Incentive Fees and Competition in Pension Funds: Evidence from a Regulatory Experiment

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Abstract

Concerned with excessive risk taking, regulators worldwide generally prohibit private pension funds from charging performance-based fees. Instead, the premise underlying the regulation of private pension schemes (and other retail-oriented funds) is that competition among fund managers should provide them with the incentives to make investment decisions that would serve their clients' interests. Using a regulatory experiment from Israel, we examine the effects of incentive fees and competition on the performance of retirement savings schemes. Taking advantage of a unique institutional setup, we compare three exogenously-given types of long-term savings schemes operated by the *same* management companies: (i) funds with performance-based fees, facing no competition; (ii) funds with AUM-based fees, facing minimal competitive pressure; and (iii) funds with AUM-based fees, operating in a highly competitive environment. We find that funds with performance-based fees exhibit high returns, possibly somewhat higher risk (depending on the measure used) and, in particular, high risk-adjusted returns. By contrast, we find no evidence that competitive pressure leads to improved performance. We conclude that incentives and competition are not perfect substitutes in the retirement savings industry. Our analysis also suggests that the pervasive regulatory restrictions on the use of performance-based fees in pension fund management may be costly and should be reconsidered.

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I. Introduction

Private retirement savings funds play an increasingly important role around the world. By the end of 2013, retirement funds in the OECD countries held about $25 trillion of assets under management (OECD, 2014). Moreover, countries are increasingly relying on private pension schemes using the defined-contribution model, where investment risks are borne by savers (OECD, 2013). The well-being of future retirees around the world thus depends on the quality of investment decisions made by fund managers and on the extent to which these managers' interests are aligned with the long-term interests of their investors-savers.

The academic literature on private retirement savings has focused on the U.S. pension system, where employees generally save through their employer's pension plan. In the case of government and some company pension plans, employees have little choice concerning the investment of their savings (Martin, 2014). Other employers' pension plans, however, offer employees a menu of investment options. Employees thus assume responsibility for their retirement savings' investment decisions, and can move their funds from one investment option offered by their employer to another. Savers increasingly invest through mutual funds included in their pension plan, although these funds serve other types of investors as well (Fisch, 2010). Against this background, research has focused on the (poor) quality of individual investor choices and on mutual fund behavior and performance.

In many countries, however, the retirement savings landscape is remarkably different: savers (not employers) choose their own private retirement savings scheme or pension fund. While they can choose among different schemes, savers cannot make specific investment decisions. Rather, they are bound to rely on the professional money managers of their pension funds to make investment decisions on their behalf. Pension fund managers thus have considerable discretion—they make asset allocation decisions (what percentage of fund assets to invest in equity, government bonds or other asset classes) as well as specific investment decisions within any asset class (which shares or government bonds to hold). While the reliance on money managers may alleviate some of the concerns associated with having individual savers making specific investment decisions, this regulatory setting underscores the agency problem between fund managers

and savers. Pension fund managers make daily decisions with significant long-term effects on savers (and on the economy); their interests, however, may not be fully aligned with those of their clients.

In this setting, policymakers can use several types of regulatory strategies to align the interests of fund managers with those of savers. First, they can regulate the level and structure of fund fees, including the compensation of individual fund managers. Second, policymakers can determine the intensity of competition between private pension funds by imposing restrictions on the mobility of savers or by adopting measures to facilitate saver choice and reduce the cost of switching pension providers.[1] Third, policymakers can constrain fund-managers' asset-allocation and other investment decisions, either directly by imposing quantitative limits on investment in certain asset classes (Antolin et. al., 2009), or indirectly by subjecting fund managers to fiduciary duties (Gordon, 1987; Davis, 2002). Finally, regulators can subject fund managers to a variety of corporate governance and disclosure duties.

In this study, we address the first two policy instruments: fee structure and competition. We take advantage of a unique regulatory experiment in Israel that enables us to study the interaction between regulation, fee structure, competition and fund performance.[2] Specifically, we explore the effect of performance-based fees and competition on fund performance and costs.

What should be the structure of fees paid to private pension funds? A vast principal-agent literature prescribes performance-based pay for an agent whose performance is a function of her unobserved actions. Indeed, most unregulated money managers, such as venture capital, private equity or hedge funds, use performance-based fees. Institutions, endowments or high-net worth individuals often prefer to invest in actively managed funds whose compensation depends on their performance. Such funds

[1] In Italy, for example, there is an ongoing debate over the wisdom of allowing full portability of pension savings, see Moreolo (2015).

[2] We have no data on individual money managers' compensation or their career concerns (e.g., age or experience). We therefore focus on fees paid to the fund management companies and not to the individual managers whom they employ; however, there is a clear link between the two. Even though performance-based pay may exist at the individual fund manager level, it is limited by the fact that fund fees are not related to performance. For a recent study of portfolio manager compensation in the U.S. mutual fund industry, see Ma et al. (2015).

typically receive a significant (around 20%) fraction of their investors' returns (Gompers and Lerner, 1999; Metrick and Yasuda, 2010; Kandel et al., 2011).[3] Yet, policymakers around the world normally prohibit such incentive fee arrangements in retirement savings schemes and other retail-oriented investment products, such as mutual funds.[4] Thus, the predominant form of retirement savings (and mutual) fund fees around the world is a fixed percentage of assets under management (AUM). A recent OECD survey identifies only two countries—the Czech Republic and Poland—where pension funds charge fees based on investment returns (OECD, 2011).

The rationale underlying this prohibition is the concern that performance-based fees might lead to excessive risk taking (e.g., Illig, 2007).[5] Excessive risk-taking by fund managers may present a special concern for retirement savings schemes for two reasons. First, whereas savers normally allocate their savings among different mutual funds, in the setting underlying this paper, a saver's entire retirement portfolio is under the direction of a single private fund (and its managers). Second, as explained earlier, pension fund managers typically have more decision-making power than in mutual funds, as they have considerable discretion concerning their portfolio's asset allocation.

By itself, an AUM-based fee structure does not provide adequate incentives for fund managers, as it does not directly relate to the funds' investment returns or cost structure.[6] However, in an environment of AUM-based fees, the role of motivating funds to ensure savers' long-term interests is assigned to competition among funds (Cooper, 2010). The premise underlying this regime is that funds with better investment returns will attract more investors (inflows), thereby increasing assets under management and fees. According to this logic, competition provides the link between fund performance

[3] See also Lim et al. (2015) for a recent attempt to measure direct and indirect incentives in hedge funds.
[4] In the U.K., for example, pension fund fees may be based on assets under management (AUM), on a combination of AUM and contributions, or on a combination of a fixed fee and AUM http://www.legislation.gov.uk/uksi/2015/879/regulation/5/made).
[5] Illig (2007) and earlier studies (e.g., Manges, 1972; Lovitch, 1975) indicate that the "hostile" attitude towards incentive fees in money management in the United States dates back to the Investment Advisers Act of 1940 and especially to a series of regulations in the 1970s which imposed restrictions on the kind of incentive fees which could be allowed (e.g., requiring a symmetry of incentives) and on the type of clients to whom money management funds with incentive fees could be offered.
[6] Kahan and Rock (2007) blame this fee structure for the passive attitudes of institutional investors towards monitoring management in the United States. Mahoney (2004) and Illig (2007) argue that easing regulatory restrictions on incentive pay for fund managers would benefit investors.

and fund fees. This important link, however, assumes that inflows are driven by savers' correct evaluation of the relevant fund performance. We discuss this strong assumption below.

Empirically, an extensive literature on mutual funds has shown that the combination of competition and AUM-based fees can distort investment incentives. One possible reason is that fund managers focus on the kind of investment performance that would attract inflows and increase AUM. To the extent that inflows are determined by a fund's short-term past performance relative to that of its competitors (see, for example, Sirri and Tufano, 1998), the combination of AUM-based fees and competition may induce fund managers to maximize absolute short-term, rather than risk-adjusted long-term, returns and focus on relative performance. This may lead to inefficient levels of risk taking (Chevalier and Ellison, 1997 and 1999) and to "herding" (Grinblatt et al., 1995; Wermers, 1999), where most funds make similar investment decisions, thereby adversely affecting performance and possibly threatening the stability of the financial system.

Ideally, one should study the effect of performance-based fees (or competition) on investment performance by comparing two otherwise identical funds that differ, for exogenous reasons, only with respect to their fee structure or competitive environment. However, because regulators worldwide are generally opposed to performance-based fees, such a research design may not be feasible with respect to pension funds. In Israel, however, a unique regulatory setting provides a rare opportunity to estimate the effect of incentives and competition on fund performance. A decade-long process of reform has created *exogenous* differences among retirement savings schemes in both their management fee structure and the intensity of the competition they face (due to the year in which a specific retirement savings scheme was established). Moreover, in many cases the same management companies run all three types of savings schemes contemporaneously. This unique environment enables us to study how the fee structure and the intensity of competition affect the quality of management and risk taking of long-term savings schemes.

We use monthly data spanning a ten-year period (January 2005-March 2015) on asset allocations and returns for 73 long-term savings funds. The sample period includes the financial crisis of 2008, when funds taking higher risks would have been penalized.

Our main findings are as follows: First, funds with performance-based fees exhibit higher returns (gross and net of fees) than funds with AUM-based fees. They may also exhibit somewhat higher risk, according to one measure but not according to other measures. Second, and perhaps more importantly, funds with performance-based fees consistently exhibit higher *risk-adjusted* returns, as measured by α (calculated using several different methods). The difference in (gross) α between funds with incentive fees and those with AUM-based fees is estimated to be around 0.8% per year.[7] Third, when comparing funds with AUM-based fees facing intense competition with similar funds facing weak competition, we identify smaller and less consistent differences in the average risk and return performance. If anything, funds with AUM-based fees facing intense competition tend to under-perform funds operating with minimal competitive pressure. Competition, however, may be associated with reduced fees, but not with substantially higher net returns to savers.

