one year or longer) issued by the Central Bank of Chile and the Treasury between 2002 and 2009. The data come from the central bank, which organizes these auctions. The dataset has information on biddings made by banks, insurance companies, and pension funds. Banks are likely to bid both for themselves and other institutions, notably mutual funds and small insurance companies that do not bid directly. This means that we cannot separately identify the bidding behavior of mutual funds. For this reason, and in light of the similarities in maturity structure between pension and mutual funds, we focus our analysis on the bids of pension funds. Although we do not explicitly analyze the bank bids, they are included in the sample as a control group. In total, the dataset contains 1,185 auctions and 20,937 bids.

With the auction data, we estimate how much pension funds request at different maturities and what price they offer for each quantity requested. We also compare the behavior of pension funds and large insurance companies. Table 2 shows the results, indicating when the differences between requests at different maturities (within institutions) are statistically significant. Estimated quantities are reported as a share of the total auction amount. Panel B reports the ratio of the share requested by insurance companies and pension funds at each maturity, in the same auction. When an investor is

not bidding for an issuance we impute a zero for the quantity requested, but the estimations for prices only include information for those investors that present a bid. For this reason, the ratios of shares reported in Panel B do not include the cases when pension funds do not bid for a security, biasing the results against finding larger shares bid by insurance companies.

Table 2 Panel A shows that pension funds request larger shares of the issuance than insurance companies at most maturities, except for 30 year instruments. The shares requested by insurance companies increase monotonically with time to maturity. When comparing prices offered by both institutional investors, pension funds offer significantly higher prices for five and ten year bonds, while no differences are observed between prices offered for 20 and 30 year bonds. A larger amount bid for by pension funds is expected since pension funds are significantly larger investors than insurance companies. Thus, a smaller request of 30 year bonds reflects less preference by pension funds for those long-term instruments, especially considering that similar prices are offered for them across institutional investors. Furthermore, although pension funds typically ask for larger shares of issuances, the ratio between the quantities demanded by insurance companies and pension funds hits a through for bonds of ten year maturity (Panel B). In fact, insurance companies request 60% of the amount requested by pension funds of 20 year bonds and more than three times that of 30 year bonds.

The results in Table 2 show that pension funds bid for short-term instruments more aggressively than insurance companies; their bids weaken with the maturity of the bonds issued and even reverse for 30 year bonds. Moreover, the behavior of pension funds does not seem to be driven by low returns on long-term bonds. In fact, as shown

below in Section 4.C, the long-term bonds yield substantial returns when compared to short-term ones.

To conclude, although the evidence presented in this section is not derived from formal estimates of the demand functions, and takes the supply as given, the overall results suggest that the short-termism of pension funds is not significantly constrained by the supply side of instruments. Pension funds seem to demand less heavily bonds with longer maturities and their demand seems to play an important role in their short-termism.

4.B. Rebalancing

Institutional investors might hold a large fraction of short-term assets for tactical purposes to respond opportunistically to shocks, rebalancing their portfolios and taking advantage of good buying opportunities. This is known as "cash-in-the-market" pricing, and refers to the idea that holding liquidity is costly because less liquid assets have higher expected returns, but agents may hold liquidity because on occasion they are able to make a profit by buying assets at fire-sale prices (Allen and Gale, 1994, 1998; and Allen and Carletti, 2008).

To shed light on the rebalancing effects, we use unique data from the Superintendency of Pensions to display the behavior of short-term assets during crisis times.[18] We focus on pension funds because we have exclusive access to high frequency

[18] In the working paper version of this paper, we also analyze many regulatory changes related to pension funds. Since these regulatory changes have typically been announced in advance, PFAs could accumulate liquidity prior to the deregulation to take advantage of such changes. In other words, if PFAs hold liquidity to take advantage of investment opportunities we should expect an increase in short-term holdings before the limits change and a reduction after their implementation. We find that that around the regulatory events the portfolio share of short-term assets does not change significantly. Namely, we find no evidence of liquidity hoarding before the regulatory changes.

(daily) portfolio data. Since, as we show below, pension funds experience significantly less outflows than mutual funds, they should be especially able to use their liquidity to take advantage of market opportunities in turbulent times instead of meeting redemptions.

Several papers have proposed that crisis periods in emerging markets are frequently related to lack of liquidity, when assets are sold at fire-sale prices (Krugman, 1998; and Aguiar and Gopinath, 2005). There is also evidence that at least international investors tend to react to price changes (Borensztein and Gelos, 2003; Kaminsky et al., 2004; Broner et al. (2006); and Hau and Rey, 2008). So the natural question here is whether the domestic investors, who know the domestic market and have deep pockets, are the ones on the other side of those selloffs. To analyze changes in the short-term portfolio during crises, we study the evolution of short-term assets held by pension funds during the Asian and Russian crises of 1997-1998.

Figure 6 shows the evolution of short-term assets during the major crisis period in the sample, indicating the dates of some of the main events in international financial markets. The pattern of short-term asset holdings shows an increase from an average of 2% one week before the Asian crisis hit South Korea in November 1997 (with the downgrade of Korean debt) to more than 3% two weeks afterward, and remains high for the rest of this turbulent period. If anything, the evolution of short-term assets is more consistent with a flight-to-liquidity strategy than with the hoarding of liquidity to take advantage of fire-sale asset prices. Results for the evolution of short-term assets around the September 11, 2001 terrorist attack yield similar conclusions (not reported).

In sum, while the evidence analyzed here does not explain the average high holdings of short-term assets by pension funds, it illustrates whether pension funds use

their large short-term positions to take advantage of buying opportunities. The evidence that short-term positions do not seem to decrease during the type of events analyzed here seems inconsistent with pension funds holding liquid assets to act opportunistically.

4.C. Risk of Investment Instruments

Standard models of asset allocation indicate that the portfolio composition of an investor depends on the risk-return combination of the different assets available for investment (Campbell et al., 2001; and Campbell and Viceira, 2002). Thus, in principle, the short maturity structure of Chilean asset managers could result from the risk profiles of the assets in which they invest. We explore next some the risks involved.

A first potential explanation related to risk is that inflation could tilt portfolios toward shorter maturities. Inflation movements are difficult to predict in the long term, adding extra risk to the price of bonds with longer maturities. In other words, the comparisons presented above could be misleading since they aggregate all fixed-term instruments held by Chilean mutual and pension funds, including those in different currencies. To address this issue and shed light on how risk might be affecting managerial decisions, we report the maturity structure of portfolios by currency, separating the holdings in nominal pesos, "hard currencies" (US dollar, euro, British pound, and yen), and indexed pesos (inflation-linked).

Figure 7 shows the maturity structure of mutual funds and pension funds by currency. In the case of mutual funds, the maturity structure of holdings in pesos is similar to that in hard currencies (with holdings in pesos slightly longer), while the maturity structure of holdings in inflation-linked pesos is significantly longer. In the case

of pension funds, the maturity structure differs significantly across currencies. Pension funds are very short-term investors in pesos, less so in hard currencies, and even less so in inflation-linked instruments. For example, 56% (76%) of peso holdings are held in instruments maturing in less than one (three) year(s). On the contrary, less than 50% of hard-currency assets and about 30% of inflation-linked ones are in assets maturing in less than one year. The differences in the distributions are statistically significant, as shown by the KS tests displayed in Panel E.

The patterns illustrated in Figure 7 are consistent with pension and mutual funds being more tilted toward the short term in assets with higher long-term risk. The price of nominal peso instruments responds to inflation volatility, which tends to increase with the maturity of the bond, thus the short-term structure. Hard currency bonds expose Chilean investors to currency and inflation risks. Therefore, investors would be more willing to go long in hard currencies than in Chilean pesos if holding hard currencies allowed investors to hedge part of the inflation risk, which does not seem to be strongly the case in Chile.[19] Not being exposed to currency or inflation risk, indexed peso bonds are relatively less risky than peso and hard-currency bonds, especially at longer maturities, which could account for the willingness of Chilean investors to buy more long-term indexed peso instruments. Therefore, for some types of instruments, asset managers might perceive a tradeoff between maturity, on the one hand, and currency and inflation risks, on the other hand. When managers can reduce those risks, they seem more willing to invest more long term. Still, the evidence shown here suggests that mutual and pension funds hold a significant fraction of short-term assets even when risks are reduced. For

[19] While the correlation between monthly inflation and depreciations of the Chilean peso against the US dollar between 1990 and 2008 is about 0.17, the correlations between annual and bi-annual inflation and depreciations are 0.35 and 0.49, respectively.

example, the average maturity for holdings of indexed peso bonds is 6.7 and 3.6 years for mutual and pension funds, respectively.

In addition to the risk of different investment instruments, there exist the risks of investing at different maturities. Available evidence from other emerging markets suggests that, if anything, investors in emerging markets should tilt their portfolios toward the long term relative to investors in developed countries.[20] Here, we complement the existing evidence by compiling new data on prices of inflation-indexed government bonds at different maturities, measured, alternatively, by indices of traded bonds at different maturity buckets and indices derived from a model-based estimation of the yield curve.[21] We compute average returns, standard deviations, and Sharpe ratios (average returns over standard deviations) for securities of different maturities over different holding periods. These estimates are useful because, assuming zero covariance across bonds of different maturities, portfolios should be proportional to the Sharpe ratios.

Figure 8 shows that, as expected, investing in long-term bonds yields higher returns, albeit at a higher risk. For example, over a holding period of three months, annualized returns for the five year bond index is approximately 4%, in contrast to 7% for the 15 year bond index. Standard deviation also rise, with longer maturities being 4% and 7% for five and 15 year bond indices respectively, also considering a holding period of three months. In nearly all cases, higher standard deviations are observed when decreasing the holding period, especially so for the longer-term maturities.

[20] Broner et al. (2007) compute Sharpe ratios of short- and long-term bonds in various emerging markets (excluding Chile) and show that, on average, the difference in the Sharpe ratio of long- and short-term bonds is higher in emerging markets than in developed countries.

[21] We focus on inflation-indexed securities because, as discussed above, they are the ones that better allow investors to reduce risk and invest more long term. On a more pragmatic note, bonds issued by the central bank at maturities beyond ten years are almost exclusively inflation indexed. The price information comes from RiskAmerica, a private company that provides fair value pricing for the Chilean fixed income market. These prices are widely used by institutional investors that mark their portfolios to market.

