

# **Investment strategies of institutional investors: an international comparison of Sovereign Pension and Social Security Reserve Funds**

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## **Abstract**

The crisis induced severe adverse effects on profitability, growth and stability of the financial sector. At the same time, Sovereign Wealth Funds (SWFs) have increased in numbers and in the global role of their investment activities, despite within a highly heterogeneous sector. The aim of this paper is to assess the impact of a specific implicit or explicit retirement scope on investment strategies and portfolios of such entities. Based on a sample of 12 Sovereign Pension Reserve Funds (SPRFs) and Social Security Reserve Funds (SSRFs), we analyze the effects of size, operational model, country development, fund's experience and quality of disclosures on the strategic asset allocation for the period 2007-2012. Moreover, we investigate the impact of the financial crises and to relevance of the 'home-bias' issue for both groups. Our results suggest a less aggressive asset allocation for SSRFs, where funding relies on contributions from participants and involves more external scrutiny, and a higher level of home investments, despite SPRFs may express other domestic strategic goals than retirement. Finally, we do not find major shifts in asset allocation induced by the financial crisis, whereas recent years reduced the amount of home-country investments especially after the triggering of the sovereign debt crisis.

**Keywords:** Sovereign Wealth Funds (SWFs), Sovereign Pension Reserve Funds (SPRFs), Social Security Reserve Funds (SSRFs), asset allocation, home-bias

*JEL Classification:* G23; G29

## 1. Introduction

In recent years Sovereign Wealth Funds (SWFs) have increased their numbers and their global importance in terms of assets under management. From the peak of the financial crisis, both the banking sector and the securities' industry have suffered severe adverse effects on profitability, growth and financial stability. At the same time, the number and size of SWFs soared: at year-end 2012, at least 65 investment vehicles are active with total asset under management in excess of 5 trillion USD (Sovereign Wealth Fund Institute, 2013).

SWFs are heterogeneous under several variables (scope, country-specific background, funding sources, etc.) with relevant impacts on their investment strategy that only recently received political and academic attention. Due to their role of institutional investors and their growth potential, their capability of being active in absorbing systemic risks from financial markets contrasts with their limited transparency and the availability of extensive financial data to assess their performance.

Public Pension Reserve Funds (PPRFs) gained also importance within the financial system, given the generalized evolution in demographic variables and increasing constraints of public budgets, especially in countries with prominent social security systems. A number of public pension reforms took place in most countries, including a renewed attention to alternative welfare solutions both government-sponsored and left to individual responsibility that add to the need of societies to transfer wealth between generations. The pension fund sector has a longer history and is also populated by heterogeneous operational models, encompassing private funds, government-sponsored institutions and SWFs with retirement purposes (OECD, 2013). Figures, based on 2012 data, show that 133 out of the 300 largest pension funds are PPRFs, accounting for assets under management in excess of 9 trillion USD (TowersWatson, 2013).

Our paper focuses on the analysis of two types of funds within this group, namely Sovereign Pension Reserve Funds (SPRFs) and Social Security Reserve Funds (SSRFs). The former are funds established directly by governments and separated from social security systems, whose financial inflows come mainly from direct fiscal transfers (Blundell-Wignall *et al.*, 2008). Therefore, SPRFs

are a type of SWF with the exclusive or partial specific purpose to finance future public pension expenditure. The other category includes funds set up as a part of the overall social security system, whose funding is mainly derived from surpluses of employee and employer contributions over current payouts (Blundell-Wignall *et al.*, 2008).

Considering that those two clusters share similar investment objectives within a medium/long-term time horizon and as institutional investors may act as systemic risk-absorbers in the financial sector, the aim of this paper is to assess the impact of the retirement scope on their strategic and geographical asset allocation. In order to keep a proper balance between the depth allowed to our analysis and the scarce availability of homogenous data, we base our comparison on a reduced sample of the largest SPRFs and SSRFs. Moreover, by focusing on the period 2007-2012 we aim at investigating how the financial crises impacted these funds and at measuring the level of ‘home-bias’ in investments for both groups. Finally, we additionally control for the effects of experience, location in emerging or developed countries, quality of disclosures and size of portfolios.

Our paper contributes to the existing literature in two ways. First, we aim to shed light on investment strategies carried out by government-sponsored investment vehicles, typically characterized by a lack of disclosure and transparency that contrasts with the relevance of their performance for citizens and their share of global investments held. Secondly, we extend the literature on home-bias of investments, so far focused on mutual and private pension funds.

Our study has significant implications for financial markets, given the impact that these funds may produce on specific asset classes or geographical areas and their potential role of risk absorbers due to their long-term investment strategies. To the best of our knowledge, this is the first study that explicitly compares strategic portfolios of SPRFs and SSRFs, whereas literature on SWFs is per se relatively scarce but growing significantly.

This paper is structured as follows. In Section 2 we review of the most relevant literature on this topic, in Section 3 we describe our dataset and methodology, in Section 4 we provide our findings

and in Section 5 we conclude our paper with suggestions for policy implications and future research.

## **2. Literature review**

SWFs are public institutional investors, established with different investment purposes that originate from productive and financial imbalances across countries (Griffith-Jones and Ocampo, 2010). Due to their heterogeneous nature, SWFs can be divided in four categories: (1) stabilization funds, aiming at isolating state budgets from the excessive volatility of commodity prices, (2) saving funds, ensuring intergenerational transfers of national wealth, (3) sovereign pension reserve funds (SPRFs), covering potential future pension deficits and (4) reserve investment corporations, dealing with currency reserves in excess of those managed by the Central Bank, in order to maximize the risk-return relationship (Kunzel *et al.*, 2011). In this paper we consider SPRFs as our first panel group.