These findings have several implications for the regulation of private pension funds. First, in the retirement savings industry incentives and competition do not appear to be perfect substitutes.[8] The performance of the portfolio of a saver who allocated her retirement savings to funds with performance-based fees would be different from (superior to) that experienced by a saver whose retirement savings are managed in AUM-based retirement savings schemes. By contrast, the performance of the portfolio of a saver who allocated her retirement savings to funds with AUM-based fees operating in a competitive environment would not be superior (indeed, by some measures it would be inferior) to the performance of the portfolio of a saver whose retirement savings' managers are shielded from competitive pressures.

Note that this finding is consistent with the view that competitive pressures may have different effects on specific funds depending on their relative performance, fund age, or their individual managers' career concerns, as documented in the literature and

[7] The relation between α and investment in illiquid assets is discussed below, but other than this effect, we do not attempt to attribute α to market timing, asset allocation, or security selection. For an attempt to do so in the context of U.S. pension funds, see Andonov et al. (2013).

[8] Giroud and Miller (2011) discuss several theoretical models of the relation between incentives and competition. Although studies differ in their assumptions and results, there is considerable theoretical support for the intuitive conjecture that incentives and competition are, under certain conditions, substitutes.

discussed in the next section. Our results suggest that, on average, the effects on specific funds may cancel out so that a competitive retirement savings *sector* exhibits results which are not superior to those of a retirement savings industry with weak competitive pressures.

Second, our findings cast doubt on the efficacy of the prohibition on performance-based fees in retirement savings funds. Specifically, we show that this prohibition may undermine the quality of fund management. Even though, in line with the regulatory rationale underlying the prohibition of performance-based fees, funds with such fees may be perceived by some measures as riskier than other funds, performance-based fees seem to raise the quality of fund management to an extent that savers in such funds consistently realize higher risk-adjusted returns than investors in funds with AUM-based fees. Note that we cannot determine whether the level of risk in the funds with performance-based fees in our sample is optimal (it may be the case that these funds take excessive risks or that other funds take too little risk). However, to the extent that the prohibition of performance-based fees reduces risk, this reduction comes at the cost of reducing the quality of investment management as well. Stated differently, it is possible that the natural tendency of regulators to try prevent a pension savings crisis in the short run (through restrictions on the use of high-powered incentives and therefore on risk-taking) may come at a significant long-term cost for the retirees.[9]

Finally, our analysis supports a new direction for regulating pension funds' fee structure and competition. Regulators have at their disposal a variety of measures that can contain excessive risk-taking even under a regime of performance-based fees, such as quantitative limits on investments in certain asset classes and fiduciary duties. Yet, regulatory measures are unlikely to induce fund managers to "work hard" or produce better risk-adjusted returns, and competition does not seem to perform well in this role

[9] The policy implications outlined here reflect our understanding that the superior performance of funds with performance-based fees which we observe in the data is not simply due to accounting manipulation of fund performance (which would be very difficult under Israel's strict regulatory regime). Also important for our conclusion is the view that superior return is not simply due to "luck" or to the allocation of good investments which arrive at random to a specific type of fund. Instead, we view performance as a function of effort, skills and so forth. For a recent discussion of the use of incentives in money management, see also a *Financial Times* "Insight" article (July 9, 2015, pp. 38): http://www.ft.com/intl/cms/s/0/ba9207a8-248e-11e5-bd83-71cb60e8f08c.html?siteedition=uk#axzz3fTL1j3Xp .

either. Policymakers should therefore consider amending the traditional prohibition on performance-based fees and adopting regulatory measures to contain excessive risk taking.

The rest of the paper is organized as follows. The next section surveys some of the related literature. Section III describes the institutional background and the regulatory changes used in this study. The data set, empirical approach and main results are discussed in Section IV. Robustness tests appear in Section V, and Section VI concludes.

II. Related Literature

Economic or legal research on the provision of optimal incentives to private retirement schemes under the defined-contribution model is scant, even though the economic literature on retirement policy and the design of pension benefits (for instance, life-cycle investment strategies or retirement age) is quite extensive (e.g., Medill, 2000). Moreover, both economists and legal scholars have, for the most part, studied the U.S. retirement landscape, where savers are often responsible for making both contribution and investment decisions. These studies often focus on the quality of decisions made by individual savers or on the nature of the investment options that employers offer to their workers (see, for example, Ayers and Curtiss, 2015). As explained above, however, in many countries the regulatory landscape concerning pension savings differs from that of the United States (OECD, 2013). Only a few studies address the policy measures that can be used to align the interests of managers of private, defined-contribution retirement savings schemes with those of their savers: Gordon (1987) discusses the nature of the fiduciary duties imposed on pension fund managers. Antolin et al. (2009) and Davis (2002) study the regulatory use of quantitative restrictions to contain portfolio risk and align the interests of fund managers with those of savers.

By contrast, an extensive literature studies mutual funds. Although many U.S. savers use mutual funds for their retirement savings, there are important differences

between mutual funds and private pension funds.[10] The literature on performance-based fees and competition in mutual funds is discussed below.

Consider first performance-based fees. The results in the theoretical literature on principal-agent relationship in the context of money managers vary significantly with the model's assumptions: Das and Sundaram (2002) analyze a model in which managers with unobserved ability can choose effort levels and the risk of the managed portfolio. They then compare two forms of fees: the AUM fee and the "fulcrum" (relative to a benchmark) incentive fee that U.S. mutual funds are allowed to use (see discussion below). They show that, in many cases, an incentive fee is better for investors. In the model of Palomino and Prat (2003), a bonus for achieving returns above a certain threshold is optimal when risk is controlled by the fund manager. This contract could induce excessive or insufficient risk relative to the first best, depending on the price of risk in terms of added return. Gil-Bazo and Ruiz-Verdú (2008) develop a model of a competitive market of equity mutual funds with unobservable managerial ability. They assume that some investors do not use all the available information and show that, in equilibrium, poorly performing funds may set higher fees than better performing funds.[11]

Empirical results vary considerably in their focus and findings as well. U.S. law allows mutual funds to charge incentive fees only under the so-called fulcrum model—where fees must be based on an index, with increases in fees for performance above that index matched by decreases in fees for performance below the index. Elton et al. (2003) find that funds with this (rarely used) fulcrum fee structure exhibit positive risk-adjusted returns—as measured by α—and end up costing their investors less than funds with standard AUM-based fees. They also find that funds with incentive fees assume more risk

[10] From a legal standpoint, U.S. mutual funds are organized as corporations and investors are shareholders. More importantly, as noted above, retirement savings schemes normally hold multiple asset-class portfolios and fund managers have broad discretion to make not only stock selection but also asset allocation decisions (Blake et. al., 1999). Relatedly, while a single pension fund manager may be in charge of a client's entire retirement savings, the manager of any single mutual fund is normally in charge of only a fraction of her client's assets. In addition, assets in mutual funds are tradable and therefore easy to assess and move, whereas retirement savings portfolios may include a variety of tradable and non-tradable assets.

[11] Also related is a study by Basak et al. (2007) who examine the impact of the convex relationship of fund flows to relative performance. In the model of Li and Tiwari (2009), benchmark-linked, option-like "bonus" incentive fees can induce efficient effort exertion by portfolio managers. Theoretical work by Holmstrom (1999), not specifically in the context of money management, is also related: he shows that managerial career concerns have incentive effects, but these do not necessarily lead to efficient risk-taking decisions.

than funds with AUM-based fees, especially after periods of poor performance. In their study, however, there is no exogenous variation in fund fee structure (funds are the ones to choose their fee structure and investors may chose funds based on this fee structure). Also closely related is Massa and Patgiri (2009), who show that funds with (a different type of) incentive contracts exhibit more volatile returns and have a lower probability of survival. At the same time, they deliver higher risk-adjusted returns in comparison with other funds, and this superior performance is persistent.[12] Golec and Starks (2002) show that the 1970s reform that prohibited U.S. mutual funds from charging asymmetrical performance fees (where the reward for beating a benchmark was higher than the penalty for underperforming it) affect risk taking behavior. An advantage of our study in comparison with much of the above literature is the absence of sample selection issues, which often arise in settings where funds (and perhaps investors) endogenously choose their own fee structure.

We now turn to the literature on competition between fund managers with AUM-based fees. Coates and Hubbard (2007) argue that fierce competition exerts a strong disciplinary force on mutual funds, thereby reducing the need for legal intervention to prevent funds from charging excessive fees. Morley and Curtis (2010) claim that competition can substitute for both governance regulation and litigation. These studies, however, do not focus on the impact of competition on investment returns. By contrast, a much larger body of literature finds that competition can distort incentives because AUM-based fees push mutual funds to compete on inflows, which are likely to be determined by a fund's short-term performance relative to that of competing funds. In such an environment, competition may lead to excessive risk taking (Chevalier and Ellison, 1997), and to investment decisions that are correlated across funds ("herding"), posing a risk to financial stability (Grinblatt et al, 1995; Wermers, 1999). Dass, Massa and Patgiri (2008) argue that mutual funds under the AUM-based fees tend to "herd" more than funds with incentive fees. They show that this behavior had a significant effect on fund performance during the high-tech bubble of the late 1990s.

[12] Massa and Patgiri (2009) acknowledge the endogeneity of fee structure choice and try to address it by using a TSLS approach. Also in the same vein, Diaz-Mendoza et al. (2014) show, without controlling for sample selection, that Spanish mutual funds choosing to charge performance-based fees tend to outperform other funds.