The estimates also suggest that, given the risk-return tradeoff, investors with a short-run horizon have more incentives to invest in short-term instruments relative to investors with a long-term horizon. For example, Sharpe ratios for bond indices present a flat structure along different maturities for short holding periods but tend to increase with the maturities for longer holding periods. Similarly, Sharpe ratios obtained from the model of the yield curve (Panel B.3) strongly decline with maturity for short holding periods (except for maturities below three years) but are relatively flat for longer holding periods. Regardless of the maturity, Sharpe ratios are larger for longer holding periods, but especially so for longer maturities. This evidence suggests that, given the risk return profile of Chilean securities, the portfolios of investors with short horizons will be more biased toward short-term securities than those of investors with long horizons. Thus, the bias of mutual and pension funds toward short maturities could be explained by short-investment horizons.

Taken as a whole, the evidence from this section suggests that the risk profile of the available investment opportunities affects the degree of short-termism of mutual and pension funds. Institutional investors in Chile are sensitive to the risks involved in investing in different instruments. However, as we analyze next, these risks affect managers depending on the incentives they face.

4.D. Managerial Incentives

Traditional theories of asset allocation focus on the problem of an isolated investor whose goal is to maximize wealth or consumption at some point in time. But several papers study the incentives schemes that arise in the context of financial

intermediation, in particular, how the conflicts of interest between fund managers and underlying investors affect manager risk-taking behavior (Sharfstein and Stein, 1990; Shleifer and Vishny, 1990; Chevalier and Ellison, 1999; Kapur and Timmermann, 2005; and Stein, 2003, 2005). There are at least two factors that can affect manager incentives and that are analyzed here: short-run monitoring and the liability structure.

Short-run monitoring can be exercised by the underlying investors, the regulator, and the asset management companies. Short-term monitoring induces a short-run investment horizon for managers, and thus leads to the holding of short-term instruments because the higher volatility of long-term assets poses an additional risk to asset managers. In other words, short-run monitoring generates incentives for managers to be averse to engaging in investments that are profitable at long horizons (like holding long-term bonds) but can have poor short-term performance and let managers away from their competitors (Stein, 2005). If the risk of long-term investment is large, it would be difficult to deviate from an equilibrium in which all managers hold short-term returns. In contrast, an equilibrium in which all managers are tilted toward long-term investments is not sustainable to the extent that monitoring takes place on a short-term basis.

The underlying investors can play an important role in how managers allocate the maturity structure of their portfolio through the redemptions or outflows they generate.[22] Outflows are costly to managers because they force them to liquidate assets, reducing at the same time the pool of assets they administer and their associated fees (Rajan, 2005). Higher outflows or liquidity needs are usually associated with higher cash reserves or less

[22] Since mutual funds are open-ended investment vehicles, investors decide at each point in time how much funds they invest, and they may decide to withdraw their investments at any moment. In the case of pension funds, pensioners must contribute to the pension fund system, but they are able to select any PFA (and any fund within the PFA itself). Namely, pensioners can switch among funds, both across and within administrators, but they have to stay within the system.

volatile short-term assets. Furthermore, outflows might reflect the way in which underlying investors conduct their short-run monitoring, generating market discipline on a high frequency basis.

To analyze how significant outflows (negative inflows) are and whether they might be related to performance, we compute the outflow that each fund faces each month. We calculate the net inflows to a fund k at time t, I_t^k, as the change in the fund value W_t^k during a month, adjusted by the gross return of the portfolio in that month R_t^k:

$$I_t^k = W_t^k - W_{t-1}^k(1 + R_t^k)\,. \tag{4}$$

We use this method to calculate net inflows to mutual funds. For pension funds, we compute this measure by aggregating daily data on net inflows into each fund, directly collected by the Chilean Superintendency of Pensions.[23]

The results are displayed in Figure 9. Panel A shows the cumulative distribution of net inflows I_t^k relative to fixed-income assets for Chilean mutual funds and PFAs. As a benchmark, we also report those of US mutual funds. Negative (positive) values are outflows (inflows). The figure shows that Chilean mutual funds face significant outflows. For example, the historical probability of experiencing a net outflow of 3% of the portfolio or more is 33%. To complement this evidence, Panel B shows the fraction of fixed-term assets held in short-term assets (up to one and three months) and the probability of outflows of that magnitude.[24] Chilean mutual funds hold 9.3% of their fixed-term assets in instruments with maturity of less than one month, and the probability

[23] Though not reported, we also computed the monthly inflows using the values and returns derived from our monthly database and obtained qualitatively similar results.

[24] The values reported correspond to the probability that would be required to have a value at risk (VAR) equal to the fraction of fixed-term assets held by funds at maturities of up to 30 and 90 days. For US funds, we do not have information on the maturity structure at less than three years, so we use the extreme assumption that within the zero to thee year interval, the maturity structure of US funds is proportional to that of Chilean mutual funds.

of an outflow of that magnitude occurring is almost 22%. US multi-sector bond funds are subject to fewer outflows. For example, the historical probability of experiencing a net outflow of 3% of the portfolio or more is 9% (instead of 33%). Therefore, the short-termism of Chilean mutual funds might be partly explained by the relatively large outflows they face.

Chilean pension funds, on the contrary, are not exposed to significant outflows. The distribution of net inflows of Chilean PFAs is significantly tilted to the right. So redemption risk does not seem to be an important factor explaining pension funds' short-term holdings. For example, a net outflow of 1% of the portfolio has a historical probability of 3% for PFAs and 38% for mutual funds. Though they face very different outflows, the short-term positions of mutual funds and pension funds are not very different, as shown in Figure 3.[25] The estimations reported in Figure 9 Panel B also show that pension funds seem to hold a large fraction of liquid assets for low-probability events: they hold 4.4% of their fixed-term assets in instruments with a maturity of less than one month, while the probability of an outflow of that magnitude is negligible. To the extent that there is an opportunity cost of holding short-term instruments, pension funds are paying a high price for their elevated self-insurance levels.

Since mutual funds are subject to significant outflows, we analyze whether these outflows are related to performance, as a sign of short-run monitoring. Table 3 shows the relation between outflows and returns. Indeed, outflows are associated with short-term returns. A positive (negative) return relative to the industry from a previous month is

[25] This is even more striking when one considers that mutual fund redemptions can be systemic aside from idiosyncratic (investors may massively pull out of all mutual funds when market conditions worsen). See Kaminsky et al. (2004). The systemic nature of mutual fund redemptions makes liquidations by mutual funds more costly as all funds liquidate their positions at the same time.

related to an inflow (outflow) into the mutual fund. Since the results are robust to controlling for time (and fund) effects, they are not capturing positive flows to all funds in good times or vice versa, although these flows could be consistent with short-run monitoring. The short-term relation vanishes when we use a longer-term horizon. This indicates that, while outflows respond to short-run performance, they do not seem to be affected by the long-term returns generated by a fund. Though not reported, the relation is never statistically significant for pension funds.[26]

The short-termism of pension funds might be explained by regulatory (rather than investor) short-run monitoring that tries to protect underlying investors. Pension funds are required to yield returns within established margins. In fact, pension fund managers are monitored monthly and are penalized by regulations when they deviate from industry standards, having to cover these losses with their own capital.[27] This regulatory discipline might also help explain why pension fund administration companies monitor their managers through a tracking error model that constrains them to be close to the average pension fund (Roll, 1992; Castañeda, 2007; and Castañeda and Rudolph, 2009). There is also evidence that pension funds display herding behavior (Raddatz and Schmukler, 2008).

[26] In the case of pension funds, for regulatory reasons, PFAs send monthly reports of their real returns to future pensioners and must base their publicity on real returns. Thus, the reduction in real returns resulting from inflation can potentially affect their ability to capture new affiliates or generate outflows. Although there is not much evidence that the number of affiliates changes with returns, the ranking of PFAs by returns (typically used in publicities) seems to be positively correlated with the number of affiliates across PFAs (Cerda, 2005).

[27] Pension funds are subject to a minimum return regulation that establishes that administrators are responsible for ensuring an average real rate of return over the last 36 months that exceeds either (i) the average real return of all funds minus two or four percentage points, depending on the riskiness of each fund, or (ii) 50 percent of the average real return of all the funds, whichever is lower. The average real rate of return to calculate the minimum return changed from 12 months to 36 months in October 1999, giving PFAs more flexibility to deviate in the short term from industry comparators.

An additional significant factor that might affect incentives is the structure of liabilities. To test its importance, we analyze insurance companies. Unlike mutual and pension funds, insurance companies have long-term liabilities as they mostly provide annuities for pensioners and life insurance; moreover, they are not evaluated on a short-term return basis by investors that can pull out their funds.

As shown above, insurance companies bid for more long-term instruments than pension funds at government auctions. Here we take a close look at their portfolio holdings. Figure 10 shows the maturity structure of Chilean insurance companies. The figure shows that insurance providers are much more heavily invested in long-term instruments than mutual and pension funds are. The differences are quite startling. For example, Chilean insurance companies invest 31% of their holdings up to three years, 38% up to five years, and 52% up to ten years, compared to Chilean PFAs that invest 60% up to three years, 79% up to five years, and 96% up to ten years, and to Chilean mutual funds that invest 59% up to three years, 73% up to five years, and 88% up to ten years. These differences are also reflected on the average maturity of Chilean insurance companies (10.32 years) relative to those of mutual and pension funds (3.88 and 3.16 years, respectively). Even compared to US mutual funds, Chilean insurance companies are more long term. For example, US multi-sector mutual funds invest 24% up to three years, 37% up to five years, and 72% up to ten years, and US short-term mutual funds invest 48% up to three years, 64% up to five years, and 75% up to ten years. [28]

In sum, the evidence suggests that the structure of liabilities matters significantly. Merely the shift from being asset managers to being asset-liability managers sharply

[28] Although the comparison with US insurance companies would be interesting, we do not have data on their portfolios.

changes the maturity structure of investments. This comparison is powerful because insurance companies face the same universe of available assets. So changing the incentive structure seems to push managers to invest long term, even in emerging markets. Furthermore, the comparison with insurance companies reinforces the conclusion that it is not the availability of instruments what makes mutual and pension funds invest short term.

5. Conclusions

Using the case of Chilean institutional investors (and US mutual funds as a comparator), this paper studies to what extent institutional investors invest long term and the factors that affect their decisions to hold assets at different maturities. This analysis provides a valuable benchmark for how long the debt maturity structure can be extended in emerging economies. Chilean institutional investors are sophisticated investors and are mostly expected to invest long term. Moreover, Chile has relatively developed capital markets and has made a conscious effort to try to extend debt maturities through a broad range of reforms.