The academic literature started examining SWFs only recently and in particular analyzed their investment strategies under different perspectives. Firstly, some contributions focus on how SWFs' investments affect target firms' stock prices and performance. Market reactions around acquisitions, in shorter windows, tend to be significantly positive, meaning that market participants believe that SWFs will improve target firms' performance; instead, in the long run, most part of the literature observes that SWFs do not improve firm value (Bortolotti *et al.*, 2010; Knill *et al.*, 2012a; Kotter and Lel, 2011), implying that they are passive investors and that there are other investment motivations beyond the maximization of the risk-return relationship (Knill *et al.*, 2012b).

A second strand of literature directly investigates the asset allocation of these entities. Balding (2008) analyzes portfolios held by seven SWFs in 2008, highlighting a preference for investment grade bonds and liquidity. In relation to the equity component, the author shows that SWFs prefer to hold low-risk shares, typically large-cap blue chips, and domestic shares. Chhaochharia and Laeven (2010), achieve similar conclusions and extend their findings to a lack of geographical

diversification outside the countries of origin (“cultural bias”). Fernandez and Eschweiler (2008), conversely, forecast a more aggressive asset allocation strategy for SWFs, suggesting that the weight of alternatives and equity in the medium to long term is destined to increase.

Mercer (2008) introduces a classification of SWFs in terms of risk tolerance levels. The presence of various asset classes in SWF portfolios depends on institutional objectives and on the greater or lesser risk tolerance of the fund: while Central Banks may purchase equity, stabilization funds simply invest in government bonds or other liquid financial instruments, in line with the short-term time horizon and with the goal to protect domestic budgets from excessive commodity price volatility. With specific reference to savings funds the study shows that, despite the medium-to-long term time horizons pursued, not all funds have high risk tolerance.

Kunzel et al. (2011) compare the portfolio composition of SWFs across two different time periods, identifying four institutional goals (stabilization, savings, Sovereign Pension Reserve Funds and reserve investment), analyzing their impact on the strategic asset allocation and the influence of the subprime financial crisis. Authors find that wide differences exist within funds ideally aiming at the same goal and that reaction to the financial crises was also heterogeneous, favoring liquidity or more or less conservative asset classes depending on country-specific circumstances.

Avendaño and Santiso (2009) compare the portfolios of 17 SWFs with those of 25 mutual funds. The study basically shows that there are no major differences between the two types of portfolios in terms of composition and riskiness. In terms of geographical asset allocation, SWFs show greater international diversification compared to mutual funds and seem to be characterized by a more pronounced home-bias. Similar conclusions in favor of greater diversification of SWFs are drawn with reference to sectoral asset allocation.

Pension funds have been widely investigated by existing literature. The literature originally focused on the optimal asset allocation, questioning if investments of pension funds should retain greater risks through a higher share of equities and therefore enhance inter-generational welfare or

seek conservatism through fixed-income securities to reduce uncertainty. Modeling and evidence is supportive of the relevance of the measure used for funds' liabilities (Black, 1989; Sundaresan and Zapatero, 1997). In this area, adverse effects on investments due to the accounting choice of discounting liabilities using returns on assets are reported, leading to higher investments in equities and a positive correlation between stocks and pension liabilities in the long term (Lucas and Zeldes, 2009), with potential detriment for future generations due to a higher current market-consistent measure for liabilities of pension funds (Novy-Marx and Rauh, 2011). More recently, Andonov *et al.* (2013) argue that this kind of asset-liability link could increase investment risk-taking, "camouflaging" the level of underfunding, leading to underperformance and being consistent with the conflict of interest between generations of funds' participants.

On the approach to asset allocation of pension funds, findings support the idea that strategic asset allocation accounts for most of the variability in portfolio returns, with little effects of market timing and stock picking (Blake *et al.*, 1999) and explanations that almost entirely depend on average across-funds asset allocation policy (Ibbotson and Kaplan, 2000). The positive effect of size on costs does not lead to a superior performance and diseconomies arise from portfolio rebalancing and the active management of investments (Andonov *et al.*, 2012). Despite in mutual funds evidence supports the existence of diseconomies of scale because of organizational and liquidity issues (f.i. Chen *et al.*, 2004), pension funds experience limited organizational diseconomies and positive economies of scale in asset management activities, especially towards private equity and real estate (Dyck and Pomorski, 2011). Pennacchi and Rastad (2011) investigate the optimal portfolio allocation of pension funds, finding that they retain greater risks after periods of poor investment performance, when liabilities are discounted at higher rates and participants are highly represented in governance bodies. Finally, Crossley and Jametti (2013) find that where guarantees on benefits are present, pension funds take higher levels of portfolio risk.

A third area of investigation is linked with home-bias of investments. The evolution of equity portfolio weights is found to be substantially explained by time-varying conditional expected

returns, volatilities and covariances with domestic equity returns by Timmermann and Blake (2005). The extensive report realized for the European Union by Oxera (2007) presents a number of links between regulation and home-bias. Firstly, a number of regulatory constraints limit the efficiency of pension funds' portfolios especially on cross-border investments and leading to a higher share of domestic securities and government bonds. Also, when restrictions are removed, a higher level of cross-border diversification is reported. Home-bias could also be explained by aversion to currency risk, the lack of scale or expertise in more recently established institutions, different tax regimes or transaction costs. Finally, a negative impact of restrictions is produced on risk-return performance of pension funds, especially for equities. Limits expressed in terms of fixed shares of the overall portfolio are able to trigger a predictable rebalancing when market values of securities change resulting in contrarian behavior of pension funds (Sharpe, 2010).

To analyse investment strategies of SPRFs and SSRFs within the theoretical framework of the asset management theory, we develop our hypothesis around differences in their behavior from mutual and private pension funds stemming from their significant public nature.