Part of the literature on mutual fund competition (starting with Brown et al., 1996) characterizes it as a "tournament" and shows that a fund's relative position in the tournament affects its inflow and therefore its investment decisions and risk taking. In the same vein, a more recent study by Kempf and Ruenzi (2008) also uses the tournament analogy to describe competition between large U.S. mutual fund families, arguing that managers tend to adjust the risk of their funds on the basis of their relative position in the fund family and the family's competitive position. Kempf, Ruenzi and Thiele (2009) show that mutual fund managers respond to poor mid-year performance differently, depending on their employment risk and compensation package. Higher employment risk tends to reduce portfolio risk, while stronger incentives tend to increase it.[13]

While the present paper will not directly test for these phenomena, the problems that these studies identify in the context of mutual fund competition seem to apply—and perhaps become more severe—in the context of private pension funds that compete for savers. The view that competition disciplines money managers hinges on the premise that savers can compare the performance of various funds and use this information to choose a retirement scheme that is consistent with their long-term interests. Such a choice, however, would be a particularly difficult task given the complexity of retirement savings products (for example, the degree to which different products protect against longevity risks) and their portfolio management. Savers would need to evaluate asset allocation decisions across very different asset classes while taking into account their investment horizons. Empirically, research has established that savers—and especially those who save for retirement—use very simple heuristics to choose money managers (see, for example, Benartzi and Thaler, 2007), chase past returns (Ben Rephael et al., 2012), are strongly affected by their peers' choices (Mugerman et al., 2014), and in general make sub-optimal decisions with respect to their investment choices (Gennaioli and Shleifer, 2010).[14]

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[13] On employment termination risk and mutual fund management style, see Chevalier and Ellison (1999).

[14] Specifically in Israel, Shaton (2015) shows that inflows into long-term savings funds are sensitive to short-term fund returns. However, when savers are provided with easily accessible information on long-term returns, whereas information on short-term returns can only be indirectly inferred, the sensitivity of fund flows to short-term returns declines significantly. An earlier study by Porath and Steinberg (2013) also finds that short-term returns affect inflows into retirement savings schemes.

To summarize, the existing literature casts doubt on the extent to which competition can provide pension fund managers (like mutual fund managers) with optimal incentives to make portfolio investment decisions. While it does suggest that performance-based fees may increase portfolio risk, the literature portrays performance-based fees in a more positive light. Put differently, the literature casts doubt on the justification for the prevalent regulatory prohibition on the use of incentive fees in the pension sector. The evidence on the effectiveness of incentives in retirement savings schemes is, however, very limited, largely because, in most countries, regulators allow only AUM-based compensation in pensions. Consequently, the contest between the incentive-based and AUM-based fee structures in the retirement savings setting is still open. The present study attempts to address this gap.

III. Institutional Background, Data and Empirical Approach

Our empirical strategy relies on the fact that, in Israel, there are several types of private retirement schemes that differ, for exogenous (historical) reasons, in the use of performance-based fees and in the degree of their exposure to competition. "Old Life Insurance" (OLI) plans, a major instrument for retirement saving established in 1992, charge performance-based fees. In 2004, however, the concern of excessive risk-taking by these funds (and the common practice in other countries) led regulators to prohibit the use of such fees. Starting in 2004, OLI plans can no longer admit new members, but due to grandfathering arrangements, they continue to accept monthly contributions from existing members and charge them performance-based fees. Also starting in 2004, the *same* management companies began to offer, in parallel to the existing performance-fee-based life insurance plans serving pre-2004 savers, two new retirement savings schemes. One scheme, which we refer to as the "New Life Insurance" (NLI) plan, is a retirement savings scheme (with a life insurance component) where fees are based on AUM; savers in this scheme face significant switching costs and hence there are only weak competitive pressures in this sector.[15] The second long-term savings scheme is the "Provident Fund"

[15] The main switching cost associated with life-insurance-based retirement savings schemes (both OLI and NLI) is related to changing life expectancy. When a person joins a life insurance plan, the rate at which her retirement savings will be converted to an annuity upon retirement is fixed; when a person shifts between

(PF): In this scheme, fees are AUM-based and members can easily withdraw their savings and switch to a different fund manager.[16] The different features of these three types of long-term savings schemes, and in particular, the differences in fees and in the extent of competition across the different types of retirement savings, are summarized in Table 1.[17] These exogenous differences allow us to test the following hypotheses:

Hypotheses on the Effects of Fee Structure

The first hypothesis largely tracks the policy rationale underlying the prevailing prohibition of performance-based fees, namely, the perception that performance-based fees in retirement savings would lead to excessive risk taking. Consider two retirement savings funds, operating in the same competitive environment and differing only in their fee structure: in Fund A fees are based purely on AUM, while in Fund B fees are calculated as a fraction of returns.[18] We conjecture, in line with commonly-observed regulatory restrictions, that Fund B will expose its members to a higher level of (priced) risk than Fund A. Consistent with the standard Finance theory and evidence, Fund B is expected to yield a higher absolute return.[19]

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similar schemes provided by different management companies, the new scheme will use a different conversion rate, reflecting the constantly increasing life expectancy and the fact that the individual has already lived with probability one a certain number of years since joining the original scheme and therefore his conditional life expectancy is higher than it was initially. This longevity risk constitutes a significant switching cost which limits the extent of actual shifts across life-insurance plans. Post-2004 life insurance plans (NLI) may admit new savers, but the pool of potential new clients is mostly limited to individuals joining the labor force.

[16] The category "provident funds" (PF) includes two variants referred to in Hebrew as *Kupot Gemel* and *Kranot Hishtalmut*; the differences between these two are immaterial for the present discussion. PF differ from life insurance plans in not having a life insurance policy embedded in them. Prior to 2008, it was possible to redeem certain PF savings in the form of a lump sum rather than an annuity. This is no longer possible. In addition, many PF changed owners early in our sample period following the "Bachar Committee" report which prohibited bank ownership of any money management funds. These institutional characteristics are not expected to have a major effect on the present analysis.

[17] We exclude from the analysis another type of retirement savings provider, pension funds. Up to 30% of the portfolios of these funds consist of "designated" (heavily subsidized) risk-free government bonds, thereby making their performance and asset allocation decisions not comparable to those of the other types of retirement savings providers.

[18] Fees that depend on risk-adjusted returns in excess of a benchmark are theoretically superior to fees based on absolute returns. We focus on fees based on absolute returns because this is what we observe in the data.

[19] The increased risk can take the form of high systemic risk (β), or appear in other forms, such as large investments in relatively illiquid and risky "alternative assets." This issue is discussed further in Section IV.

Our second hypothesis, based on agency theory, is that performance-based incentive fees would be associated with higher risk-adjusted returns. This is because these fees elicit higher effort by managers, and because they lead these funds to attract better (and more expensive) managerial talent. To the extent that managerial effort and talent affect investment returns, funds with profit-based fees should exhibit higher risk-adjusted returns than funds with AUM-based fees, while facing the same level of competition.[20] In our setting, the investment decisions of funds with different fee structures or varying degrees of competition under the same management are often made by the same individuals working for a fund management company that has multiple products. It is also possible that a fund management company may assign more able individuals to one type of funds.[21]

Hypotheses on the Effects of Competition

Predicting the effect of competition on fund performance is more complicated. Compare Fund A to Fund C: in both funds, fees are calculated as a fraction of AUM but, unlike Fund A, Fund C operates in a competitive environment where savers can withdraw their funds if they are unhappy with the fund's performance, while savers from other funds can join it if they like the fund's track record. Theory suggests that competition should lead to a better outcome in Fund C, which would be induced to hire better portfolio managers who, in turn, will exert more effort. However, as discussed above, the existing literature suggests that the effect of competition on (mutual) fund performance may depend on the fund's short-run performance relative to competing funds and on the fund manager's career concerns. In our analysis, we use measures of *average* risk and return for the subsample of retirement savings funds facing strong competitive pressures (PF) and compare them with the average measures of risk and return for funds facing

[20] In formulating this hypothesis we do not take an explicit stand on whether it is possible to achieve high risk-adjusted returns by selecting securities within an asset class ("stock picking"), by allocating investment across asset classes, or through various forms of "market timing." We examine if all of these together are associated with better outcomes in funds with performance-based fees. Dyck et al. (2013) find that active management in Canadian pension funds tends to be profitable in less than fully developed emerging markets; our conjecture that active management could matter for retirement savings fund operating in Israel is consistent with this logic.

[21] Fang et al. (2014) show that mutual fund families allocate their most skilled managers to market segments in which managerial skill is most needed.

very weak competitive pressures (NLI plans). Given the preference of regulators to use competition as a mechanism to achieve desirable outcomes in the retirement savings sector, our conjecture is that, on average, a dollar of savings invested in a competitive money management segment should result in a better outcome than a dollar allocated to a retirement savings sector with little competitive pressure.

IV. **Data and Results**

Data

Our sample is constructed from official data on retirement savings schemes published by the Israeli Ministry of Finance. We have data on monthly returns for a ten-year period starting in January 2005 and ending in March 2015, and on asset allocation starting in January 2008. Our sample period includes the years of the global financial crisis.

The Effect of Incentives on Risk and Return

Table 2 presents summary statistics by fund type: average AUM, average monthly returns, cumulative ten-year returns (gross and net of fees), the standard deviation of monthly returns, and average fees.