The paper finds that, despite all the favorable conditions, asset managers in Chile are significantly tilted toward the short term, with a large portion of their portfolio in very liquid assets. Regarding the factors that might be driving the short-termism, the evidence from this paper is inconsistent with two hypotheses as determinants of the maturity structure. First, asset managers choose short-term instruments even when assets for long-term investments are widely available, that is, the supply side of instruments does not pose a mechanical constraint. On the contrary, the investor side (the supply side of funds)

seems essential to understand debt maturity structures. Second, evidence from pension funds suggests that institutional investors do not hold short-term instruments for tactical reasons, to take advantage of buying opportunities and purchase assets at fire sale prices.

At least two factors seem to play an important role in shaping investor demand and, consequently, the maturity structure of institutional investors: the risk profile of available instruments and incentives. Mutual and pension funds invest more long term in indexed, which yield less volatile returns. Moreover, mutual and pension funds hold a large proportion of the less risky short-term instruments, even when they yield low returns. Managers forgo higher returns by not investing long-term, especially as their investment horizon expands.

The short-term investment horizon of mutual and pension funds seems to be explained by the incentive structure. In fact, part of the finance literature has already stressed the importance of incentives when there are principal-agent problems due to financial intermediation. In this paper, we show how these incentives lead to investments in short-term instruments. Two types of incentives the paper shows to be very relevant are short-run monitoring and the liability structure of asset managers. First, Chilean mutual funds are subject to substantial investor redemptions that are related in the short run to performance, explaining part of their short-termism. In the case of pension funds, the short-run monitoring is exercised by the regulator, who punished funds that deviate from industry averages (in addition to the monitoring of asset-management companies). Given the volatility of long-term assets, managers can avoid punishment by investing short term. Second, asset managers (those of mutual and pension funds) do not have liabilities, and thus have incentives to invest in short-term assets that are less risky and, as

a consequence, reduce the likelihood of deviating from their peers. In contrast, insurance companies have long-term liabilities and, as a result, the maturity structure of their assets is significantly more long term. In other words, given that asset managers and asset-liability managers face the same investment opportunities, the exercise shows the important role of incentives in shifting the maturity structure of assets, and further rejects the role of the supply side of instruments.

To conclude, despite the benefits of long-term debt, emerging economies seem to face an uphill effort in extending debt maturities, even when many of the ex-ante conditions are in place. In particular, extending debt maturities by just developing institutional investors such as mutual and pension funds seems very difficult to achieve and runs contrary to many of the initial expectations. However, two factors might help. First, a reduction of systemic risk and the provision of instruments that hedge those risks might help investors feel more secure to move long in their maturity choices. While reducing systemic risk seems to be welfare improving, providing hedges might just entail a transfer of risk from creditors to debtors. How this risk is distributed in the economy is material for further research. Second, having the right incentives seems crucial for manager behavior. Merely establishing asset-management institutions and assuming that managers will invest long term does not appear to yield the expected outcome. Moreover, there seems to be a strong tradeoff between, on the one hand, monitoring managers according to their short-term performance (which leads to short-term investments) and, on the other hand, obtaining higher returns and incurring higher risks by investing long term. The socially optimal design to balance this tradeoff is not obvious (Acemoglu et al., 2007) and requires further research.

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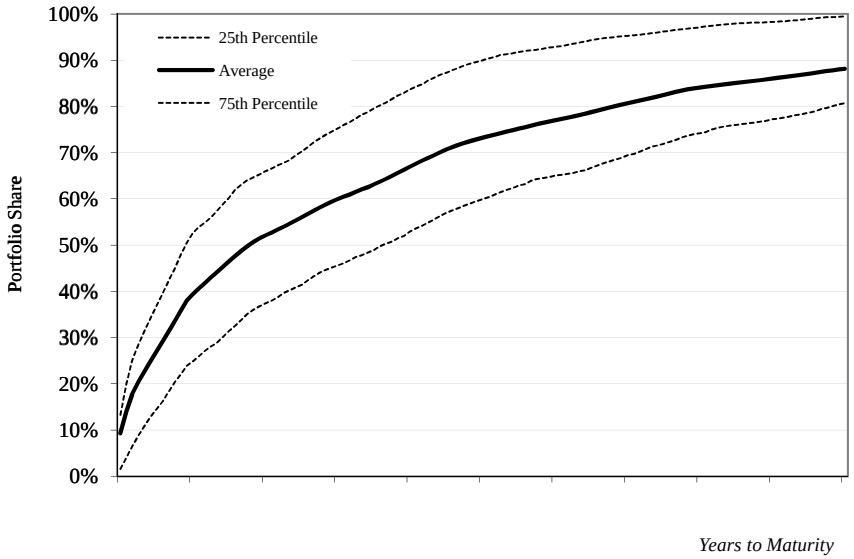
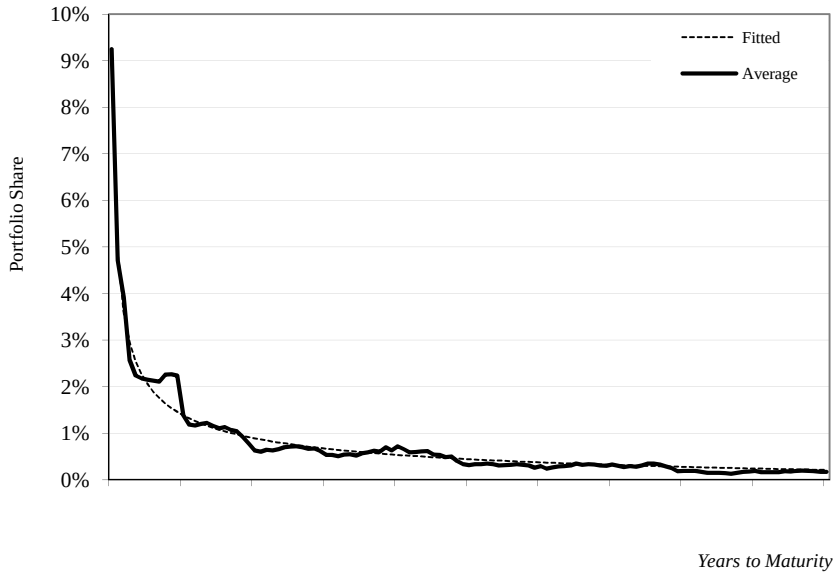
Figure 1
Maturity Structure of Chilean Mutual Funds

This figure presents the maturity structure of Chilean domestic bond mutual funds, that is, the proportion of the portfolio held at different terms to maturity. Shares are calculated as a fraction of the overall portfolio. Only medium- and long-term bond mutual funds are taken into account. The maturity structure is calculated per mutual fund and averaged across funds at each moment in time using monthly bins, and then averaged over time. The sample period is Sep. 2002-Dec. 2005. Panel A shows the average accumulated portfolio weight in each bin as well as the 25th and 75th percentiles across mutual funds. Panel B shows the average total portfolio weight within each monthly bin, along with the fitted value of the fractional polynomial regression of total portfolio weights on the term to maturity in months. Panel C shows the accumulated weights in a table format.

A. Accumulated Weights



B. Weights within Each Maturity Range



C. Accumulated Weights

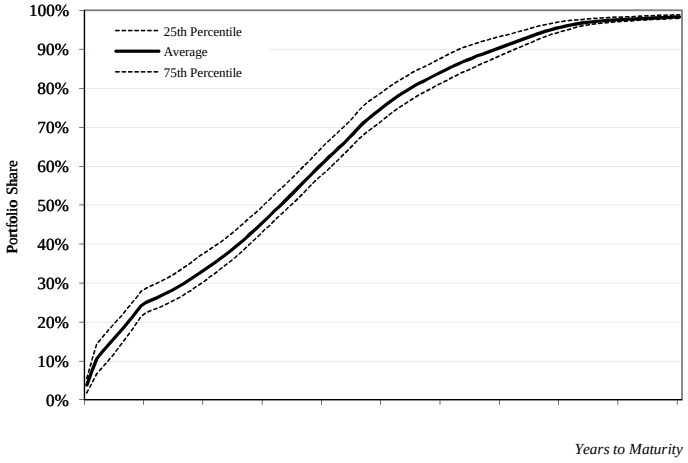
	<1year (y)	<3y	<5y	<7y	<10y	<15y	<20y	<30y
Chilean Domestic Mutual Funds	38%	59%	73%	80%	88%	95%	99%	100%

Figure 2
Maturity Structure of Chilean PFAs

This figure presents the maturity structure of Chilean pension fund administrators (PFAs), that is, the proportion of the portfolio held at different terms to maturity. Shares are calculated as a fraction of the fixed-term portfolio. The maturity structure is calculated per PFA (over all fund types) and averaged across PFAs at each moment in time using monthly bins, and then averaged over time. Panel A shows the results for the entire sample period (Jul. 1996-Dec. 2005) and Panel B for the multi-fund period (Sep. 2002-Dec. 2005). Panels A1 and B1 show the accumulated portfolio weight in each bin, as well as the 25th and 75th percentiles across PFAs. Panels A2 and B2 show the total portfolio weight within each bin, along with the fitted value of the fractional polynomial regression of total portfolio weights on the term to maturity in months. Panel C shows the accumulated weights in a table format.