Following this approach, we can expect time horizon to be a key driver in the strategic asset allocation: the longer the time horizon and holding period, the higher the risk tolerance (Siegel, 1998). This is related to equity risk premium (Fama and French, 2001; Damodaran, 2010): we expect a higher proportion of equities and alternatives over bonds and liquidity in SPRFs given their longer time horizon (Brandt and Kavajecz, 2004; Gollier, 2007; Khandani and Lo, 2009), whereas SSRFs, being funded by participants, should hold more bonds.

In relation to the geographical asset allocation, we expect a significant preference for domestic assets for both groups (Bernstein et al., 2009) as in other institutional investors such as mutual funds and private pension funds (Chan et al., 2005; Ke et al., 2006). However, we expect the home-bias to be stronger SSRFs, given their closer connections with national economic policies, whereas for SPRFs we expect a less stable level of domestic investments due to the potential presence of

additional explicit or implicit strategic goals in the use of funds' resources to answer to contingent circumstances.

Finally, we expect that from the peak of the financial crisis these institutions changed strategic asset allocation, with greater preference for riskier assets and home-country investments in SPRFs when compared to SSRFs.

### **3. Data and methodology**

The sample for our study consists of 6 Sovereign Pension Reserve Funds (SPRFs) and 6 Social Security Reserve Funds (SSRFs). The limited number of observations is mainly due to the scarce availability of information for SPRFs and the aim of keeping the highest balance possible for a direct comparison of data.

For the SPRFs' sub-sample, we started considering the largest funds that, according to the list of 60 entities provided by the Sovereign Wealth Funds Institute (2013), have the exclusive or partial specific purpose to finance future public pension expenditures. These SPRFs have total assets under management (AUM), in 2012, of 831.6 billion USD, or about 17% of AUM of all SWFs. Compared to other SWFs categories (stabilization, savings, reserve investment corporation), however, these entities provide a relatively greater amount of information. Our subsample includes two of the most important SWFs, namely the Government Pension Fund Global (Norway) with a total AUM of 694.4 billion USD and the Australia Future Fund with 85.7 billion USD.

In the SSRFs' subset, we chose the six largest funds for AUM with available data from the OECD sample (OECD, 2013). These funds have AUM of 4,604.1 billion USD, or about 51% of total AUM of SSRFs.

Table 1 lists the largest funds by AUM in the two categories, whereas Table 2 lists those that constitute our sample. Despite the skewness in size of entities, our analysis is carried in relative terms and therefore excludes this potential bias.



[insert Table 1 about here]

[insert Table 2 about here]

We collect data for the period 2007-2012 concerning strategic asset allocation, geographical asset allocation, size, experience and transparency. The sources for this data are Annual Reports and individual websites of investigated entities.

For strategic asset allocation we gather data on ratios of AUM represented by four macro-classes of investments: cash and equivalents, equity investments, fixed-income and alternatives. The latter asset class includes real estate, commodities, hedge funds and private equity, accordingly to Kunzel et al. (2011). The granularity of investment classes was limited in order to keep consistency across heterogeneous disclosures provided by entities across space and time.

For geographical asset allocation we reconstruct data on domestic and non-domestic investments by considering the proportion of such classes at the portfolio level, since only few entities provide this information for each asset class (f.i. seven funds report details on the percentage of equity home investments, four only on fixed income). For the same reason we are not be able to investigate target countries (f.i. only eight funds report the target macro-geographical area).

Data on size is based on total AUM. Since this amount is expressed in local currency, we applied a conversion in US dollars based on the average exchange rate of each reporting year published by Bank of Italy on its official website.

The experience of each fund may be another determinant of its asset allocation: we proxy this element by the age in years since inception for each fund.

Additionally, being located in a developed or emerging country could also have an impact on asset allocation. This information at the fund level as opposed to consider it at the target investment level, to the best of our knowledge, has not been investigated in existing literature yet. We include

this explanatory variable with reference to the classification provided by Morgan Stanley Capital International.

Finally, despite scoring systems on quality of disclosures are present for SPRFs (f.i. the Linaburg-Maduell Index provided by Sovereign Wealth Fund Institute or the Truman Index developed in Truman, 2007), the lack of a comparable measure for SSRFs restrained us to propose, as a tentative proxy, the total number of pages of Annual Reports.

During this process, due to the lack of data, we had to drop from our original sample the National Wealth Fund of Russia and the Employees Provident Fund Organisation of India. In particular, the former no longer provides detailed information on past strategic asset allocation (except for general references to its fixed income investment strategies), whereas the latter publishes only its 2012 annual report.

Finally, our analysis had to consider the potential effect on the asset allocation of annual reports being published in different dates. In particular, our sample consists of three SPRFs that publish reports in June, three SSRFs in March and the rest in December. This potential bias is partially addressed by considering these effects separately in our regressions.

In order to assess the different impact on the strategic asset allocation of these covariates, we build our dependent variables as the ratio of specific asset classes on total AUM. To avoid the adverse effect on regressions induced by proportions, we apply the following logit transformation:

$$LOGIT(Y_i) = \log[Y_i / (1 - Y_i)] \quad (1)$$

where  $Y_i$  is each investment class (equity, fixed income, cash and equivalents, alternatives). Therefore, we run four pooled OLS regressions with time-varying intercepts and with the same covariates, in the following matrix form:

$$\begin{aligned} LOGIT(Y_i) &= \beta + \tau_i + M\psi + S\theta + X\beta + \varepsilon \\ \varepsilon &\sim i.i.d.N(0, \sigma_\varepsilon^2 I) \end{aligned} \quad (2)$$

where  $\tau_i$  is the time-effect,  $M\psi$  is the time-invariant dummy for each fund's model (taking the value 1 if the fund is a SPRF and 0 in the case of a SSRF),  $S\theta$  is the dummy for emerging markets,

$X$  is the matrix of fund-specific variables (logarithm of size in billion USD, experience as the logarithm of the age of each fund in years, two dummies representing the publication date of annual reports in March or June) and  $\beta$  is the vector of coefficients to be estimated. In particular, the time-effect  $\tau_t$  will be represented by year-dummies or, alternatively, a dummy taking the value of 1 if results refer to years before 2010, set as the beginning of the sovereign crisis, in two separate regressions.