OLI plans, which are large (in terms of assets under management) relative to other retirement savings schemes,[22] exhibit higher returns than NLI plans (which, with one exception, are run by the same management companies, but have a different fee structure). The average monthly return in OLI plans is about 0.04 percentage points higher than in the NLI plans (gross of fees). Over the entire ten-year sample period, the cumulative return of OLI plans is about eight percentage points higher than the return of NLI plans (about 116% vs. 108%). OLI plans are, on average, slightly more expensive than NLI plans, yet, even net of fees, savers in the OLI plans still realized, over the entire

[22] In the multivariate regressions that follow, we control for fund size to make sure our results are not driven by the allocation of talent to, or managerial focus on, the larger funds of each provider. "Conventional wisdom" has it that small funds can generate higher returns than large funds because of their "flexibility;" If this is the case, our tests may be biased against finding superior performance of the larger OLI plans.

period, returns which were six percentage points higher than those of savers in the NLI plans. All these differences are statistically significant.[23]

In Table 2, risk, measured in terms of return volatility, appears to be similar in OLI and NLI plans. Another possible indication of the riskiness of OLI and NLI plans can be inferred from their performance in the face of an adverse shock experienced in financial markets in 2008 (and to a much smaller extent, in 2011). In 2008, the average monthly return of OLI plans was approximately -1.54%, roughly similar to the corresponding figure for NLI plans, -1.47% (the figures for 2011 are also similar for the two types of plans, around -0.33% per month, on average). According to this measure, then, there are also no substantial differences in the riskiness of OLI and NLI plans. There is, however, one measure of risk where OLI plans do appear to bear more risk: Figure 1 shows that, in comparison with NLI plans (and other retirement savings schemes), OLI plans hold a higher fraction of their portfolio in risky asset classes such as equity and, even more so, "alternative assets" (e.g., as real estate, VC and PE investments etc.). Similarly, the overall proportion of investment in illiquid (and potentially risky) assets, such as private (non-tradable) loans, in the portfolios of OLI plans is nearly twice as high as in other retirement savings schemes (close to 30% of the OLI portfolios, on average, for the entire sample period vs. about 15-16% in the portfolios of NLI plans and PF; we discuss this issue in detail below).[24]

Taken together, the statistics presented in this section suggest that OLI plans are high-return savings schemes in comparison with NLI plans; they could also be high-risk (when risk is measured according to the types of assets they invest in). In part, these differences may be due to the fact that OLI plans (exert effort and) invest more than other retirement savings schemes in illiquid assets, perhaps in order to take advantage of the

[23] To derive the statistical significance of the comparisons between OLI and NLI plans presented in Table 2 and in later tables, we conduct pairwise tests (i.e., the returns of the eight pairs of OLI and NLI plans under the same management).

[24] Presumably, investment in illiquid or non-tradeable assets is not only risky, but also requires effort and skill on behalf of fund managers. The profit-based incentives in OLI plans can explain the choice of managers in these schemes to assume the additional risk and exert the additional effort, involved in investment in this asset class. This issue is examined when we estimate risk-adjusted returns. It is important to note that the population of savers in the OLI plans is older than in NLI plans (because these plans were started earlier) and therefore the measures of risk used in this section may under-estimate the true tendency to assume additional risk in OLI plans.

liquidity premium, as they should. All this is despite the fact that from the management company's perspective, the simplest and the least costly alternative would have been to hold a single portfolio and then to allocate it proportionally to OLI and NLI plans.

The Effect of Competition on Risk and Return

Similar comparisons between NLI plans and PF provide indications of the effects of competition. Recall that PF are much more exposed than NLI plans to competition for savers. Nevertheless, cumulative and average monthly returns (gross of fees) are nearly identical in the PF sector and in the NLI industry (Table 2). The standard deviation of monthly returns (Table 2) and the proportion of the portfolio invested in risky assets (Figure 1) in the two schemes are also quite similar. This suggests that, on average, the expected performance of a retirement savings account in a competitive money management industry is unlikely to be very different from the performance of a similar account invested in a sector facing weak competitive pressures.[25]

In Table 2, the only economically meaningful difference between NLI plans and PF is in management fees, which are substantially lower in the PF industry where competition is intense (0.7% per annum, on average) than in the NLI sector, where switching costs are high and savers rarely move from one provider to another (average fees in NLI plans are about 1.16% per year). However, as noted above, NLI (and OLI) plans pre-commit to the rate at which savings will be converted to an annuity upon retirement and savers are therefore insured against the risk of rising life expectancy. Savers in PF are exposed to this demographic risk and hence the reported differences in fees between the two schemes are probably an over-estimate of the effect of competitive pressures. Notice that even net of fees PF do not outperform NLI plans (Table 2); once we take into account the additional insurance provided by NLI plans, it may well be the case that PF provide an inferior return relative to NLI plans, indicating the possibility that

[25] The literature discussed in Section II argues that competition does not have the same effect on all (mutual) funds. Poorly performing (laggard) funds or funds whose management team is young would be affected differently than leading funds or funds whose management team is mature. We do not examine these differences here and present only a comparison of the *average* performance of retirement savings schemes operating in a highly competitive environment (PF) vs. the *average* performance of NLI plans, where competitive pressures are weak.

competition may be detrimental to returns, in line with some of evidence on the adverse effects of competition on mutual funds (Section II).

Because retirement savings schemes differ in size, and given that their performance varies over time, Table 3 presents regression results where the dependent variables are gross monthly returns or the annual standard deviation of monthly returns. Even controlling for fund size and management-company and period fixed effects, OLI plans continue to exhibit higher returns than NLI plans (the omitted category) and PF.[26] Interestingly, the difference between OLI and the NLI plans in the standard deviation of monthly returns regression is not statistically significant, indicating that perhaps funds with performance-based fees do not take excessive risks. The comparison between PF and NLI plans suggests that PF exhibit lower returns (although the magnitude of this difference is smaller than the magnitude of the difference between OLI and NLI plans), as well as lower volatility.[27] We conclude from the evidence presented so far that performance-based fees affect the composition of portfolios in OLI plans in the direction of increased return (there is less evidence on increased risk), whereas the average effect of competition is less apparent in the sample statistics of Table 2, and may be associated with low risk and low returns (according to the regressions in Table 3). In addition, management fees are lower in a competitive environment (PF). We now turn to a comparison of risk-adjusted returns in the three retirement savings schemes.

Risk-adjusted Returns by Fund Type

Our primary measure of management quality (risk-adjusted returns) is *α,* the excess return generated by fund managers, controlling for a set of risk factors.[28] Unlike

[26] In non-tabulated tests, we also examine a specification where we regress the (excess, above the risk-free rate) return of each of the eight OLI plans on the returns of the same management company's NLI plans. The correlation between the two portfolios is high, in the order of 0.9 and yet, in all eight regressions, there is a positive intercept suggesting that, while the two portfolios are similar, they are not identical and OLI plans exhibit higher returns.

[27] It is possible that NLI plans may do better than PF because of "positive spillovers" from OLI plans. We return to this issue below.

[28] Berk and van Binsbergen (2015), following Berk and Green (2004), argue that α may not be an appropriate measure of "skill" in fund management. Instead, *α* may be related to the intensity of competition. Despite this criticism, we choose to use *α* as out primary measure of fund management quality because it is standard in the literature and, perhaps more importantly, because OLI and NLI plans do not differ much in the intensity of the competition they face and hence differences between them in *α* cannot be

equity-only mutual funds, which have been the focus of the existing literature, funds in our sample manage portfolios consisting of many asset classes, such as government or corporate bonds, in addition to equity. Therefore, to derive α, we focus on a simple set of easily identified indices as proxies for risk factors. In our benchmark specification, we regress the monthly excess return (above the risk-free rate, derived from short term government bonds) of each fund on the excess return of two equity indices, the Tel Aviv 100 Index and the MSCI World Index, as well as on the excess returns of three bond indices: inflation-indexed government bonds, non-indexed government bonds, and inflation-indexed corporate bonds.[29] To address the possibility that these factors may not fully capture the funds' systemic risk, we examine several additional specifications for robustness.

In most of our regression specifications, we use three periods of 36 non-overlapping monthly observations for each fund: January 2005 to December of 2007; January 2008 to December of 2010; and from January 2011 to December 2013. The averages of estimated parameters from these regressions are presented in Table 4. First, notice that the average values of *R*-squared are very high and roughly the same for all fund types, indicating that the proposed risk control measures work for all the retirement savings schemes in the sample. Second, the absolute magnitudes of the estimated α for all three categories appear to be high in comparison with the values of α typically reported in the literature for equity-only mutual funds, an issue we return to below. At this stage, it is important to note that the average α in OLI plans is substantially higher than in NLI plans. Furthermore, α is higher, on average, in OLI plans in each of the three 36 month sub-periods (see Appendix). The *t*-statistics of the estimated α's are also much higher for OLI plans. We interpret this as indicative evidence that OLI plans exhibit superior money

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easily attributed to competitive pressures. NLI plans and PF do operate in different competitive environments but differences between them in α turn out to be smaller. Another possible measure of fund performance is the Sharpe Ratio which may be more relevant to savers than α; we nevertheless choose to focus on α because it is commonly perceived as a proxy for the quality of fund management, our main variable of interest.

[29] The five risk factors that we use were developed by Professors Jacob Boudoukh and Zvi Wiener for the Ministry of Finance's official website to allow comparisons of long-term savings instruments. These are appropriate for the retirement savings schemes in our sample, because most of their investments are in these five asset categories. A unique feature of the Israeli capital market is that many government bonds and most corporate bonds are inflation-indexed. This is a remnant of the hyper-inflation in the 1980's.

management skills due to better talent employed and better incentives. By contrast, we document no clear effect of competition on α: the average α of PF is similar in magnitude to that of NLI plans. Table 4 also indicates that OLI plans invest more than NLI plans in equity (about 40% loadings vs. 36% on average, a borderline statistically significant difference), while NLI plans invest more in equity than PF.

Next we introduce various control variables. Table 5 presents regression results where the calculated α is the dependent variable. The right-hand-side variables include fund type, fund size (the natural logarithm of assets under management), as well as period and management company-fixed effects. Given that we calculate three estimates of α for each fund, the standard errors are clustered at the fund level.[30] Column 1 of Table 5 presents our benchmark specification and main finding: controlling for other factors, OLI plans generate an annual excess return that is 0.87 percentage points higher than that generated by NLI plans. This difference is highly statistically significant. Figure 2 illustrates this phenomenon, depicting the difference in the risk-adjusted return for each management company that provides both products. For all eight companies, α is higher in OLI plans, and the difference is highly statistically significant (t=4.5). The probability that such a result would be obtained at random for eight independent managers, under the assumptions that they are of the same quality and have the same incentives, is about 0.25%.

Column 1 also shows that NLI plans outperform PF on average, but, as before, the difference is much smaller and less statistically significant than the difference between OLI and NLI plans. It certainly does not suggest that competition (to which PF are exposed) is associated with superior performance.