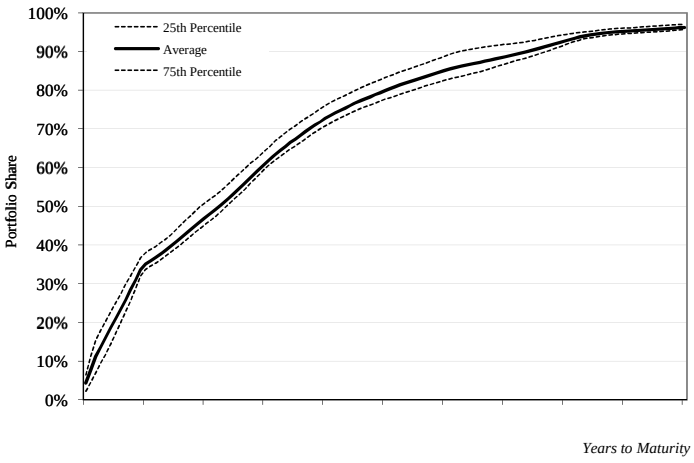
A. Entire Sample Period

A1. Accumulated Weights

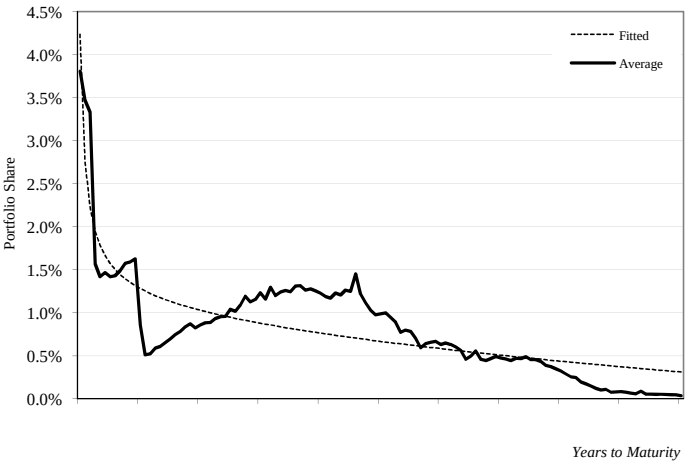


B. Multi-Fund Period

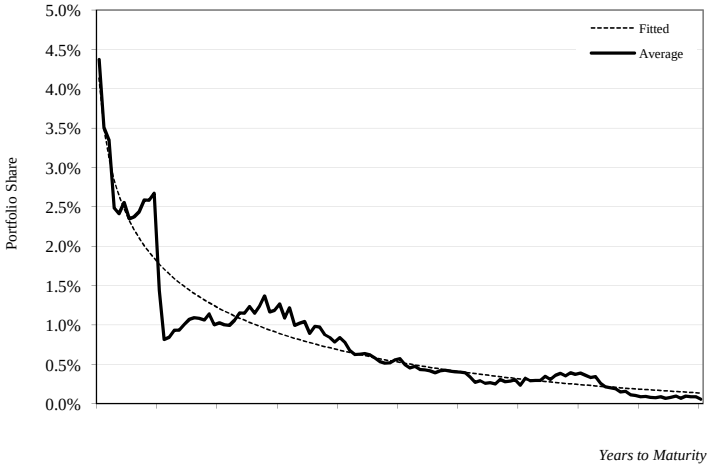
B1. Accumulated Weights



A2. Weights within Each Maturity Range



B2. Weights within Each Maturity Range



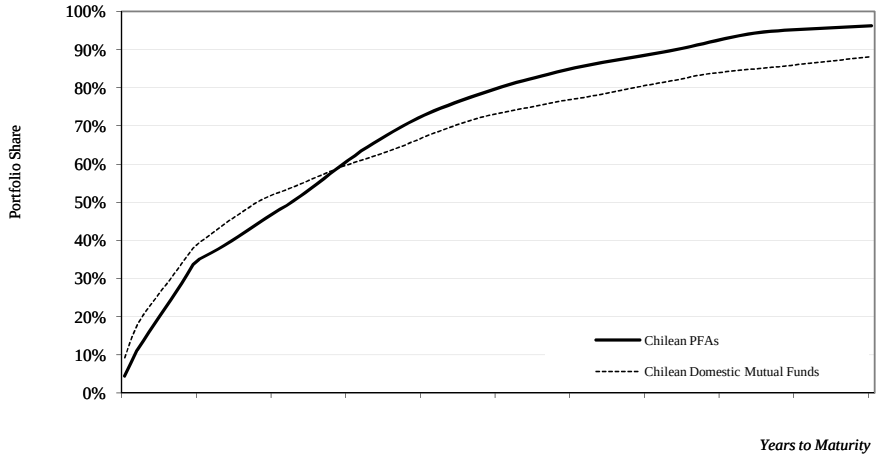
C. Accumulated Weights

	<1year (y)	<3y	<5y	<7y	<10y	<15y	<20y	<30y
Chilean PFAs - Entire Sample Period	24%	45%	74%	90%	98%	100%	100%	100%
Chilean PFAs - Multi-Fund Period	34%	60%	79%	88%	96%	100%	100%	100%

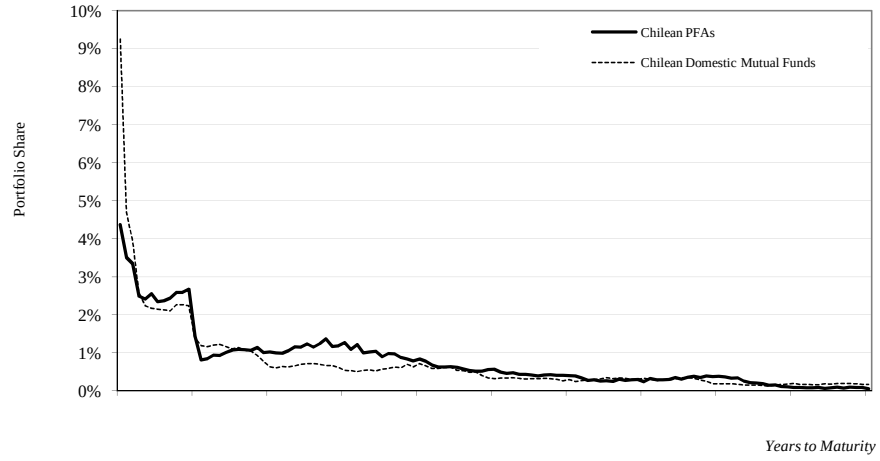
Figure 3
Maturity Structure of Chilean Domestic Mutual Funds and PFAs

This figure compares the maturity structure of Chilean domestic bond mutual funds to that of PFAs. Only medium- and long-term bond mutual funds are taken into account. The maturity structure of Chilean domestic mutual funds (PFAs) is calculated per mutual fund (PFA) and averaged across mutual funds (PFAs) at each moment in time using monthly bins, and then averaged over time. PFA shares are calculated as a fraction of the fixed-term portfolio, whereas mutual fund shares are calculated as a fraction of the overall portfolio. The sample period is Sep. 2002-Dec. 2005. Panel A shows the accumulated portfolio weights of the maturity structure of Chilean domestic mutual funds and PFAs. Panel B shows the same information within each monthly bin. Panel C shows the average maturity and accumulated weights in a table format. Panel D shows p-values for the two-sided t-tests of equality of average maturities, accumulated weights, and the Kolmogorov-Smirnov (KS) test of equality of the whole maturity structure. The KS test for functional data is based on the methodology proposed by Cuesta-Albertos et al. (2006) that relies on random projections of the samples of maturity structures. The p-value reported for this test is adjusted for false discovery rate as suggested by Benjamini and Yekutieli (2001) and corresponds to the minimum p-value obtained after repeating the test as many times as the number of maturity bins used to construct the figure, using a different random projection vector in each repetition. *, **, and *** represent statistical significance at the 10%, 5%, and 1% level, respectively.

A. Accumulated Weights



B. Weights within Each Maturity Range



C. Average Maturity and Accumulated Weights

	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(viii)	(ix)
		Accumulated Weights							
	Avg. Maturity	<1year (y)	<3y	<5y	<7y	<10y	<15y	<20y	<30y
(1) Chilean Domestic Mutual Funds	3.88	38%	59%	73%	80%	88%	95%	99%	100%
(2) Chilean PFAs	3.16	34%	60%	79%	88%	96%	100%	100%	100%

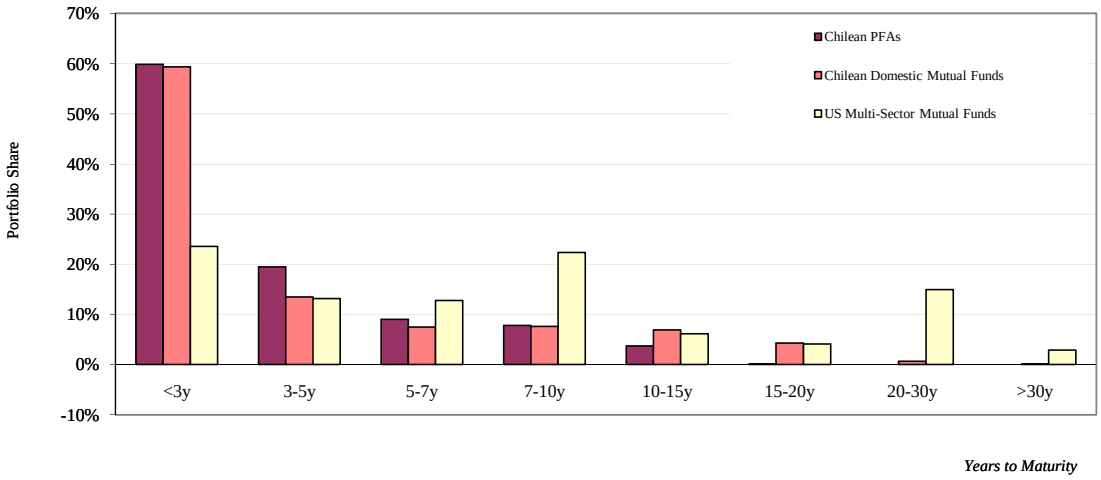
D. Hypothesis Testing

	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(viii)	(ix)
		Accumulated Weights							
	Avg. Maturity	<1year (y)	<3y	<5y	<7y	<10y	<15y	>20y	KS
(1) = (2)	0.29	0.16	0.75	0.39	0.20	0.07*	0.03**	0.10*	0.02**

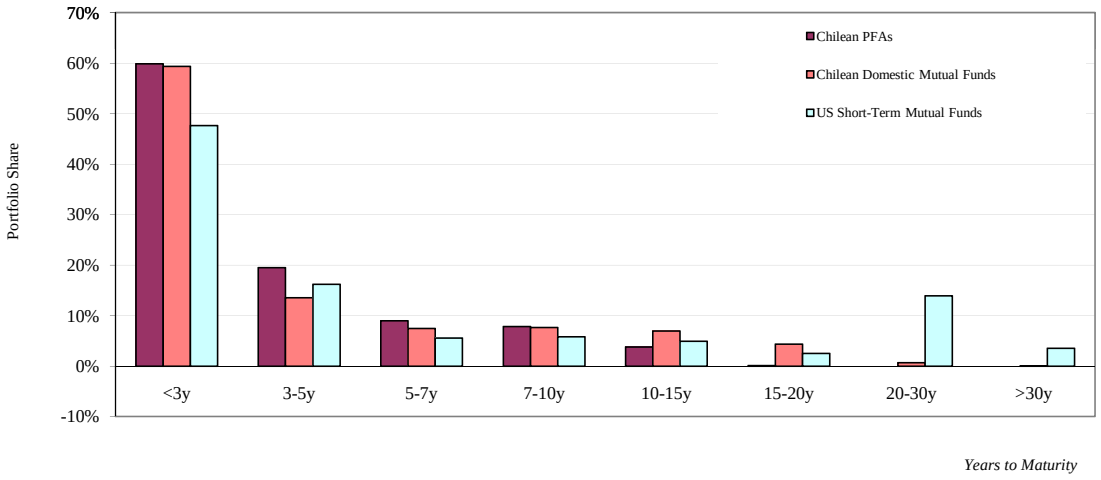
Figure 4
Maturity Structure of Chilean Domestic Mutual Funds and PFAs Compared to US Mutual Funds

This figure compares the maturity structure of Chilean domestic bond mutual funds and PFAs to that of US bond mutual funds (multi-sector mutual funds and short-term mutual funds). PFA shares are calculated as a fraction of the fixed-term portfolio, whereas Chilean and US mutual fund shares are calculated over the entire portfolio. The maturity structure of Chilean mutual funds and PFAs is averaged across monthly data for the period Sep. 2002-Dec. 2005 and that of US mutual funds is averaged across annual data for the period 2003-2005. Panel A uses the maturity structure of US multi-sector mutual funds and Panel B that of US short-term mutual funds. Panel C shows the average maturity and accumulated weights in a table format. Panel D shows p-values for the two-sided t-tests of equality of average maturities, accumulated weights, and the Kolmogorov-Smirnov (KS) test of equality of the whole maturity structure. The KS test for functional data is based on the methodology proposed by Cuesta-Albertos et al. (2006) that relies on random projections of the samples of maturity structures. The p-value reported for this test is adjusted for false discovery rate as suggested by Benjamini and Yekutieli (2001) and corresponds to the minimum p-value obtained after repeating the test as many times as the number of maturity bins used to construct the figure, using a different random projection vector in each repetition. *, **, and *** represent statistical significance at the 10%, 5%, and 1% level, respectively.