A second analysis is focused on the issue of home-bias. We run a pooled OLS regression with time-varying intercepts of a similar logit transformation of the ratio of home investments at the portfolio level in the same matrix form shown above, where  $\tau_t$  is the time-effect,  $M\psi$  is the time-invariant dummy for each fund's model (taking the value 1 if the fund is a SPRF and 0 if a SSRF),  $S\theta$  is a dummy taking the value of 1 if the fund is located in an emerging country,  $X$  is the matrix of fund-specific variables (logarithm of size in billion USD, experience as the logarithm of the age of each fund in years, quality of disclosures as the logarithm of the number of pages in annual reports) and  $\beta$  is the vector of coefficients to be estimated. Again, the time-effect  $\tau_t$  will be represented by year-dummies or a dummy taking the value of 1 if results refer to years before 2010 (set as the beginning of the sovereign crisis) in two separate regressions.

Consistently with our hypothesis, in the first set of regressions we expect that coefficients:

- for experience are positive for equity/alternatives and negative for fixed income/cash;
- for emerging markets' funds are positive for equity/alternatives and negative for fixed income/cash;
- for SPRFs are greater and positive for equity/alternatives and negative for fixed income/cash if compared with SSRFs;
- for time-dummies are positive for riskier assets if compared to other asset classes in more recent years.

In the second set of regressions focused on home-bias, we expect that coefficients are positive for experience, emerging markets' funds and transparency, whereas are negative for SPRFs. Finally, we expect time dummies to show a reduction of home investments in more recent years.

#### 4. Discussion of findings

Table 3 presents a summary of mean and median values for dependent variables of our models.

[insert Table 3 about here]

Considering the full period 2007-2012, equity represents the major asset class for SPRFs (45-51%) whereas fixed income is the largest investment for SSRFs (70-74%). Moreover, alternative investments are significant for SPRFs (14%) and marginal for SSRFs (0-5%). Finally, the comparison of home and international investments shows a symmetrical behavior of these entities: around 80% is invested locally by SSRFs whereas this ratio is around 20% for SPRFs.

With reference to 2007-2012 trends, SPRFs show an increase in median values for cash investments<sup>1</sup>, as well as a generalized increase in alternatives (up to about 20% of total assets in 2012). SSRFs, instead, show an increase in median equity investments<sup>2</sup>. Considering home investments, SPRFs increased significantly their domestic exposure (about 25% of total assets in 2012), despite within lower levels than SSRFs that at the same time increased their internationalization (about 20-30% of international assets in 2012).

The main descriptive statistics of our variables are presented in Table 4.

[insert Table 4 about here]

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<sup>1</sup> The decrease in mean values is greatly influenced by one SPRFs founded in 2006 and expressing for the first part of the analyzed time-span an asset allocation almost entirely focused on cash and equivalents.

<sup>2</sup> Mean values are significantly different due to the presence of two SSRFs that do not invest in equities.

Our variables are affected by a high level of variance. Despite this is due to the limited number of entities included in our sample and that this should be kept in mind when reading our results, this bias is typical in studies that involve SFWs and, in our case, SPRFs. With reference to size, our samples encompass both small and very large institutions, spanning from 2 to 2,700 billion USD in assets under management. Moreover, SSRFs are larger than SPRFs. Despite our analysis considers the strategic asset allocation in relative terms, size effects could be not negligible in influencing investment decisions of these entities.

Our proxy for the quality of reporting is represented by the number of pages in annual reports. This represents a very raw measure if compared to more comprehensive indexes available for SWFs but it is able to underline the fact that SSRFs are usually more transparent.

Results of the analysis on the strategic asset allocation are presented in Table 5 and Table 6, respectively with the two definitions used for the time-dummies. Both models provide the same results and are therefore examined together.

[insert Table 5 about here]

[insert Table 6 about here]

Regressions are more robust and comparable with reference to equity and fixed income. In both cases we find that experience is positively associated with equity and negatively with fixed income: as expected, the longer the history of both SPRFs and SSRFs, the higher the asset allocation in riskier and more complex securities. This is only partially confirmed by investments in alternatives, where we obtain lower levels of statistical significance.

Being located in an emerging market is positively associated with equity investments and negatively with fixed income. Despite the existing literature, to the best of our knowledge, has never investigated this variable at the fund's level, qualitative evidence supports the hypothesis of a

different response to the financial crisis from emerging markets' funds (Monitor and FEEM, 2009 and 2010). In particular, these entities have been more active in supporting financial stability both abroad (f.i. US banks and financial intermediaries) and domestically (f.i. Middle-East funds in Qatar and Kuwait), accumulating participating interests. Finally, commodity-based funds used their high levels of liquidity available at the peak of the financial crisis to invest in riskier assets.

When looking at the difference between SPRFS and SSRFs, we find that the specific dummy is significant and positively associated with equity and negatively with fixed income. However, this result should be read together with publication dates of annual reports that, as mentioned before, biases individual results by not showing how market trends may have affected through capital gains and losses the composition of portfolios. In particular, half of our SPRFs publish reports in June, whereas half of SSRFs provide figures in March, with remaining entities reporting at year end. Therefore, by looking at March and June dummies, we can note that the former (i.e. SSRFs) present higher levels of equity and alternatives and lower levels of fixed income, whereas the latter (i.e. SPRFs) present positive and statistically significant coefficients only for cash and alternatives where the model is weaker. Therefore, despite partially biased in this sense, findings support the hypothesis that SPRFs hold significantly higher levels of equity than fixed-income securities. Results on SSRFs, on the other hand, are influenced by entities that do not publish reports in December but nonetheless show relatively lower values of equities and higher levels of fixed income investments.