Recall that OLI plans invest more in illiquid assets such as private loans, PE and VC, or real estate. On average, throughout the sample period, 27% of the portfolios of OLI plans are invested in such assets, compared to about 15% for NLI plans and PF. Although there is no readily available index to capture these differences, we do observe the proportion of illiquid assets in the portfolios of most funds in every month. In Column 2 we add this variable to the regression to see whether the differences in the risk-adjusted

[30] The results remain qualitatively unchanged when the standard errors are clustered at the management company level.

returns between the fund categories can be partially explained by investment in illiquid assets. The presumption is that, if there is an effect, it should manifest itself in funds (and periods) of higher proportions of such assets in the portfolio. The result is that the difference between OLI and NLI plans becomes even larger and more significant than in the benchmark regression. The difference between NLI and PF loses its significance, but the sign of the coefficient and its magnitude remain the same.[31]

In Columns 3 and 4 of Table 5, we make the test more precise by restricting attention to the sample of PF owned by the same insurance companies that run OLI and NLI plans (excluding all other PF). Thus, in these specifications, the differences between PF and life insurance plans cannot be attributed to differences in the quality of the managing companies. The results for the OLI-NLI comparison in this sub-sample are practically the same as in the entire sample. However, the difference in α between NLI plans and PF is no longer significant.[32] At the same time the sign remains unchanged, indicating that competition does not seem to improve performance.

We conclude that funds with performance-based incentive fees (OLI plans) are associated with better portfolio management relative to funds with AUM-based fees. Differences between AUM-based funds with weak competitive pressures (NLI plans) and AUM-based funds operating in a highly competitive environment (PF) suggest that the (average) effect of competition on returns cannot be considered a substitute for the effect

[31] It is theoretically possible that, had we controlled for the return on illiquid assets as we do for the other risk factors, the difference between OLI plans and other retirement savings schemes would have disappeared. Even if this were to be the case and the entire difference between OLI and NLI plans is driven by the return on illiquid assets and investments, this would still be consistent with the view that it is the incentives that provide the motivation to exert effort and allocate talent so as to enable investment in this not-straight-forward-to-invest-in asset class. In practice, it is not possible to control for the return on illiquid investments because of the heterogeneity of this asset class (real estate, private loans, VC and PE, etc.) and the unavailability of regular, high frequency reports on the returns on such investments. Notice also that, while PF facing competition (and possible outflows) may be limited in their ability to invest in illiquid assets, OLI and NLI plans are both equally able to do so. The larger fraction of the portfolio allocated to illiquid assets in OLI plans suggests that the effort associated with this investment is worthwhile only in OLI plans where fees are profit-based. It also suggests that illiquid assets are available in limited supply so that management companies have to allocate them to either OLI or NLI plans.

[32] The regressions in Columns 3 and 4 suggest that insurance-owned PF out-perform other PF. This can be inferred from a comparison of the coefficients on PF in Columns 3 and 4 with the corresponding coefficients in Columns 1 and 2. This can also be seen in regressions similar to those in Table 5 where the sample is restricted to PF only, insurance-owned and others (not shown). In these regressions, insurance-owned PF exhibit higher α than non-insurance owned PF, suggesting the possibility of positive "spillovers" in investment management from OLI plans to insurance-owned PF.

of incentives, and may even be in the opposite direction. This is a very troubling message for regulators around the world who tend to rely almost exclusively on competition to bring about better incentives for the pension managers.

V. Robustness Tests

Table 6 presents a number of robustness tests. For ease of comparison, the benchmark specification of Table 5, Column 1, is reproduced in Column 1 of Table 6.

In Column 2 we use an “industry peer index” as an additional risk factor in the estimation of the risk-adjusted return, following the methodology of Hunter et al. (2014). We proceed as follows: first, we construct a “peer index,” which is a simple average of the excess return of all funds in the entire sample. We then regress this “peer index” on the five risk factors (indices) used in the benchmark specification. We include the residuals from this regression as a sixth risk factor in the estimation of α for each fund. This procedure is designed to control for possible omitted risk factors in all portfolios and to improve the precision of the estimated α (Hunter et al., 2014). As in Hunter et al. (2014), this procedure leads to smaller estimated values of α. The regression results across categories, however, are virtually unchanged from those of the benchmark specification. Controlling for size and management-company and period fixed effects, OLI plans have α which is 0.81% higher than those of NLI plans (vs. 0.87 in the benchmark specification). The difference in peer-adjusted α between NLI plans and PF remains the same as in the base case.

In Column 3, we examine the possibility that the risk factors used in our regression estimates of α for each fund are correlated. We address this issue by using a specification where α is calculated in a regression that does not include the return on indexed government bonds (which is correlated with the returns on nominal government bonds and indexed corporate bonds). The estimated α’s are not different from those of the benchmark specification and the regression results remain virtually unchanged as well.

In Column 4 we examine the robustness of the results to the choice of sub-periods. We divide the entire sample (consisting of 123 months, from January 2005 to March 2015) into three equal sub-periods of 41 months each (instead of the three 36-

month periods from January 2005 to December 2013 used in the benchmark specification in Column 1 of Table 5). The results are qualitatively unchanged.[33]

In Column 5 we choose the t-statistic of the calculated base-specification α as the dependent variable to capture the differences in the estimation precision across funds and periods. In essence, this specification weighs observations of α according to their statistical significance. As shown in Table 4, the estimated α is more likely to be statistically significant for OLI plans than for other retirement savings schemes and the regression results in this specification indicate that OLI plans exhibit superior performance in this specification as well. The only change is that the difference between the NLI and PF declines, but the sign remains unchanged.

Table 7 presents (together with the benchmark specification which is reproduced in Column 1), regression results for three subsamples: in Column 2, we include in the regression only OLI and NLI plans; in Column 3, only NLI and PF; and in Column 4, only NLI plans and insurance-owned PF. The general thrust of the results remains unchanged: OLI plans with profit-based fees exhibit higher α than NLI plans which, in turn, tend to do better than PF operating in a competitive environment. Insurance-owned PF tend to do better than other PF, perhaps because of "spillovers" from insurance-owned OLI plans (which affect the performance of NLI plans and insurance-owned PF relative to other PF).[34]

Table 8 presents regressions where we use only two of the three periods for which α is estimated in each regression. There are several possible reasons to examine such a specification. In the first period (early 2005 to the end of 2007), returns may have been distorted because the volume of inflows into the newly-formed NLI plans was large relative to their AUM. This period also witnessed ownership changes in some PF, following the government-appointed Bachar Committee which forced banks to sell off bank-owned PF. The movement of savers across PF may have been less smooth (and competition less intense) in this first period than in later periods. Yet our results remain

[33] We also examine a regression specification with no management-company fixed effects. The magnitude of the OLI coefficient is nearly identical to that in the benchmark specification (0.84) and it is still highly statistically significant (t=3.24).

[34] As noted above, illiquid and alternative assets are probably available in limited supply so that it is not possible for NLI plans and insurance-owned PF to completely mimic the portfolios of OLI plans.

unchanged when the first period α is omitted from the regression. In the second period (early 2008 to the end of 2010), which includes the onset of the financial crisis, OLI plans may have had an "accounting advantage" to the extent that the valuation of the large proportion of illiquid assets in their portfolios did not adjust fully to the crisis. Yet our results remain unchanged when the second period α is omitted from the regression. When the third period α is omitted, the estimated difference between OLI and NLI plans is larger than in the benchmark specification and in the other sub-periods because the difference in α between OLI and NLI plans is smallest in the last sample period (the estimated α is 2.22 for OLI plans vs. 1.85 for NLI plans in the early 2011 to the end of 2013 period). Differences between NLI plans and PF are insignificant in this regression (omitting the last estimation period) because NLI plans outperform PF only in the last period of the sample, whereas in the earlier periods the estimated α is similar, or even slightly higher for PF. Further information on estimated α by fund type and sub-period appears in the Appendix. Overall, our main finding regarding the difference in α between OLI and NLI plans is not driven by a specific sample period and appears to be robust.

As a whole, the results are consistent with the view that performance-based fees lead to superior performance, while competition is not associated with superior performance, and may even be detrimental.

VI. Concluding Remarks

Private pension funds—especially those based on a defined-contribution model—play an increasingly important role in providing retirement income around the world. Moreover, in many countries it is pension fund managers—and not savers—who make both asset allocation and specific investment decisions. While these pension fund managers make daily decisions with significant long-term effects on savers, their interests are not always fully aligned with those of their clients. This is a major concern given that pension funds' assets under management continue to increase, making them dominant shareholders in many capital markets and key players in the financial system. Fund managers' misaligned incentives could not only harm future retirees, but also undermine investor protection, financial development, and even financial stability.

Although regulatory intervention in the retirement savings industry is pervasive, it is not clear what steps lawmakers should take to ensure that pension schemes serve the long-term interests of their clients. Our findings evaluate the effectiveness of two key policy measures: the regulation of management fees and the introduction of competition among retirement savings schemes. While regulators worldwide take the view that profit-based fees are risky and should be prohibited in pension fund management, our results cast doubt on the validity of this view: funds with performance-based fees are associated with more risk-taking in comparison with AUM-based funds only if risk is measured in terms of investment in illiquid and presumably risky "alternative assets." Comparisons based on other measures of risk, such as return volatility, are not highly consistent with the regulatory view. By contrast, funds with performance-based fees are clearly associated with high-quality investment management. Stated differently, even if funds with performance-based fees can be regarded as riskier than other funds, there seems to be a tradeoff whereby this higher risk is accompanied also by better investment management. We also find, within the limits of our sample, that incentives (profit-based fees) seem to be more effective than competition in inducing high-quality fund management; competition however, leads to lower fees for investors.