A. Comparison to US Multi-Sector Mutual Funds



B. Comparison to US Short-Term Mutual Funds



C. Average Maturity and Accumulated Weights

	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(viii)
		Accumulated Weights						
	Avg. Maturity	<3years (y)	<5y	<7y	<10y	<15y	<20y	<30y
(1) Chilean Domestic Mutual Funds	3.88	59%	73%	80%	88%	95%	99%	100%
(2) Chilean PFAs	3.16	60%	79%	88%	96%	100%	100%	100%
(3) US Multi-Sector Mutual Funds	9.55	24%	37%	50%	72%	78%	82%	97%
(4) US Short-Term Mutual Funds	7.76	48%	64%	69%	75%	80%	83%	96%

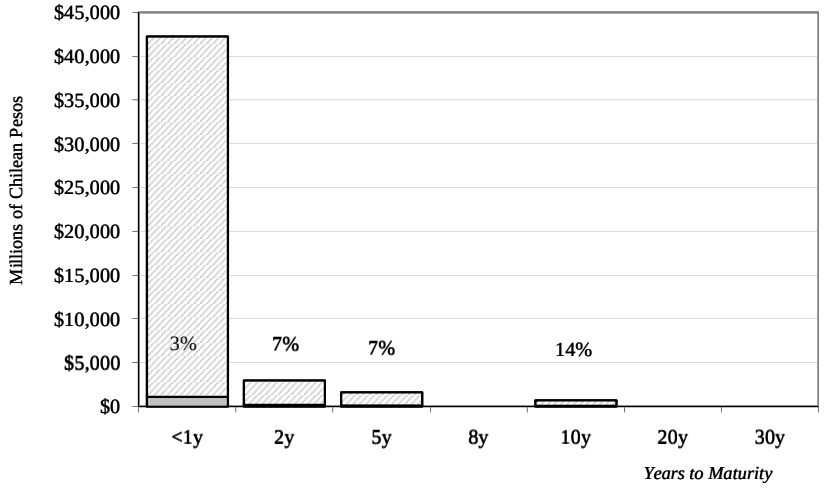
D. Hypothesis Testing

	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(viii)
		Accumulated Weights						
	Avg. Maturity	<3years (y)	<5y	<7y	<10y	<15y	>20y	KS
(1) = (3)	<0.01***	<0.01***	<0.01***	<0.01***	<0.01***	<0.01***	<0.01***	<0.01***
(1) = (4)	<0.01***	<0.01***	<0.01***	<0.01***	<0.01***	<0.01***	<0.01***	<0.01***
(2) = (3)	<0.01***	<0.01***	<0.01***	<0.01***	<0.01***	<0.01***	<0.01***	<0.01***
(2) = (4)	<0.01***	0.14	0.05**	0.01***	<0.01***	<0.01***	<0.01***	<0.01***

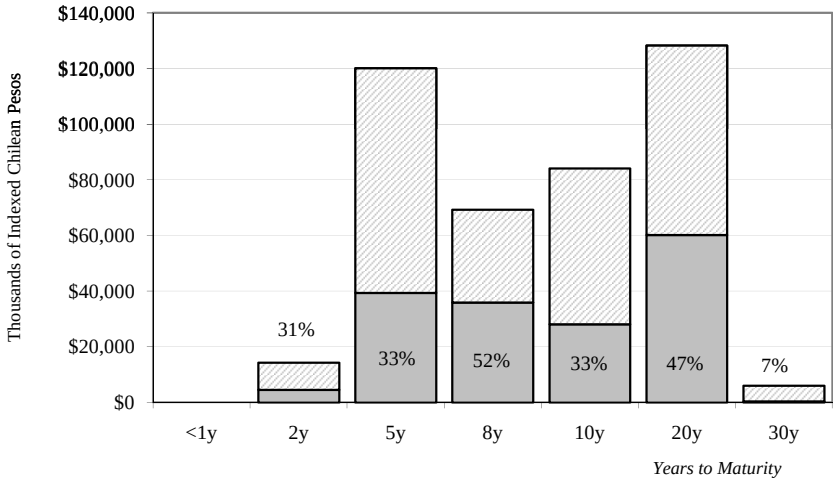
Figure 5
Government Bonds Purchased by Chilean PFAs

This figure presents the total amount of government bonds issued by currency denomination and the total amount and the proportion purchased by PFAs. The panels are shown by currency and represent total issuances and purchases. The sample period is 1998-2008. Panel A shows the results for bonds denominated in nominal Chilean pesos, Panel B for bonds denominated in indexed (inflation-linked) Chilean pesos, and Panel C for bonds denominated in US dollars.

A. Issuance Denominated in Nominal Chilean Pesos



B. Issuance Denominated in Indexed Chilean Pesos



C. Issuance Denominated in US Dollars

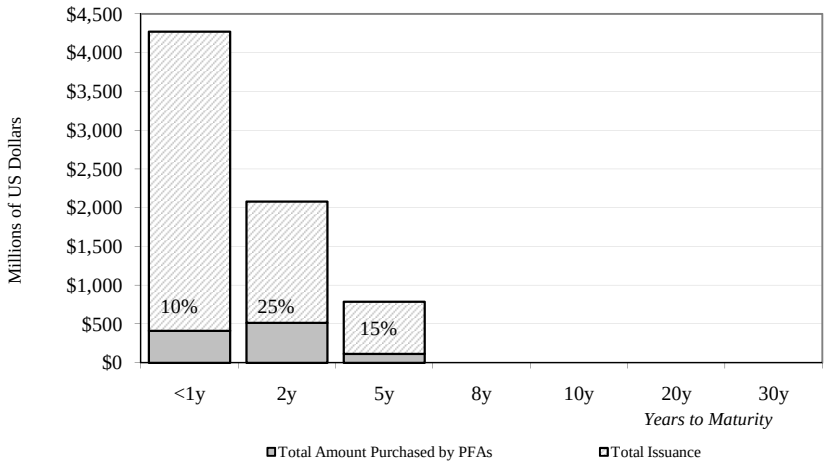


Figure 6
Evolution of PFA Short-Term Assets around Events

This figure shows how the share of short-term assets in the portfolio of PFAs varies during the Asian and Russian Crises of 1997-1998. It presents the average share of domestic short-term fixed-income assets (those with a term to maturity of up to 30 days) held by Chilean PFAs. PFA shares are calculated as a fraction of the fixed-term portfolio, not the overall portfolio. Some of the major events occurring during this period are displayed in vertical lines.

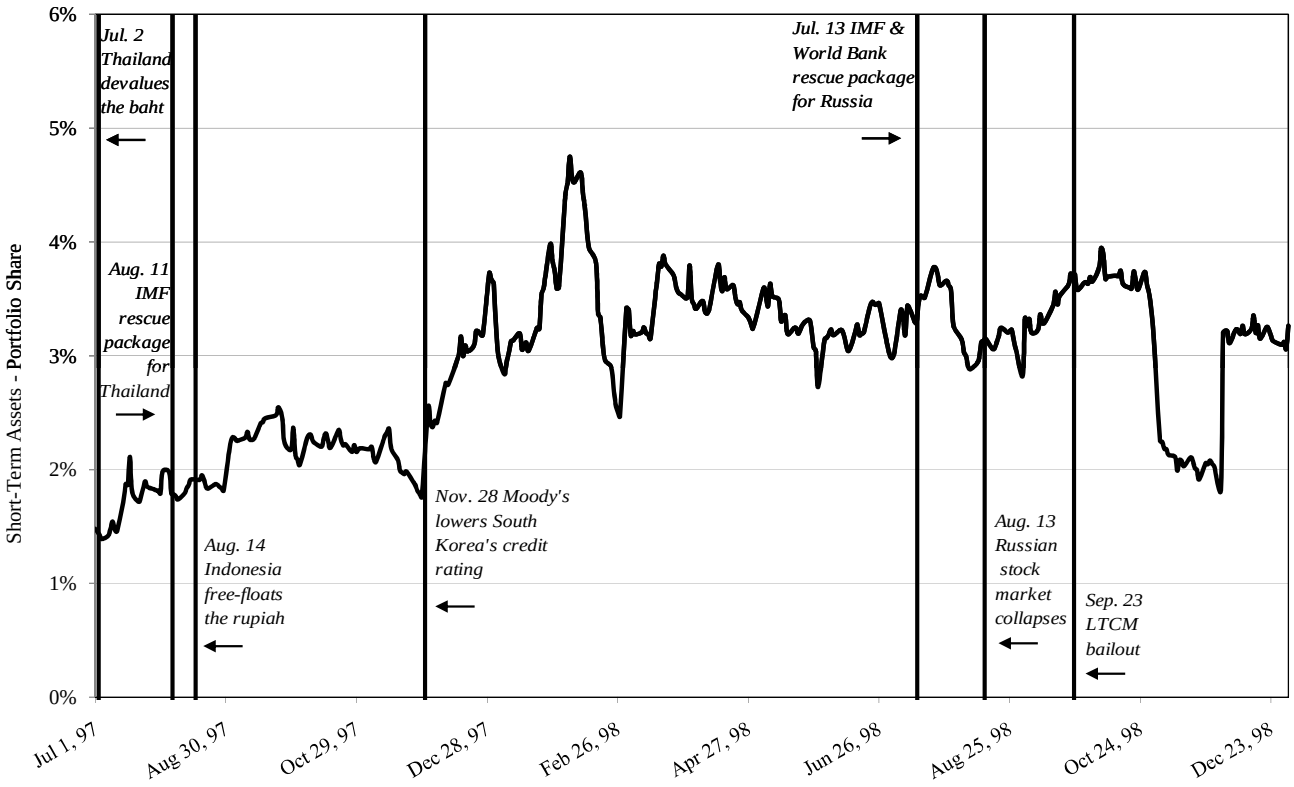
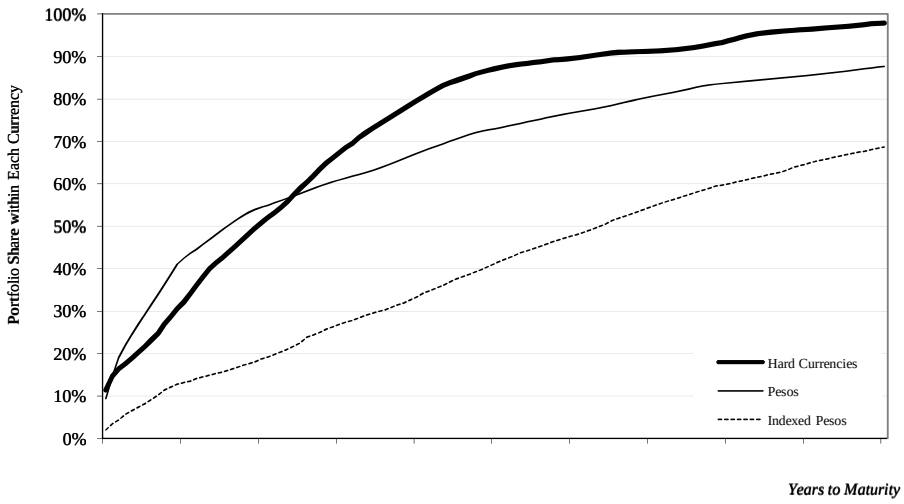