Contrary to our expectations, in both versions of this model time dummies never present a significant coefficient: in other terms it seems that at least at the portfolio level strategic asset allocation is not strongly sensitive to contingent market trends. This partially reduces the previous bias stemming from different reporting dates: apparently differences do not depend on gains and losses emerging in particular years. However, as mentioned above, the post-2008 period triggered a redistribution of investments within each asset class: unfortunately, publicly available data on SPRFs does not allow further investigation of this finding.

Finally, the model is weak in explaining cash investments and leads only to a negative relationship with the size of the institution: bigger funds hold lower levels of naturally liquid investments. However, due to the limited robustness stemming from the residual role of this asset class within SPRFs and SSRFs, this result should be subject to further investigation.

Our second analysis focuses on home-bias. Results of regressions are presented in Table 7.

[insert Table 7 about here]

Firstly, the size of institutions is positively associated with the share of assets held within the home country. This result may be puzzling, in the sense that one could expect that smaller institutions may be induced to increase their investments within the domestic market in order to cope with transaction costs of international investments. However, we argue that larger funds, potentially exerting more influence through their asset allocation and the direct or indirect connection with governments could be subject to greater pressures to back up the economy of their home country. Supporting this explanation, the positive association between experience and home-bias in our findings may suggest that older funds, usually also larger, may feel a greater involvement in supporting their domestic market.

Funds that are located in emerging markets are apparently subject to a higher level of home-country investments, despite statistical significance of this result is particularly weak. This result requires further investigation, since stronger evidence may suggest that such entities are more likely to increase their domestic assets due to political influence or regulation.

SPRFs are strongly associated with lower levels of home-bias than SSRFs. Despite one could expect that pursuing additional purposes to long-term retirement expenditure (in particular, contingent domestic financial stability), the stronger home-bias of SSRFs is due to a higher level of fixed-income securities (especially government bonds) due to their role within national economic

and monetary policies. This effect should be considered together with the positive association of home-bias and a higher level of transparency, usually greater for SSRFs if compared with SPRFs.

Finally, unlike the results on asset classes, time dummies bear a moderate statistical significance for years 2011 and 2012 (equivalently for the pre-2010 dummy in the second model), showing that after the emergence of the sovereign debt crisis the share of home-country investments generally decreased. The interpretation of this result should also consider the different contribution expressed by SPRFs, experiencing a lower proportion of domestic investments and increasing such exposures at the peak of the crisis (Monitor and FEEM, 2009 and 2010): therefore, when compared to SSRFs in our sample, these entities saw their home-bias reduced to a higher extent.

## **6. Conclusions and policy recommendations**

This paper analyzes the strategic asset allocation of Sovereign Pension Reserve Funds (SPRFs) and Social Security Reserve Funds (SSRFs) in the light of their importance as institutional investors within an explicit or implicit reference to long-term retirement goals. Moreover, we examined their response to the financial crisis and the level and trend in home-bias of their portfolios.

We analyze a small sample of large SPRFs and SSRFs for the period 2007-2012 through a pooled OLS regression on four major asset classes and on the level of home-country investments, controlling for size, experience, location in emerging or developed countries, quality of disclosure and time. Our hypothesis mainly revolve around an expected higher level of risk-taking and lower level of home-bias in SPRFs if compared to SSRFs, with effects increasing since the inception of the financial crisis. The scarcity of data and heterogeneity typically biasing research on SWFs allowed only a partial confirmation of our expected results.

Our findings suggest a less aggressive asset allocation for SSRFs, with an overweight of fixed income, consistently with the prevalence of contributions and scrutiny of private citizens. Conversely, we find an overweight of equity and alternatives in SPRFs that could indicate the pursuit of equity and illiquidity premiums together with additional strategic goals, such as the



maximization of risk/return reward in managing public financial resources. However, the general strategic asset allocation of funds does not seem to be significantly influenced from the financial crisis. In terms of home-bias, higher levels of domestic investments are shown by larger institutions and SSRFs, in particular after the triggering of the sovereign debt crisis, potentially due to their role within national economic policies.

These results convey policy implications especially in two areas. Firstly, despite a stable trend of improvement in transparency of SPRFs, a greater compliance to international standards (f.i. the “Santiago principles”) could be beneficial for both management and performance of these entities. Then, regulatory frameworks on investments of SSRFs should weight more carefully the trade-off between the importance of supporting the domestic financial stability and the risks posed by an excessive concentration on home assets on future retirement benefits of citizens.

Finally, the main limitations of this study suggest two main directions for further research emerge. On one side, an increased transparency could extend the size and depth of the analysis, allowing comparisons with other institutional investors such as mutual investment and private pension funds and improve the robustness of results, contributing to the steering of these entities. Additionally, more detailed and homogeneous information within each asset class at the level of each security should allow an effective measure of the risk-based performance and the investment behavior of funds that will affect the retirement income of a high number of individuals in both developed and emerging countries.

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## Tables and figures

**Table 1: Largest SPRFs and SSRFs by size (AUM December, 2012)**

The table lists the largest sovereign pension reserve funds and social security reserve funds by assets under management in billion USD as of 2012.