Given that it is unclear whether competition (or other regulatory mechanisms) could effectively incentivize fund managers, our analysis suggests that policymakers should consider adopting regulatory measures to directly contain risk taking by fund managers while relaxing the prohibition on performance-based fees. Policymakers have at their disposal a variety of such mechanisms, including the imposition of fiduciary duties or quantitative limits on certain types of risky investment.

Why is it, then, that regulations which are possibly sub-optimal govern the pension fund industry in most countries? It may well be the case that an "information cascade" (Bikhchandani et al., 1998) has turned a questionable premise (on the disadvantages of profit-based incentive fees) into regulation in a few countries, and the rest have just copied it under the assumption that the first countries had been better informed. Alternatively, regulators may be myopic in the sense that their main objective is to avoid a crisis in the short run, even at the cost of lowering the expected retirement

savings for large segments of the population many years into the future. To the extent that this is the case, a revision in the current regulatory regime should perhaps be considered.

References

Andonov, Aleksander, Rob Bauer and Martijn Cremers (2013), "Can Large Pension Funds Beat the Market? Asset Allocation, Market Timing, Security Selection, and the Limits of Liquidity," unpublished manuscript, University of Notre Dame.

Antolín, Pablo, Sandra Blome, David Karim, Stéphanie Payet, Gerhard Scheuenstuhl and Juan Yermo (2009), "Investment Regulations and Defined Contribution Pensions," OECD Working Papers on Insurance and Private Pensions No. 37, OECD Publishing.

Ayers, Ian and Quinn Curtis (2015), "Beyond Diversification: The Pervasive Problem of Excessive Fees and "Dominated Funds" in 401(k) Plans," *Yale Law Journal* Vol. 124, pp. 1476-1552.

Basak, Suleiman, Anna Pavlova and Alexander Shapiro (2007), "Optimal Asset Allocation and Risk Shifting in Money Management," *Review of Financial Studies*, Vol. 20, pp. 1583-1621.

Benartzi, Shlomo and Richard Thaler. (2007). "Heuristics and Biases in Retirement Savings Behavior," *Journal of Economic Perspectives*, Vol. 21, pp. 81-104.

Ben Rephael, Azi, Shmuel Kandel and Avi Wohl (2012), "Measuring Investor Sentiment with Mutual Fund Flows," *Journal of Financial Economics*, Vol. 104, pp. 363-382.

Berk, Jonathan and Richard Green (2004), "Mutual Fund Flows and Performance in Rational Markets," *Journal of Political Economy*, Vol. 112, pp. 1269-1295.

Berk, Jonathan and Jules van Binsbergen (2015), "Measuring Skill in the Mutual Fund Industry," *Journal of Financial Economics*, Vol. 118, pp. 1-20.

Bikhchandani, Sushil, David Hirshleifer and Ivo Welch (1998). "Learning from the Behavior of Others: Conformity, Fads, and Informational Cascades," *Journal of Economic Perspectives*, Vol. 12, pp. 151-170.

Blake, David, Bruce Lehmann and Allan Timmermann (1999), "Asset Allocation Dynamics and Pension Fund Performance," *Journal of Business*, Vol. 72, pp. 429-471.

Brown, Keith, W.V. Harlow and Laura Starks (1996), "Of Tournaments and Temptations: An Analysis of Managerial Incentives in the Mutual Fund Industry," *Journal of Finance*, Vol. 51, pp. 85-110.

Chevalier, Judith and Glenn Ellison (1997), "Risk Taking by Mutual Funds as a Response to Incentives," *Journal of Political Economy*, Vol. 105, pp. 1167-1200.

Chevalier, Judith and Glenn Ellison (1999), "Career Concerns of Mutual Fund Managers," *Quarterly Journal of Economics*, Vol. 114, pp. 389-432.

Coates, John and Glenn Hubbard (2007), "Competition in the Mutual Fund Industry: Evidence and Implications for Policy," *Journal of Corporation Law*, Vol. 33, pp. 151-222.

Cooper, Jeremy (2010), "Super for Members: A New Paradigm for Australia's Retirement Income System," *Rotman International Journal of Pension Management*, Vol. 3, pp. 8-15.

Das, Sanjiv and Rangarajan Sundaram (2002), "Fee Speech: Signaling, Risk-Sharing and the Impact of Fee Structures on Investor Welfare," *Review of Financial Studies*, Vol. 15, pp. 1465-1497.

Dass, Nishant, Massimo Massa and Rajdeep Patgiri (2008), "Mutual Funds and Bubbles: The Surprising Role of Contractual Incentives," *Review of Financial Studies*, Vol. 21, pp. 51-99.

Davis, Philip (2002), "Prudent Person Rules or Quantitative restrictions? The Regulation of Long-term Institutional Investors` Portfolios," *Journal of Pension Economics and Finance*, Vol. 1, pp 157-191.

Dıaz-Mendoza, Ana, German Lopez-Espinosa and Miguel Martınez (2014) "The Efficiency of Performance-Based Fee Funds," *European Financial Management*, Vol. 20, pp. 825-855.

Dyck, Alexander, Karl Lins and Lukasz Pomorski (2013), "Does Active Management Pay? New International Evidence," *Review of Asset Pricing Studies*, Vol. 3, pp. 200-228.

Elton, Edwin, Martin Gruber and Christopher Blake (2003), "Incentive Fees and Mutual Funds," *Journal of Finance*, Vol. 58, pp. 779-804.

Fang, Jieyan, Alexander Kempf and Monika Trapp (2014), "Fund Manager Allocation," *Journal of Financial Economics*, Vol. 111, pp. 661-674.

Fisch, Jill (2010), “Rethinking the Regulation of Securities Intermediaries,” *University of Pennsylvania Law Review*, Vol. 158, pp. 1961-2041.

Gennaioli, Nicola and Andrei Shleifer (2010), “What Comes to Mind,” *Quarterly Journal of Economics*, Vol. 125, pp. 1399-1433.

Gil-Bazo, Javier and Pablo Ruiz-Verdú (2008), “When Cheaper is Better: Fee Determination in the Market for Equity Mutual Funds,” *Journal of Economic Behavior and Organizations*, Vol.67, pp. 871-885.

Giroud, Xavier and Holger Mueller (2011), “Corporate Governance, Product Market Competition, and Equity Prices,” *Journal of Finance*, Vol. 66, pp. 563-600.

Gompers, Paul and Josh Lerner (1999), “An Analysis of Compensation in the U.S. Venture Capital Partnership,” *Journal of Financial Economics* Vol. 51, pp. 3–44.

Gordon, Jeffrey (1987), “The Puzzling Persistence of the Constrained Prudent Man Rule,” *New York University Law Review*, Vol. 62, pp. 52-115.

Grinblatt, Mark, Sheridan Titman and Russ Wermers (1995), “Momentum Investment Strategies, Portfolio Performance, and Herding: A Study of Mutual Fund Behavior,” *American Economic Review*, Vol. 85, pp. 1088-1105.

Holmstrom, Bengt (1999), “Managerial Incentive Problems: A Dynamic Perspective,” *Review of Economic Studies*, Vol. 66, pp. 169-182.

Hunter, David, Eugene Kandel, Shmuel Kandel and Russ Wermers (2014), “Endogenous Benchmarks,” *Journal of Financial Economics*, Vol. 112, pp. 1-29.

Illig, Robert (2007), “What Hedge Funds Can Teach Corporate America: A Roadmap for Achieving Institutional Investor Oversight,” *American University Law Review*, Vol. 57, pp. 225-339.

Kahan, Marcel and Edward Rock (2007), “Hedge Funds in Corporate Governance and Corporate Control,” *University of Pennsylvania Law Review*, Vol. 155, pp. 1021-1093.

Kandel, Eugene, Dima Leshchinskii and Harry Yuklea (2011), “VC Funds: Aging Brings Myopia,” *Journal of Financial and Quantitative Analysis*, Vol. 46, pp. 431-457.

Kempf, Alexander and Stefan Ruenzi (2008), “Tournaments in Mutual-Fund Families,” *Review of Financial Studies*, Vol. 21, pp. 1013-1036.

Kempf, Alexander, Stefan Ruenzi and Tania Thiele (2009), "Employment Risk, Compensation Incentives, and Managerial Risk Taking: Evidence from the Mutual Fund Industry," *Journal of Financial Economics*, Vol. 92, pp. 92–108.

Li, Wei and Ashish Tiwari (2009), "Incentive Contracts in Delegated Portfolio Management," *Review of Financial Studies*, Vol. 22, pp. 4681-4714.

Lim. Jongha, Berk Sensoy and Michael Weisbach (2015), "Indirect Incentives of Hedge Fund Managers," forthcoming, *Journal of Finance*.

Lovitch, Fred (1975), "The Investment Advisers Act of 1940-Who Is an Investment Adviser?" *University of Kansas Law Review*, Vol. 24, pp. 67-104.

Ma, Linlin, Yuehua Tang and Juan-Pedro Gómez (2015), "Portfolio Manager Compensation in the U.S. Mutual Fund Industry," unpublished manuscript, IE Business School.

Mahoney, Paul (2004), "Manager-Investor Conflicts in Mutual Funds," *Journal of Economic Perspectives*, Vol. 18, pp. 161–182.

Manges, Gerard (1972), "The Investment Company Amendments Act of 1970-An Analysis and Appraisal after Two Years," *Boston College Industrial and Commercial Law Review*, Vol. 14, pp. 387-436.

Martin, Roger (2014), "Why Monopolistic Pension Funds Undermine Capitalism," *Harvard Business Review Online*, October 6, 2014.

Massa, Massimo and Radjeep Patgiri (2009), "Incentives and Mutual Fund Performance: Higher Performance or Just Higher Risk Taking?" *Review of Financial Studies*, Vol. 22, pp. 1777-1815.

Medill, Colleen (2000), "The Individual Responsibility Model of Retirement Plans Today: Conforming ERISA Policy to Reality," *Emory Law Journal*, Vol. 49, pp. 1 – 53.