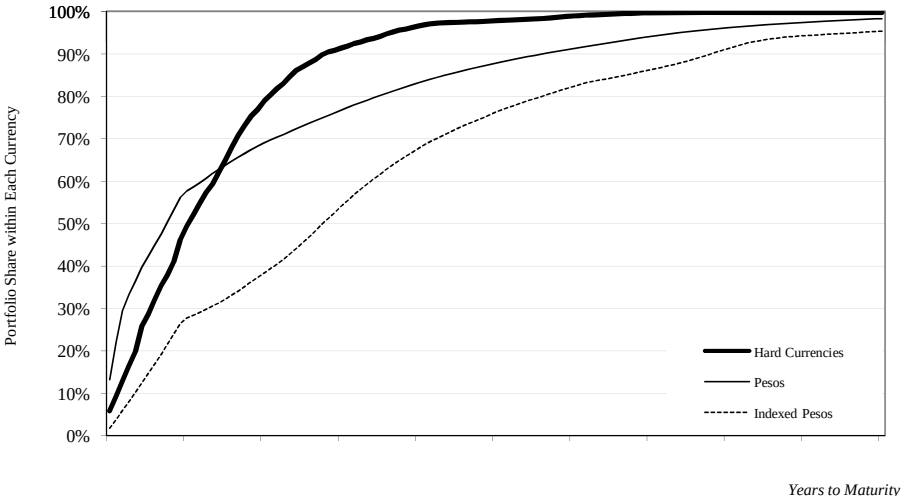
Figure 7
Maturity Structure of Chilean Mutual Funds and PFAs by Currency

This figure presents the maturity structure of Chilean domestic bond mutual funds and PFAs by currency: nominal Chilean pesos, indexed (inflation-linked) Chilean pesos, and "hard currencies" (US dollars, yens, euros, and British pounds). The maturity structure of Chilean mutual funds (PFAs) is calculated per mutual fund (PFA), respectively, and averaged across mutual funds (PFAs) at each moment in time using monthly bins. Weights are calculated over the entire portfolio and then normalized within each currency category. The sample period is Sep. 2002-Dec. 2005. Panel A shows the maturity structure of Chilean domestic mutual funds and Panel B shows that of Chilean PFAs. Panel C shows the portfolio composition by currency. Panel D shows the average maturity by currency. Panel E shows p-values for the two-sided t-tests of equality of average maturities and the Kolmogorov-Smirnov (KS) test of equality of the whole maturity structure. The KS test for functional data is based on the methodology proposed by Cuesta-Albertos et al. (2006) that relies on random projections of the samples of maturity structures. The p-value reported for this test is adjusted for false discovery rate as suggested by Benjamini and Yekutieli (2001) and corresponds to the minimum p-value obtained after repeating the test as many times as the number of maturity bins used to construct the figure, using a different random projection vector in each repetition. *, **, and *** represent statistical significance at the 10%, 5%, and 1% level, respectively.

A. Chilean Domestic Mutual Funds by Currency



B. Chilean PFAs by Currency



C. Overall Portfolio Weights by Currency

	(1) Pesos	(2) Indexed Pesos	(3) Hard Currencies
Chilean Domestic Mutual Funds	81%	6%	13%
Chilean PFAs	22%	73%	5%

D. Average Years to Maturity

	(1) Pesos	(2) Indexed Pesos	(3) Hard Currencies
Chilean Domestic Mutual Funds	3.59	6.71	3.37
Chilean PFAs	2.08	3.61	1.60

E. Hypothesis Testing

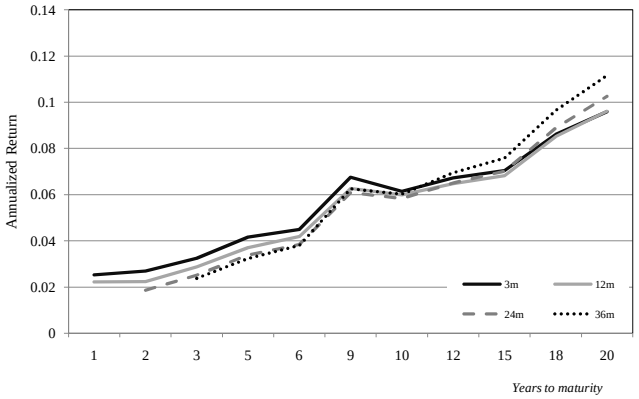
	(i)	(ii)		(iii)	(iv)
	Chilean Mutual Funds			Chilean PFAs	
	t-test	KS		t-test	KS
(1) = (2)	<0.01***	<0.01***	(1) = (2)	<0.01***	<0.01***
(1) = (3)	0.64	<0.01***	(1) = (3)	0.01***	0.01**
(2) = (3)	<0.01***	<0.01***	(2) = (3)	0.03**	0.01***

Figure 8
Bond Returns at Different Maturities and Holding Periods

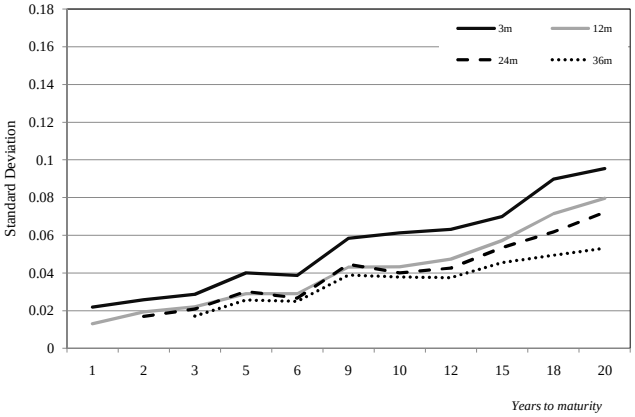
This figure presents the average annualized returns, standard deviations, and Sharpe ratios (average returns/standard deviations) of Chilean bonds of different maturities for various holding periods (3 months, 1 year, 2 years, and 3 years). Panel A shows statistics for indices of government inflation-indexed bonds. Panel B shows statistics using prices from model-based estimations of the yield curve. Returns for bonds of different maturities are daily, calculated using a rolling window for the different holding periods. The sample period is Jan. 2002-Dec. 2007.