Country	Name	AUM
<b>SPRF</b>		
Norway	Government Pension Fund-Global	694.4
UAE	Abu Dhabi Investment Authority	627.0
Saudi Arabia	SAMA	532.8
China	China Investment Corporation	482.0
Kuwait	Kuwait Investment Authority	342.0
Singapore	GIC	247.5
Russia	Oil & Gas Fund	175.5
Singapore	Temasek Holdings	157.5
Qatar	Qatar Investment Authority	115.0
Australia	Australian Future Fund	85.7
Kazakhstan	Kazakhstan National Fund	61.8
South Korea	Korea Investment Corporation	56.5
USA	Alaska Permanent Fund	46.8
Azerbaijan	State Oil Fund	32.7
Ireland	National Pension Reserve Fund	19.4
<b>SSRF</b>		
United States	Social Security Trust Fund	2,732.3
Japan	Government Pension Investment Fund	1,298.1
Saudi Arabia	General Organisation for Social Insurance	448.0
South Korea	National Pension Service	302.9
China	National Social Security Fund	175.9
Canada	Canada Pension Plan Investment Board	173.6
Sweden	National Pension Fund	147.0
India	Employees Provident Fund Organisation	106.7
Spain	Social Security Reserve Fund	83.1
France	AGIRC-ARCOO	65.7
Argentina	Sustainability Guarantee Fund	50.0
Canada	Qebec Pension Plan	39.3
Belgium	Zilverfonds	25.3
Portugal	Social Security Financial Stabilisation Fund	14.4
Indonesia	Jamsostek	14.1

**Source: Sovereign Wealth Fund Institute, 2013; OECD, 2013**

**Table 2: Sample of SPRF and SSRF (AUM December, 2012)**

The table lists sovereign pensions reserve funds and social security reserve funds included in our sample, together with their size in billion USD as of 2012.

<b>Country</b>	<b>Name</b>	<b>Established</b>	<b>AUM</b>
<b>SPRF:</b>			
Norway	Government Pension Fund-Global	1990	694.4
Australia	Australian Future Fund	2006	85.7
Ireland	National Pension Reserve Fund	2001	19.4
New Zealand	New Zealand Superannuation Fund	2003	17.2
US	New Mexico State Investment Council	1958	9.0
Chile	Chile Pension Reserve Fund	2006	5.9
<b>Total SPRF</b>			<b>831.6</b>
<b>SSRF:</b>			
US	Social Security Trust Fund	1937	2,732.3
Japan	Government Pension Investment Fund	2006	1,298.1
South Korea	National Pension Service	1988	302.9
Canada	Pension Plan Investment Board	1997	173.6
Spain	Social Security Reserve Fund	2000	83.1
Indonesia	Jamsostek	1957	14.1
<b>Total SSRF</b>			<b>4,604.1</b>

**Table 3: Median and mean values of dependent variables**

The table illustrates median and mean values for the composition of investments in our sample of sovereign pension reserve funds (SPRF) and social security reserve funds (SSRF) for the period 2007-2012. *Cash* are investments in cash and equivalents. *Fixed inc.* are investments in interest-bearing securities. *Equity* are investments in stock and equivalents. *Altern.* are investments in real estate, commodities, hedge funds and private equity. *Home* represents investments within the home country of each fund. *Intern.* represents investments outside the home country of each fund.

Year	Fund	Median values						Mean values					
		Cash	Fixed inc.	Equity	Altern.	Home	Intern.	Cash	Fixed inc.	Equity	Altern.	Home	Intern.
2007	SPRF	1%	18%	54%	3%	7%	94%	16%	34%	43%	8%	19%	81%
	SSRF	0%	77%	21%	0%	82%	18%	6%	71%	21%	3%	78%	22%
2008	SPRF	1%	18%	52%	6%	6%	95%	10%	34%	45%	10%	15%	85%
	SSRF	0%	80%	17%	0%	85%	16%	6%	73%	18%	4%	80%	20%
2009	SPRF	5%	18%	52%	11%	18%	82%	10%	33%	45%	13%	21%	79%
	SSRF	0%	77%	21%	0%	84%	17%	6%	72%	18%	5%	82%	18%
2010	SPRF	5%	25%	50%	19%	18%	82%	5%	35%	45%	15%	19%	81%
	SSRF	0%	73%	23%	0%	86%	14%	6%	71%	18%	5%	82%	18%
2011	SPRF	5%	21%	48%	17%	19%	82%	4%	34%	44%	17%	22%	79%
	SSRF	0%	70%	24%	0%	86%	15%	6%	69%	18%	7%	83%	18%
2012	SPRF	6%	18%	50%	21%	23%	77%	5%	27%	48%	20%	25%	75%
	SSRF	0%	64%	27%	0%	78%	22%	5%	64%	25%	6%	70%	30%
Full period	SPRF	2%	19%	51%	14%	12%	88%	9%	33%	45%	14%	20%	80%
	SSRF	0%	74%	23%	0%	83%	17%	5%	70%	20%	5%	78%	22%

**Table 4: Main descriptive statistics of dependent and independent variables**

The table illustrates descriptive statistics for our dependent and main independent variables. SPRF are sovereign pension reserve funds. SSRF are social security reserve funds (SSRF) for the period 2007-2012. *Cash* are investments in cash and equivalents. *Fixed inc.* are investments in interest-bearing securities. *Equity* are investments in stock and equivalents. *Altern.* are investments in real estate, commodities, hedge funds and private equity. *Home* represents investments within the home country of each fund. *Intern.* represents investments outside the home country of each fund. *Size* is the total of assets under management in billion USD. *Transparency* is expressed in terms of the number of pages of annual reports.