Metrick, Andrew and Ayako Yasuda (2010), "The Economics of Private Equity Funds," *Review of Financial Studies*, Vol. 23, pp. 2303-2341.

Moreolo, Carlo (2015), "Italian Regulator Questions Merit of Pension Fund Competition Bill," *Investments & Pension Europe*, July 3, 2015.

Morley, John and Quinn Curtis (2010), "Taking Exit Rights Seriously: Why Governance and Fee Litigation Don't Work in Mutual Funds," *Yale Law Journal*, Vol. 120, pp. 84-142.

Mugerman, Yevgeny, Orly Sade and Moshe Shayo (2014), "Long Term Savings Decisions: Financial Reform, Peer Effects and Ethnicity," *Journal of Economic Behavior & Organization*, Vol. 106, pp. 235–253.

OECD (2011), *Pensions at a Glance: Retirement-income Systems in OECD and G20 Countries* (Paris, OECD Publishing).

OECD (2013), *Pensions at a Glance: OECD and G20 Indicators* (Paris, OECD Publishing).

OECD (2014), *Pension Market Focus No. 11* (Paris, OECD Publishing).

Palomino, Frederic and Andrea Prat (2003), "Risk Taking and Optimal Contracts for Money Managers," *RAND Journal of Economics*, Vol. 34, pp. 113-137.

Porath. Yehuda and Nadav Steinberg (2013), "Chasing Their Tails: Inflow Momentum and Yield Chasing among Provident Fund Investors in Israel," *Israel Economic Review* Vol. 10, pp. 71–106.

Shaton, Maya (2015), "The Display of Information and Household Investment Behavior," unpublished manuscript, the University of Chicago.

Sirri, Erik and Peter Tufano (1998), "Costly Search and Mutual Fund Flows," *Journal of Finance,* Vol. 53, pp. 1589-1622.

Wermers, Russ (1999), "Mutual Fund Herding and the Impact on Stock Prices," *Journal of Finance*, Vol. 54, pp. 581-622.

Table 1: Types of Retirement Savings Schemes in the Sample

Competition/Fee Structure	AUM	Incentive Fees
No competition	New (post-2004) Life Insurance[ii] N=9	Old (pre-2004) Life Insurance[i] N=8
Competition	Provident Funds[iii] N=56	N/A

(i) **Old Life Insurance (OLI) Plans**: Life-insurance policies with a very substantial savings component. Fees are based on a combination of a relatively small AUM-based fee (up to 0.6%) and a large performance-based fee (up to 15% of inflation-adjusted returns). A high-watermark provision ensures that the fund manager collects such fees only after any losses from previous years have been recouped; no fees are charged on deposits. These funds are closed to new members; old members can leave without a tax penalty, but lose important benefits when doing so. Old members can, however, discontinue deposits and retain some of their benefits. In January 2013 two insurance companies merged, leaving a sample of seven OLI plans in the years 2013-2015.

(ii) **New Life Insurance (NLI) Plans** (established in 2004 or later): These are generally similar the OLI plans, except that fees are based primarily on AUM (and on monthly deposits). Unlike the OLI plans, the NLI ones are open to new members, but savers face substantial switching costs and are unlikely to leave or switch plans. In addition to the eight insurance companies providing OLI plans, the sample includes one additional insurance company offering only a NLI plan. The same merger mentioned in (i) reduced the sample of NLI plans to eight in the years 2013-2015.

(iii) **Provident (including shorter term) Funds (PF)**: A long-term saving scheme with roughly the same tax benefits as life insurance plans, but without insurance coverage. Fees on these products are based on AUM and the environment they operate in today is highly competitive and without switching costs. Tax regulations allow most savers in PF to withdraw their savings after 15 (and sometimes fewer) years without any tax penalty, although such a withdrawal involves the loss of tax benefits on future returns. PF are closest to U.S. mutual funds in the environment they operate in. Our sample includes only PF whose assets under management, as of 2013, exceeded NIS 500 million (about $125 million). To the extent that there are some funds which used to be above the threshold and no longer satisfy the size criterion in 2013, the performance of the PF industry that we measure may be an upper bound on the sector's actual performance. The actual number of funds varies slightly in some months.

Table 2: Sample Statistics by Fund Type

	Average Fund AUM (billions NIS, as of 12/2013)	Average Monthly Return (1/2005-3/2015)	Cumulative Gross [Net] Returns (1/2005-3/2015)	Average Annual STD of Monthly Returns	Average Annual Fees
Old Life Insurance Plans	18.5*	0.64%*	115.65%*	1.54%	1.30%*
	(6.5)	(0.06)	[101.46%]	(0.06)	(0.076)
New Life Insurance Plans	3.4	0.60%	107.59%	1.53%	1.16%
	(1.6)	(0.06)	[95.04%]	(0.07)	(0.025)
Provident Funds	2.8	0.58%	104.71%	1.47%	0.74%
	(0.5)	(0.02)	[96.53%]	(0.03)	(0.021)

Notes: Fund size in US dollar terms is about ¼ of the reported size in NIS terms. Monthly and cumulative returns are gross returns in nominal terms. The standard deviation of monthly returns is calculated annually and then averaged across years and fund types. Fees refer to total fund fees charged (excluding life insurance fees). Standard errors (standard deviations divided by the square root of the number of observations) appear in parentheses except for cumulative returns where returns net of fees appear in square brackets. * denotes cases where differences between OLI and NLI plans are statistically significant at conventional levels in pairwise (within fund-manager) *t*-tests. None of the differences between all NLI plans and all PF (in non-paired tests) is statistically significant, except the difference in fees.

Table 3: Comparison of Risk and Return of Retirement Savings Schemes 1/2005-3/2015

	Monthly Return	**Standard Deviation of Monthly Returns**
	(1)	(2)
Old Life Insurance Plans	0.072 ***	0.019
	(0.020)	(0.051)
Provident Funds Scheme	-0.028 *	-0.089 **
	(0.014)	(0.040)
Size (log AUM)	-0.017 **	-0.004
	(0.007)	(0.018)
Observations	8,172	730
R^2	.254	.744
Year Fixed Effects	Yes	Yes
Management Company Fixed Effects	Yes	Yes

Notes: OLS regressions; robust standard errors, clustered at the fund level (73 funds) are in parentheses. The dependent variables are, in Column 1, monthly gross return (%) and, in Column 2, the annual standard deviation of monthly returns (%). ***=Significant at the 1-percent level; **=Significant at the 5-percent level; *=Significant at the 10-percent level.

Table 4: Comparison of Individual Fund Regression Results by Fund Type

	R^2	α	t-stat of α	β Tel Aviv 100	β MSCI World	β Corporate Bonds
	(1)	(2)	(3)	(4)	(5)	(6)
Old Life Insurance Plans	0.910	2.518*	2.114*	0.221	0.179	0.405
	(0.010)	(0.234)	(0.198)	(0.008)	(0.016)	(0.046)
New Life Insurance Plans	0.913	1.540	1.313	0.217	0.146	0.379
	(0.011)	(0.294)	(0.230)	(0.007)	(0.012)	(0.048)
Provident Funds	0.929	1.455	1.440	0.192+	0.113+	0.408
	(0.006)	(0.117)	(0.083)	(0.004	(0.006)	(0.025)

Notes: The table reports factor loadings from fund-specific regressions where the dependent variable is the monthly excess return (where the risk free rate is derived from yields on short-term government bonds) on a number of indices proxying for risk factors. α is expressed in percent, in annual terms. Non-overlapping 36-month periods are used in all regressions, with 1/2005 as the starting month. All means are unweighted; standard errors (the standard deviation of the variable, divided by the square root of the number of observations) are in parentheses. * denotes cases where differences between OLI and NLI plans are statistically significant at conventional levels in pairwise (within fund-managers) *t*-tests. + denotes cases where differences between NLI plans and PF are statistically significant at conventional levels (in non-paired tests).

Table 5 – The Effect of Incentive Fees and Competition on Risk-Adjusted Return

	Whole Sample		Insurance Companies Only	
	(1)	(2)	(3)	(4)
Old Life Insurance Plans	0.866***	0.923***	0.959***	0.837***
	(0.236)	(0.266)	(0.232)	(0.259)
Provident Funds	-0.321*	-0.208	-0.268	-0.123
	(0.184)	(0.176)	(0.175)	(0.175)
Percentage in Illiquid Assets		0.841		2.221*
		(1.346)		(1.249)
Size (log AUM)	-0.047	-0.099	-0.089	-0.119
	(0.095)	(0.086)	(0.094)	(0.081)
Observations	192	180	75	72
R^2	.467	.494	.448	.491
Period Fixed Effects	Yes	Yes	Yes	Yes
Management Company Fixed Effects	Yes	Yes	Yes	Yes

Notes: OLS regressions; robust standard errors, clustered at the fund level (Column 1 – 73 funds, Column 2 – 65 funds, Column 3 – 27 funds, and Column 4 – 26 funds) are in parentheses. The dependent variable is the calculated α for three 36-month non-overlapping periods, expressed in percent in annual terms. Column 1 presents our main specification, and includes all funds in the sample; Column 2 adds to the regression the percentage of the portfolio invested in illiquid assets as a control variable. Column 3 includes all life insurance plans as in Column 1, together with insurance company-owned provident funds only; and, finally, Column 4 adds the percentage of the portfolio invested in illiquid assets as an additional control variable to the regression in Column 3. ***=Significant at the 1-percent level; ** =Significant at the 5-percent level; *=Significant at the 10 percent level.