A. Indices of Chilean Government Inflation-Indexed Bonds

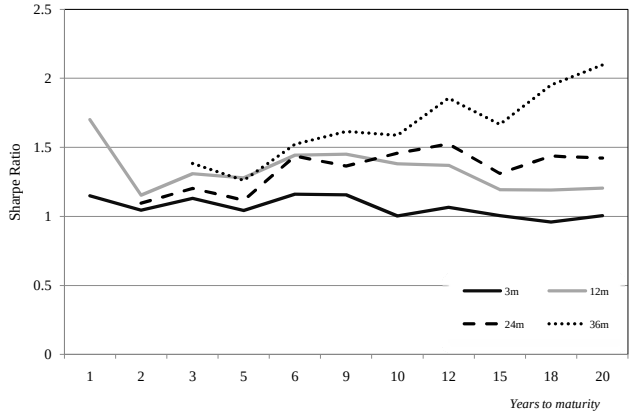
A1. Average Return



A2. Average Standard Deviation

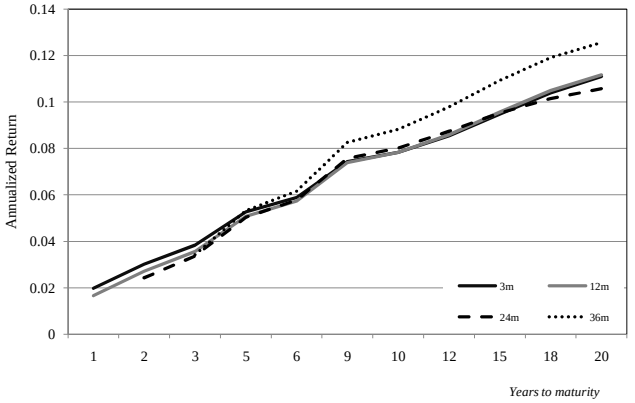


A3. Ratio between Average Return and Average Standard Deviation

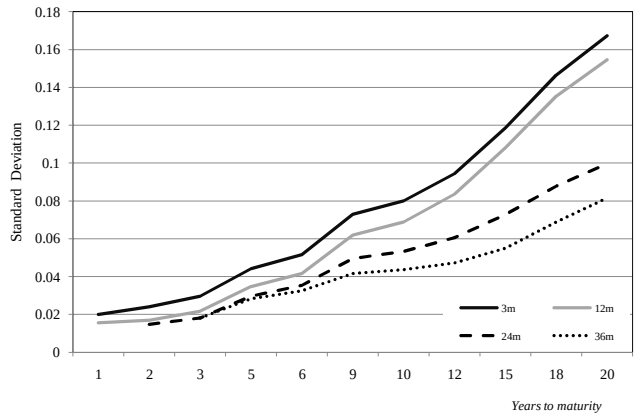


B.Indices Based on the Estimated Yield Curve

B1. Average Return



B2. Average Standard Deviation



B3. Ratio between Average Return and Average Standard Deviation

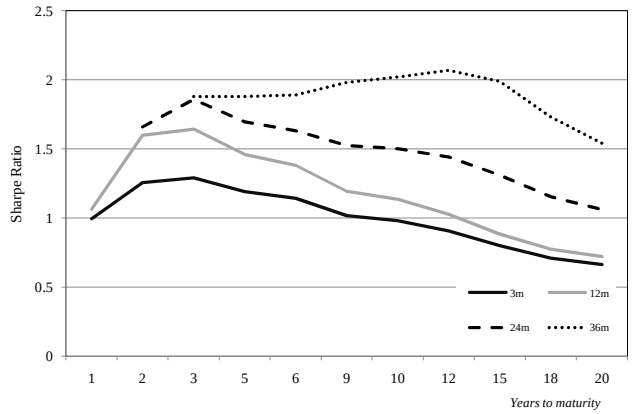
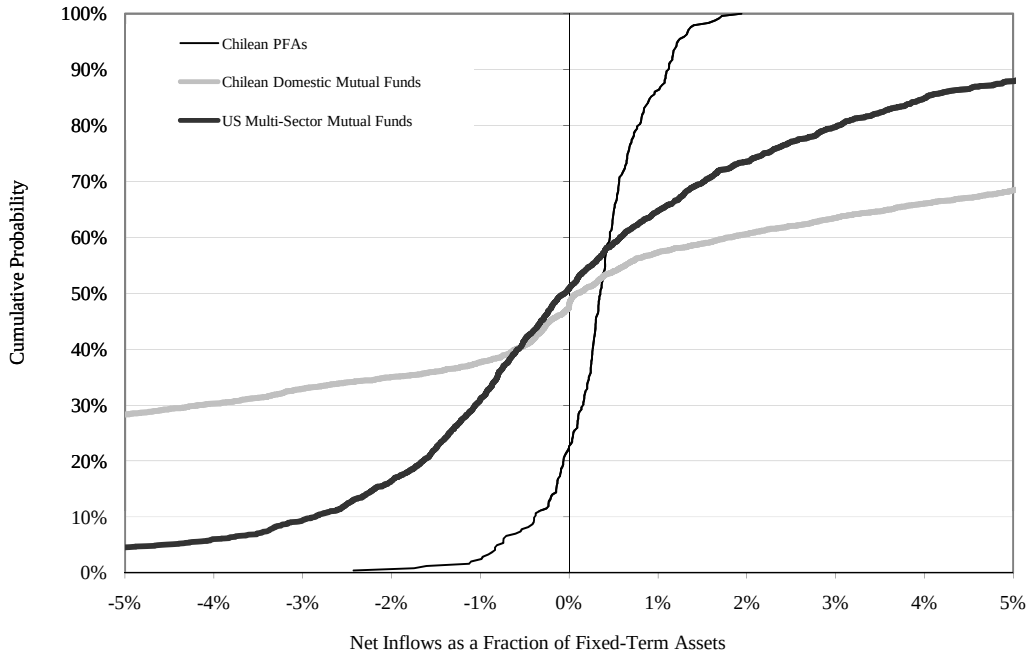


Figure 9
Net Inflows to Chilean Mutual Funds and PFAs Compared to US Mutual Funds

This figure presents the cumulative distribution of net monthly inflows of funds to Chilean domestic bond mutual funds, Chilean PFAs, and US bond mutual funds as a fraction of their fixed-term assets. Net inflows to Chilean and US mutual funds are computed for each mutual fund as the difference between the contemporaneous and lagged value of a mutual fund's assets and the returns accrued from the assets in the previous month's portfolio, and are divided by the contemporaneous value of a mutual fund's fixed-term assets. Net inflows to PFAs are calculated by aggregating daily data, directly collected by the Chilean Superintendency of Pensions. The sample period is Sep. 2002-Dec. 2005. Panel A shows the empirical cumulative probability distributions of these normalized inflows across mutual funds (PFAs) and months, under the assumption that normalized inflows are independent and identically distributed across mutual funds (PFAs) and time. The distribution of US and Chilean mutual fund inflows are shown only partially because they have been limited to fit the scale of the distribution of PFA inflows. Panel B reports the fraction of the fixed-term portfolio invested by the average mutual fund (PFA) up to one and three months (reported in the first and third columns) and the probabilities of observing an outflow larger than that magnitude (reported in the second and fourth columns). These probabilites are obtained from the empirical distributions shown in Panel A. Estimations for the US for Panel B are based on the assumption that within the zero to three year interval, the maturity structure of US funds is the same as that of Chilean mutual funds.

A. Cumulative Distribution of Net Inflows



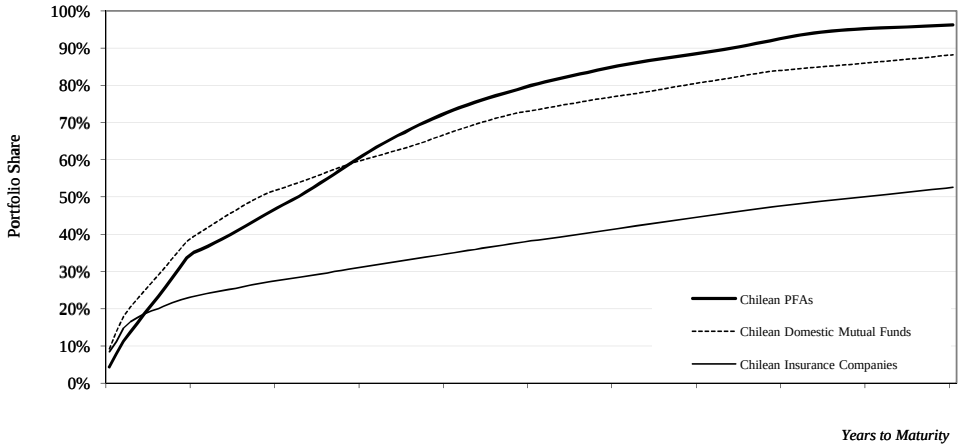
B. Percentage of Assets Held Short Term and Probability of Outflows of that Magnitude

	% of Short-Term Assets	Probability Outflows > % of Short-Term Assets	% of Short-Term Assets	Probability Outflows > % of Short-Term Assets
	Up to 1 month		Up to 3 months	
Chilean Domestic Mutual Funds	9.3%	21.6%	17.9%	13.4%
Chilean PFAs	4.4%	0.0%	11.2%	0.0%
US Multisector Bond Funds	3.7%	6.6%	7.1%	2.8%

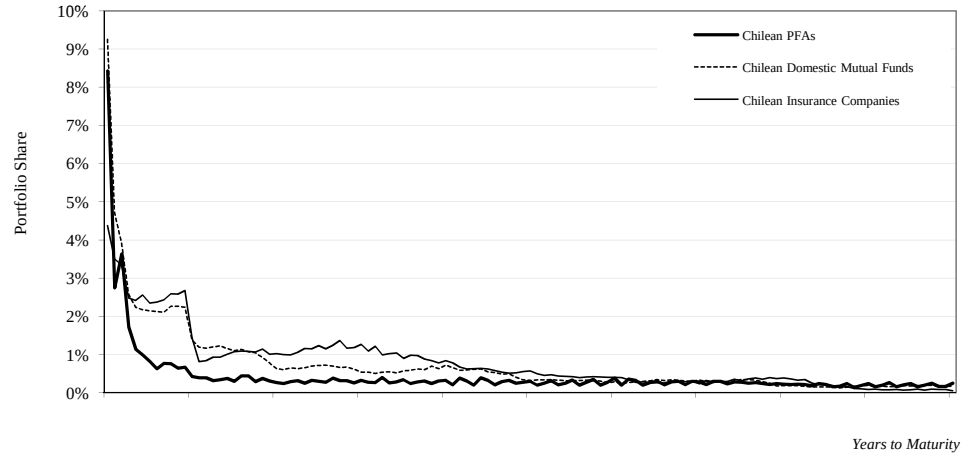
Figure 10
Maturity Structure of Chilean Insurance Companies Compared to Mutual Funds and PFAs

This figure compares the maturity structure of Chilean insurance companies to that of Chilean domestic mutual funds and PFAs. Only medium- and long-term bond mutual funds are taken into account. The maturity structure of Chilean mutual funds and PFAs (insurance companies) is calculated per mutual fund and PFA (company) and averaged across mutual funds and PFAs (companies) at each moment in time using monthly bins, and then averaged over time. PFA shares are calculated as a fraction of the fixed-term portfolio, whereas shares of insurance companies and mutual funds are calculated as a fraction of the overall portfolio. The sample period is Sep. 2002-Dec. 2005. Panel A shows the accumulated portfolio weights of the maturity structure of Chilean insurance companies, domestic mutual funds, and PFAs, and Panel B shows the same information within each monthly bin. Panel C shows the average maturity and accumulated weights in a table format. Panel D shows p-values for the two-sided t-tests of equality of average maturities, accumulated weights, and the Kolmogorov-Smirnov (KS) test of equality of the whole maturity structure. The KS test for functional data is based on the methodology proposed by Cuesta-Albertos et al. (2006) that relies on random projections of the samples of maturity structures. The p-value reported for this test is adjusted for false discovery rate as suggested by Benjamini and Yekutieli (2001) and corresponds to the minimum p-value obtained after repeating the test as many times as the number of maturity bins used to construct the figure, using a different random projection vector in each repetition. *, **, and *** represent statistical significance at the 10%, 5%, and 1% level, respectively.