	Min	Q1	Median	Mean	Q3	Max	St.Dev
<b>Asset allocation:</b>							
Cash	0.00%	0.00%	0.00%	6.97%	7.00%	91.00%	15.09%
Fixed income	0.00%	19.75%	43.00%	51.78%	81.75%	100.00%	34.37%
Equity	0.00%	13.50%	28.00%	32.14%	52.00%	76.00%	24.13%
Alternatives	0.00%	0.00%	0.50%	9.13%	19.00%	38.00%	11.76%
Home	0.00%	12.00%	52.00%	50.19%	84.75%	100.00%	36.74%
International	0.00%	15.25%	48.00%	49.81%	88.00%	100.00%	36.74%
<b>Size (bln USD):</b>							
- Full sample	2	15	78	403	345	2,733	729
- SPRF	2	13	16	84	52	591	155
- SSRF	7	84	214	704	1,313	2,733	909
<b>Transparency (pages):</b>							
- Full sample	12	73	98	127	137	638	104
- SPRF	16	73	91	100	125	164	34
- SSRF	12	73	103	152	226	638	136

**Table 5: Pooled-OLS regression on strategic asset allocation (pre- and post-2010 time dummies)**

The table illustrates results of our heteroscedasticity-robust pooled OLS regressions, where the dependent variable is the *logit* transformation of the ratio of investments in four asset classes. *P-values* are provided in brackets. *Ln(AUM)* is the proxy for size as the log of assets under management in billion USD. *Ln(exp)* is the proxy for experience as the log of age in years of each fund. *Dpre2010* is the time-dummy taking the value 1 for years 2007, 2008 and 2009 and 0 for years 2010, 2011 and 2012. *Dmar* and *Djun* are dummies taking the value 1 if, respectively, the annual report is published in March or in June. *Dsprf* is a dummy taking the value of 1 for sovereign pension reserve funds and 0 for social security reserve funds. *Demerg* is a dummy taking the value of 1 if the fund is located in an emerging market. *Cash* are investments in cash and equivalents. *Fixed inc.* are investments in interest-bearing securities. *Equity* are investments in stock and equivalents. *Altern.* are investments in real estate, commodities, hedge funds and private equity. *Home* represents investments within the home country of each fund. *Intern.* represents investments outside the home country of each fund.

	Equity			Fixed income			Cash			Alternatives		
	Coeff	St.err	t-stat	Coeff	St.err	t-stat	Coeff	St.err	t-stat	Coeff	St.err	t-stat
const	-59.4823 ** (0.017)	24.2900	-2.4488	57.8284 ** (0.027)	25.6298	2.2563	34.7915 (0.140)	23.2930	1.4936	-10.9133 (0.676)	25.9883	-0.4199
Ln(AUM)	0.6778 (0.448)	0.8885	0.7629	-0.7526 (0.433)	0.9529	-0.7899	-2.4825 *** (0.008)	0.9068	-2.7376	-0.9239 (0.349)	0.9798	-0.9429
Ln(exp)	5.8738 *** (<0.001)	1.1784	4.9845	-4.8500 *** (0.009)	1.7991	-2.6957	2.0708 (0.221)	1.6749	1.2364	3.0678 * (0.052)	1.5484	1.9814
Dpre2010	1.1713 (0.663)	2.6791	0.4372	-1.5908 (0.577)	2.8406	-0.5600	-2.9405 (0.355)	3.1555	-0.9319	-1.1291 (0.721)	3.1440	-0.3591
Dmar	29.4987 *** (<0.001)	3.5437	8.3243	-28.0503 *** (<0.001)	4.2647	-6.5773	6.3764 (0.302)	6.1288	1.0404	13.9002 ** (0.013)	5.4351	2.5575
Djun	3.7262 (0.384)	4.2551	0.8757	-6.9041 (0.184)	5.1383	-1.3436	12.9235 *** (0.006)	4.5735	2.8257	17.0505 *** (<0.001)	4.0825	4.1765
Dsprf	17.6346 *** (<0.001)	3.7812	4.6638	-16.5135 *** (<0.001)	4.2693	-3.8680	0.9505 (0.813)	4.0039	0.2374	5.2997 (0.226)	4.3343	1.2227
Demerg	11.5672 *** (<0.001)	3.1502	3.6719	-11.7451 *** (<0.001)	3.3446	-3.5117	-2.0724 (0.564)	3.5718	-0.5802	1.7545 (0.697)	4.4781	0.3918
Obs.	72			72			72			72		
R sq.	0.4120			0.3876			0.2749			0.3491		
Adj R sq.	0.3477			0.3206			0.1956			0.2779		
Ftest(7,64)	15.20			13.79			10.33			14.05		

Significance codes: '\*\*\*' expresses significance at the 0.999 level, '\*\*' at 0.99 and '\*' at 0.95



**Table 6: Pooled-OLS regression on strategic asset allocation (year time dummies)**

The table illustrates results of our heteroscedasticity-robust pooled OLS regressions, where the dependent variable is the *logit* transformation of the ratio of investments in four asset classes. *P-values* are provided in brackets. *Ln(AUM)* is the proxy for size as the log of assets under management in billion USD. *Ln(exp)* is the proxy for experience as the log of age in years of each fund. *D08-12* are time-dummies for each year. *Dmar* and *Djun* are dummies taking the value 1 if, respectively, the annual report is published in March or in June. *Dsprf* is a dummy taking the value of 1 for sovereign pension reserve funds and 0 for social security reserve funds. *Demerg* is a dummy taking the value of 1 if the fund is located in an emerging market. *Cash* are investments in cash and equivalents. *Fixed inc.* are investments in interest-bearing securities. *Equity* are investments in stock and equivalents. *Altern.* are investments in real estate, commodities, hedge funds and private equity.