Table 6 – Alternative Specifications

	Base Spec	Peers	Factor	Period	t stat
	(1)	(2)	(3)	(4)	(5)
Old Life Insurance Plans	0.866***	0.813***	0.790***	0.920***	0.654***
	(0.236)	(0.230)	(0.244)	(0.207)	(0.198)
Provident Funds Scheme	-0.321*	-0.314*	-0.378*	-0.485***	-0.102
	(0.184)	(0.177)	(0.190)	(0.165)	(0.141)
Size (log AUM)	-0.047	-0.040	-0.019	-0.064	-0.008
	(0.095)	(0.093)	(0.099)	(0.082)	(0.079)
Observations	192	192	192	192	192
R^2	.467	.467	.463	.559	.444
Period Fixed Effects	Yes	Yes	Yes	Yes	Yes
Manager Fixed Effects	Yes	Yes	Yes	Yes	Yes

Notes: OLS regressions; robust standard errors, clustered at the fund level (73 funds) are in parentheses. In Columns 1-3 the dependent variable is calculated for three 36-month non-overlapping periods, expressed in percent in annual terms. Column 1 reproduces the benchmark specification from Table 5, Column 1. In Column 2 the dependent variable is the peer-adjusted α where an additional risk factor is added based on the performance of all funds in the industry (see Hunter et al., 2014 and explanation in the text). In Column 3 the dependent variable is α which is derived from a specification without the indexed government bonds factor. In Column 4 we estimate α using three 41-month periods (1/2005-3/2015). In Column 5 the dependent variable is the t-statistic of the estimated α in the base specification. ***=Significant at the 1 percent level **.=Significant at the 5 percent level. *=Significant at the 10 percent level

Table 7 – Restricted Samples

	Base Spec	Old & New	Provident & New	Provident (Insurance-owned) & New
	(1)	(2)	(3)	(4)
Old Life Insurance Plans	0.866***	0.867***		
	(0.236)	(0.223)		
Provident Funds Scheme	-0.321*		-0.343*	-0.245
	(0.184)		(0.193)	(0.184)
Size (log AUM)	-0.047	-0.048	-0.066	-0.144
	(0.095)	(0.089)	(0.100)	(0.091)
Observations	192	48	169	52
R^2	.467	.520	.452	.438
Period Fixed Effects	Yes	Yes	Yes	Yes
Manager Fixed Effects	Yes	Yes	Yes	Yes

Notes: OLS regressions; robust standard errors, clustered at the fund level (Column 1 - 73 funds, Column 2 – 17 funds, Column 3 – 65 funds, Column 4 - 19 funds) are in parentheses. The dependent variable is the calculated α for three 36-month non-overlapping periods, expressed in percent in annual terms. Column 1 reproduces the benchmark specification from Table 5, Column 1. In Column 2 the sample is restricted to OLI and NLI plans only; in Column 3, to NLI plans and PF only; and in Column 4, to NLI plans and insurance company-owned PF. ***=Significant at the 1-percent level; ** =Significant at the 5-percent level; *=Significant at the 10 percent level.

Table 8 – Regressions for Sub-Periods

	Base Spec	1st and 2nd Periods	1st and 3nd Periods	2nd and 3nd Periods
	(1)	(2)	(3)	(4)
Old Life Insurance Plans	0.866***	1.325***	0.740***	0.722***
	(0.236)	(0.324)	(0.278)	(0.254)
Provident Funds Scheme	-0.321*	-0.122	-0.404*	-0.386*
	(0.184)	(0.229)	(0.228)	(0.227)
Size (log AUM)	-0.047	-0.147	-0.069	-0.001
	(0.095)	(0.127)	(0.102)	(0.109)
Observations	192	129	121	134
R^2	.467	.594	.613	.513
Period Fixed Effects	Yes	Yes	Yes	Yes
Manager Fixed Effects	Yes	Yes	Yes	Yes

Notes: OLS regressions; robust standard errors, clustered at the fund level (around 70 funds in each regression) are in parentheses. The dependent variable is the calculated α for two 36-month non-overlapping periods, expressed in percent in annual terms. Column 1 replicates the benchmark specification from Table 5, Column 1. In Column 2 we use the calculated α for the first two periods only (1/2005-12/2007 and 1/2008-12/2010) and omit the third period α; in Column 3 we use the calculated α for the first and last periods only (1/2005-12/2007 and 1/2011-12/2013) and omit the second period α; in Column 4 we use the calculated α for the last two periods only (1/2008-12/2010 and 1/2011-12/2013) and omit the first period α. ***=Significant at the 1-percent level; ** =Significant at the 5-percent level; *=Significant at the 10 percent level.

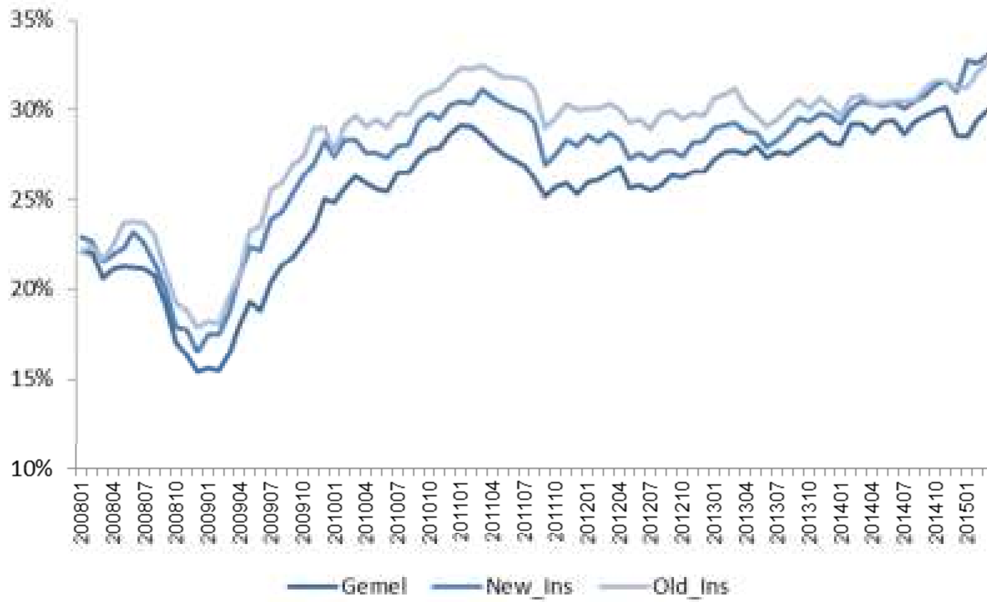
Appendix; Estimated α by Fund Type and Period

	1/2005-12/2007	1/2008-12/2010	1/2011-12/2013
Old Life Insurance Plans	2.20%*	3.05%*	2.27%
	(0.20)	(0.57)	(0.30)
New Life Insurance Plans	1.37%	1.42%	1.85%+
	(0.37)	(0.76)	(0.24)
Provident Funds	1.56%+	1.45%	1.36%
	(0.25)	(0.22)	(0.12)

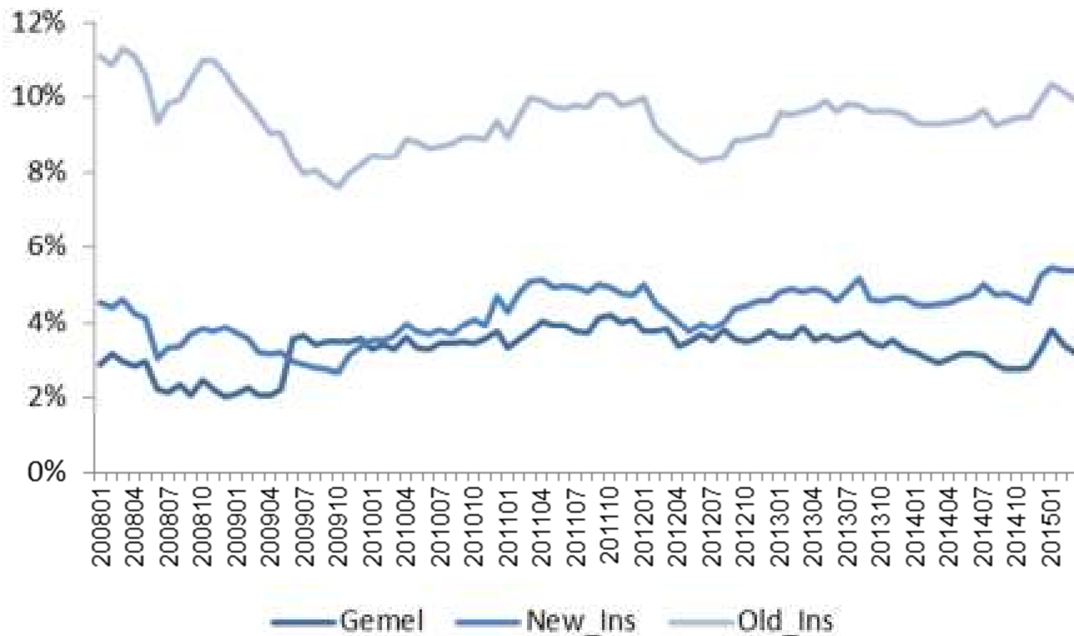
Notes: The table reports α estimated for sub-periods, expressed in percent, in annual terms. Column 1 presents the calculated α for the first period (1/2005-12/2007); Column 2 the calculated α for the second period (1/2008-12/2010), and Column 3 the calculated α for the last periods (1/2011-12/2013). All means are unweighted; standard errors (the standard deviation of the variable, divided by the square root of the number of observations) are in parentheses. * denotes cases where differences between OLI and NLI plans are statistically significant in pairwise (within fund-managers) *t*-tests. + denotes cases where differences between NLI plans and PF are statistically significant at conventional levels (in non-paired tests).

Figure 1: Asset Allocation of Retirement Savings Schemes, 1/2008-03/2015

Panel A: Percent of Assets Invested in Equity



Panel B: Percent of Assets in "Alternative Investments"



Note: The figures are calculated as the simple average of the allocation of all funds of each type in a given month.

Figure 2: Estimated α in Old and New Life Insurance Plans

Notes: Average values by fund type and manager. α is estimated using three 36-month non-overlapping periods, 1/2005-12/2013 and expressed in percent in annual terms. Manager 6 has only a NLI plan and is omitted.