A. Accumulated Weights



B. Weights within Each Maturity Range



C. Average Maturity and Accumulated Weights

	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(viii)	(ix)
		Accumulated Weights							
	Avg. Maturity	<1year (y)	<3y	<5y	<7y	<10y	<15y	<20y	<30y
(1) Chilean Insurance Companies	10.32	23%	31%	38%	44%	52%	66%	86%	100%
(2) Chilean Domestic Mutual Funds	3.88	38%	59%	73%	80%	88%	95%	99%	100%
(3) Chilean PFAs	3.16	34%	60%	79%	88%	96%	100%	100%	100%

D. Hypothesis Testing

	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(viii)	(ix)
		Accumulated Weights							
	Avg. Maturity	<1year (y)	<3y	<5y	<7y	<10y	<15y	>20y	KS
(1) = (2)	<0.01***	<0.01***	<0.01***	<0.01***	<0.01***	<0.01***	<0.01***	<0.01***	<0.01***
(1) = (3)	<0.01***	0.40	0.02**	<0.01***	<0.01***	<0.01***	<0.01***	<0.01***	<0.01***

Table 1
PFA Holdings of Outstanding Corporate Debt

This table shows the corporate bond holdings of PFAs compared to the total outstanding corporate debt. Panel A presents the fraction of outstanding corporate debt that PFAs purchase. Panel B presents the average maturity of PFA corporate bond holdings compared to the average maturity of the total outstanding corporate debt. The data on outstanding corporate debt per year come from Braun and Briones (2008). The yearly amount purchased by PFAs is the average across monthly data, obtained from the Superintendency of Pensions. Panel B presents this information as of December 31 of each year during the period 2002-2005, obtained from the Superintendency of Pensions and the Superintendency of Securities and Insurance of Chile.

A. Fraction of Outstanding Corporate Debt Held by PFAs

Year	Outstanding Corporate Debt (Millions of US Dollars)	Purchased by PFAs (Millions of US Dollars)	Purchased by PFAs (Percentage of Outstanding Corporate Debt)
1997	$2,047	$1,195	58%
1998	$1,699	$941	55%
1999	$2,156	$1,214	56%
2000	$3,974	$1,388	35%
2001	$6,076	$1,723	28%
2002	$8,293	$2,331	28%
2003	$9,790	$2,901	30%
2004	$12,931	$3,650	28%

B. Average Maturity (in Years) of PFA Corporate Bond Holdings vs. Total Outstanding Corporate Debt

	Dec. 2002	Dec. 2003	Dec. 2004	Dec. 2005
PFA Holdings of Corporate Debt	4.9	5	5.8	6.1
Outstanding Corporate Debt	12.2	12.7	14	14.7

Table 2
Bids by Pension Funds and Insurance Companies in Government Bond Auctions

Panel A shows the shares pension funds and insurance companies bid for in auctions of Chilean government bonds of different maturities. Panel B shows the ratio between the shares requested by insurance companies and pension funds. P-values for the hypothesis tests of equal requests (measured as the ratio of insurance companies to pension funds) across the different maturities are shown on the right side of the panel. The data for this table include all government auctions from 2002 to 2009 of bonds denominated in pesos, inflation-indexed pesos, and US dollars. Regressions are run separately for inflation-indexed pesos and for all currencies, controlling by currency. Standard errors are clustered by auction and type of institutional investor.

A. Shares Requested and Prices Offered

		(i)		(ii)		(iii)		(iv)	
		Shares Requested				Prices Offered			
	Time to Maturity	Indexed Pesos		Indexed Pesos, Pesos, and US Dollars, Controlling by Currency		Indexed Pesos		Indexed Pesos, Pesos, and US Dollars, Controlling by Currency	
	(Years)	Coef.	Std. Error	Coef.	Std. Error	Coef.	Std. Error	Coef.	Std. Error
Pension Funds	1			0.029	(0.010)			106	(0.521)
	2	0.063	(0.010)	0.090	(0.005)	101.10	(0.287)	107.30	(0.598)
	5	0.118	(0.006)	0.108	(0.005)	107.20	(0.309)	107.20	(0.320)
	10	0.129	(0.006)	0.125	(0.005)	58.00	(0.696)	105.70	(0.631)
	20	0.163	(0.010)	0.163	(0.010)	96.00	(0.899)	96.00	(0.898)
	30	0.075	(0.011)	0.075	(0.011)	89.69	(1.292)	89.69	(1.291)
Insurance Companies	1								
	2	0.007	(0.005)	0.045	(0.004)	101.20	(0.790)	104.80	(3.037)
	5	0.012	(0.003)	0.035	(0.003)	100.60	(0.447)	101.70	(0.581)
	10	0.012	(0.003)	0.035	(0.004)	98.64	(0.737)	99.50	(0.651)
	20	0.076	(0.010)	0.076	(0.010)	95.55	(0.687)	95.55	(0.686)
	30	0.126	(0.014)	0.126	(0.014)	88.86	(0.924)	88.86	(0.923)
No. of Observations		3,700		7,498		1,196		1,812	

When comparing within institutional investor across maturities, the differences between shares requested are all statistically significant (two-sided t-test of equality at 10% significance level), except in some cases. Differences are not significant when testing:

- 2y = 30y and 5y = 10y (indexed peso bonds) and 2y = 30y (all currencies) for shares requested by pension funds.
- 2y = 5y, 2y = 10y, and 5y = 10y (indexed peso bonds) and 5y = 10y (all currencies) for shares requested by insurance companies.

Differences between prices are all statistically significant (within institutional investor across maturities), with the following exceptions:

- 5y = 10y (indexed peso bonds) and 1y=10y and 2y = 5y (all currencies) for prices offered by pension funds.
- 2y= 5y (indexed peso bonds and all currencies) for prices offered by pension funds.

B. Ratio between Shares Requested by Insurance Companies and Pension Funds

	(i)		(ii)		(i)				(ii)				
	Ratio between Shares Requested				P-values for Hypothesis Tests of Equality between Maturities								
	Indexed Pesos		Indexed Pesos, Pesos, and US Dollars, Controlling by Currency		Indexed Pesos				Indexed Pesos, Pesos, and US Dollars, Controlling by Currency				
Time to Maturity (Years)	Coef.	Std. Error	Coef.	Std. Error	2 y	5 y	10 y	20 y	1 y	2 y	5 y	10 y	20 y
1			0.105	(0.082)									
2	0.168	(0.145)	0.053	(0.076)					0.212				
5	0.218	(0.115)	0.184	(0.098)	0.789				0.149	0.088			
10	0.119	(0.044)	0.167	(0.044)	0.746	0.424			0.449	0.144	0.858		
20	0.609	(0.113)	0.609	(0.112)	0.017	0.016	0.000		0.000	0.000	0.005	0.000	
30	3.473	(1.701)	3.473	(1.701)	0.054	0.057	0.049	0.094	0.048	0.045	0.054	0.052	0.093
No. of Observations	418		666										

Table 3
Mutual Fund Inflows and Past Returns

This table presents regressions of Chilean domestic bond mutual funds' monthly inflows (as a fraction of the assets at the beginning of the month) on funds' past returns. The different regressions use alternative independent variables, namely, lagged monthly, quarterly, semi-annual, and annual excess returns and returns. All independent variables are lagged one period. Excess returns are computed as the difference between each fund's returns over the average return across funds for the corresponding time span. Panel A shows regressions estimated using all funds (unbalanced panel). Panel B shows regressions only considering funds that exist throughout the whole sample period (balanced panel). Observations for which the monthly inflow is larger than one are excluded. The data cover the period Sep. 2002-Dec. 2005. Standard errors are clustered by fund. *, **, and *** represent statistical significance at the 10%, 5%, and 1% level, respectively.

A. Unbalanced Panel

Dependent Variable: Inflows Relative to Total Assets							
Independent Variables (Lagged)	Coef.	Std. Error	Time Dummies	Fund Dummies	R-Squared	No. of Observations	No. of Funds
Monthly Excess Return	0.261 ***	(0.055)	No	No	0.010	1,675	63
Monthly Return	0.257 ***	(0.056)	Yes	No	0.173	1,675	63
Monthly Return	0.218 ***	(0.061)	Yes	Yes	0.223	1,675	63
Quarterly Excess Return	0.123	(0.095)	No	No	0.001	1,465	63
Quarterly Return	0.124	(0.119)	Yes	No	0.179	1,465	63
Quarterly Return	-0.095	(0.220)	Yes	Yes	0.232	1,465	63
Semi-Annual Excess Return	0.035	(0.064)	No	No	0.000	1,201	58
Semi-Annual Return	0.033	(0.074)	Yes	No	0.160	1,201	58
Semi-Annual Return	-0.238	(0.200)	Yes	Yes	0.214	1,201	58
Annual Excess Return	0.180	(0.150)	No	No	0.001	864	49
Annual Return	0.181	(0.165)	Yes	No	0.189	864	49
Annual Return	-0.138	(0.418)	Yes	Yes	0.237	864	49

B. Balanced Panel

Dependent Variable: Inflows Relative to Total Assets							
Independent Variables (Lagged)	Coef.	Std. Error	Time Dummies	Fund Dummies	R-Squared	No. of Observations	No. of Funds
Monthly Excess Return	0.244 ***	(0.051)	No	No	0.011	1,178	32
Monthly Return	0.209 ***	(0.056)	Yes	No	0.177	1,178	32
Monthly Return	0.200 ***	(0.054)	Yes	Yes	0.202	1,178	32
Quarterly Excess Return	0.218	(0.159)	No	No	0.003	1,058	32
Quarterly Return	0.150	(0.216)	Yes	No	0.182	1,058	32
Quarterly Return	0.113	(0.256)	Yes	Yes	0.204	1,058	32
Semi-Annual Excess Return	0.210	(0.145)	No	No	0.002	910	32
Semi-Annual Return	0.225	(0.155)	Yes	No	0.170	910	32
Semi-Annual Return	0.128	(0.234)	Yes	Yes	0.195	910	32
Annual Excess Return	0.211	(0.139)	No	No	0.001	700	32
Annual Return	0.263 **	(0.118)	Yes	No	0.189	700	32
Annual Return	0.055	(0.358)	Yes	Yes	0.221	700	32

Appendix Table 1
Description of Main Data

This table presents information on the main data used in this paper by type of institutional investor. It includes the sample period, data frequency, number of observations, number of funds, and data source. Number of funds refers to the number of mutual funds, the number of insurance companies, or number of pension funds in each case. The pension fund data are aggregated and used at the pension fund administrator (PFA) level throughout the paper.

Institutional Investor	Sample Period	Frequency	No. of Observations	No. of Funds / Companies	Data Source
Chilean Domestic Mutual Funds	Sep. 2002 - Dec. 2005	Monthly	436,393	67	Superintendency of Securities and Insurance of Chile
Chilean Insurance Companies	Jun. 2002 - Dec. 2005	Monthly	2,156,576	36	Superintendency of Securities and Insurance of Chile
Chilean Pension Funds	Jul. 1996 - Dec. 2005	Monthly	7,501,210	57	Superintendency of Pensions of Chile
Chilean Pension Funds	Jul. 1996 - Jul. 2008	Daily	201,288,833	62	Superintendency of Pensions of Chile
US Mutual Funds	2003 - 2005	Annually	3,816	167	Morningstar