	Equity			Fixed income			Cash			Alternatives		
	Coeff	St.err	t-stat	Coeff	St.err	t-stat	Coeff	St.err	t-stat	Coeff	St.err	t-stat
const	-58.5164 ** (0.022)	24.7987	-2.3597	55.8930 ** (0.038)	26.3973	2.1174	32.3235 (0.193)	24.5701	1.3156	-12.8184 (0.627)	26.2747	-0.4879
Ln(AUM)	0.7141 (0.447)	0.9324	0.7659	-0.8087 (0.425)	1.0067	-0.8033	-2.5065 *** (0.010)	0.9398	-2.6672	-0.9302 (0.360)	1.0093	-0.9216
Ln(exp)	5.9988 *** (<0.001)	1.2026	4.9880	-5.0860 *** (0.004)	1.7058	-2.9817	1.9880 (0.260)	1.7492	1.1365	2.9723 * (0.059)	1.5444	1.9245
D08	-1.4768 (0.744)	4.4995	-0.3282	3.7960 (0.485)	5.4073	0.7020	-0.3472 (0.949)	5.3904	-0.0644	1.9272 (0.726)	5.4715	0.3522
D09	-2.4525 (0.593)	4.5613	-0.5377	4.5849 (0.400)	5.4075	0.8479	1.9767 (0.740)	5.9280	0.3335	1.7167 (0.756)	5.5084	0.3117
D10	-3.2699 (0.482)	4.6258	-0.7069	5.3465 (0.328)	5.4255	0.9854	4.3690 (0.429)	5.4826	0.7969	1.6063 (0.775)	5.5857	0.2876
D11	-3.9497 (0.405)	4.7060	-0.8393	5.8482 (0.289)	5.4673	1.0697	4.3096 (0.431)	5.4347	0.7930	1.5044 (0.790)	5.6351	0.2670
D12	-0.3659 (0.936)	4.5349	-0.0807	2.2344 (0.672)	5.2574	0.4250	1.8651 (0.748)	5.7666	0.3234	4.0427 (0.498)	5.9242	0.6824
Dmar	29.8440 *** (<0.001)	3.4751	8.5879	-28.6220 *** (<0.001)	4.0339	-7.0954	6.1379 (0.334)	6.3033	0.9737	13.7810 ** (0.016)	5.5497	2.4832
Djun	3.5032 (0.412)	4.2396	0.8263	-6.6023 (0.195)	5.0434	-1.3091	13.0847 *** (0.007)	4.7063	2.7802	17.0068 *** (<0.001)	4.1717	4.0767
Dsprf	18.1099 *** (<0.001)	3.6263	4.9941	-17.2015 *** (<0.001)	4.0272	-4.2713	0.6136 (0.885)	4.2323	0.1450	5.3116 (0.230)	4.3770	1.2135
Demerg	11.7673 *** (<0.001)	3.1433	3.7436	-12.0860 *** (<0.001)	3.3423	-3.6161	-2.2071 (0.556)	3.7293	-0.5918	1.6668 (0.721)	4.6476	0.3586
Obs.		72			72			72			72	
R sq.		0.4213			0.4025			0.2803			0.3536	
Adj R sq.		0.3152			0.2930			0.1484			0.2351	
Ftest(11,60)		12.32			10.53			6.86			8.87	

Significance codes: '\*\*\*' expresses significance at the 0.999 level, '\*\*' at 0.99 and '\*' at 0.95

**Table 7: Pooled-OLS regression on home investments**

The table illustrates results of our heteroscedasticity-robust pooled OLS regressions, where the dependent variable is the *logit* transformation of the ratio of investments in four asset classes. *P-values* are provided in brackets. *Ln(AUM)* is the proxy for size as the log of assets under management in billion USD. *Ln(exp)* is the proxy for experience as the log of age in years of each fund. *Dsprf* is a dummy taking the value of 1 for sovereign pension reserve funds and 0 for social security reserve funds. *Demerg* is a dummy taking the value of 1 if the fund is located in an emerging market. *Ln(pag)* is the proxy for the quality of reporting expressed as the log of the number of pages in each fund's annual report. *Home* is the *logit* transformation of the ratio of investments made within the home country of each fund. *D08-12* are time-dummies for each year. *Dpre2010* is the time-dummy taking the value 1 for years 2007, 2008 and 2009 and 0 for years 2010, 2011 and 2012.

	Home(1)			Home(2)		
	Coeff	St.err	t-stat	Coeff	St.err	t-stat
const	-102.1600 *** ( <i>&lt;0.001</i> )	19.5317	-5.2305	-105.9360 *** ( <i>&lt;0.001</i> )	19.3990	-5.4609
Ln(AUM)	2.2233 *** ( <i>0.002</i> )	0.6808	3.2658	2.1659 *** ( <i>0.002</i> )	0.6576	3.2934
Ln(exp)	6.3274 *** ( <i>&lt;0.001</i> )	1.0309	6.1377	6.2723 *** ( <i>&lt;0.001</i> )	1.0260	6.1131
Dsprf	-7.7710 *** ( <i>0.001</i> )	2.1518	-3.6114	-7.9489 *** ( <i>&lt;0.001</i> )	2.0458	-3.8854
Demerg	4.7914 * ( <i>0.062</i> )	2.5216	1.9001	4.7519 * ( <i>0.063</i> )	2.5151	1.8894
Ln(pag)	8.6207 *** ( <i>&lt;0.001</i> )	2.0674	4.1699	8.2731 *** ( <i>&lt;0.001</i> )	2.0842	3.9695
D08	-4.3424 ( <i>0.241</i> )	3.6700	-1.1832			
D09	-2.9189 ( <i>0.49</i> )	4.2046	-0.6942			
D10	-5.6861 ( <i>0.126</i> )	3.6664	-1.5509			
D11	-8.1045 ** ( <i>0.041</i> )	3.8822	-2.0876			
D12	-7.5759 ** ( <i>0.035</i> )	3.5141	-2.1558			
Dpre2010				4.5730 ** ( <i>0.032</i> )	2.0829	2.1955
Obs.		72			72	
R sq.		0.7210			0.7122	
Adj R sq.		0.6752			0.6857	
F-test		15.06 (10 and 61 DF)			21.46 (6 and 65 DF)	

Significance codes: '\*\*\*' expresses significance at the 0.999 level, '\*\*' at 0.99 and '\*' at 0.95