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Pension Fund Governance in Switzerland

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Summary

This thesis studies the internal governance of pension funds with evidence from Switzerland. It is composed of four chapters. Chapter 1 describes the current Swiss occupational pension system with a focus on its governance aspects. It documents in details how the various and different Swiss pension funds are organised and identifies six key structure characteristics to classify them. Chapter 2 reviews the literature on pension fund governance by focusing on the internal agency problems induced by the board of trustees and the sponsoring employer in pension funds around the world. It also uses insights from the corporate governance literature as a way to improve our current understanding of the topic. The last two chapters are empirical studies. The tests are conducted with a unique hand-collected dataset of Swiss pension funds as well as a new measure of pension board effectiveness. Chapter 3 aims to analyse the sources and determinants of an effective pension board. The results show that fund size is the key explanatory variable of the wide dispersion in the levels of board effectiveness and its dimensions including integrity, commitment, and competence. Moreover, fund size seems to matter beyond other potentially relevant sources. Chapter 4 examines whether and to what extent it really matters and may impact pension fund asset allocation. The results show that competent pension boards with a clear and detailed framework to take investment decisions seems to be what matters. In particular, they are associated with more equity and less cash, translating in a higher investment risk-taking behavior.

Keywords: Pension funds, Governance, Swiss system, Plan beneficiaries, Board of trustees, Dataset of Swiss pension funds, Measure of pension board effectiveness, Determinants, Asset allocation

JEL classification: G23, G28, G34, G11

Résumé

Cette thèse porte sur la gouvernance interne des caisses de pension (*institutions de prévoyance*) avec une application en Suisse. Elle est composée de quatre chapitres. Le chapitre 1 décrit l'actuel système suisse de prévoyance professionnelle en se concentrant sur les éléments liés à la gouvernance. Il documente en détails comment les différentes caisses de pension suisses sont organisées et identifie six caractéristiques structurelles clés pour les classifier. Le chapitre 2 passe en revue la littérature sur la gouvernance des caisses de pension en mettant l'accent sur les problèmes d'agence internes induits par le conseil de fondation (*ou d'administration*) et l'employeur dans les caisses de pension à travers le monde. Il utilise également des idées propres à la littérature de la gouvernance d'entreprises afin d'améliorer notre compréhension actuelle du sujet. Les deux derniers chapitres sont des études empiriques. Les tests sont effectués à l'aide d'un ensemble de données uniques de caisses de pension suisses collectées manuellement ainsi qu'une nouvelle mesure de l'efficacité du conseil dans les caisses de pension. Le chapitre 3 vise à analyser les sources et déterminants d'un conseil efficace. Les résultats montrent que la taille de la caisse est la variable clé pour expliquer la grande dispersion dans les niveaux d'efficacité du conseil et de ses dimensions incluant intégrité, engagement et compétence. De plus, la taille de la caisse semble compter au-delà d'autres sources potentiellement pertinentes. Le chapitre 4 examine si, et dans quelle mesure, cela a réellement de l'importance et peut avoir un impact sur l'allocation d'actifs des caisses de pension. Les résultats montrent que des conseils compétents avec un cadre clair et détaillé pour prendre des décisions d'investissement semblent être ce qui importe. En particulier, ils sont associés avec plus d'actions et moins de liquidités, représentant un comportement de prise de risque d'investissement plus élevé.

Mots-clés : Caisses de pension (*institutions de prévoyance*), Gouvernance, Système suisse, Bénéficiaires de plans, Conseil de fondation (*ou d'administration*), Données de caisses de pension suisses, Mesure de l'efficacité du conseil, Déterminants, Allocation d'actifs

Classification JEL : G23, G28, G34, G11

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"(…) being the managers rather of other people's money than of their own, it cannot well be expected that they should watch over it with the same anxious vigilance (…)"

Adam Smith, The Wealth of Nations, Book V, Chap. I, Part III, Art. I, p.311 (1776)

General introduction

Are you sure that you will get your promised pensions at retirement? Can you really trust the people who manage and are responsible for your pension assets? Pension funds are the major investors around the world. They hold more than USD 26 trillion of assets under management[1]. Pension assets also usually represent the largest part of the wealth of households. However, researchers, policymakers, legislators, regulators, and most importantly, you, their plan beneficiaries, still do not understand well how pension funds really function, are organised, who manage them, and if those persons have the competence and proper incentives to behave in your interests. This is the starting point of this thesis: to understand better the internal governance of pension funds and those in charge of managing your retirement assets.

Few research has been conducted on pension fund governance, in contrast with the abundant corporate governance literature. Specific and complex institutional settings around the world as well as a lack of transparency and data availability in most countries may explain this scarce literature, despite a large interest. For this thesis, I have collected exclusive data on Swiss pension funds and can thus investigate in details their governance. I provide evidence from Switzerland, although parts of my insights and findings could be transposed to other countries with a similar institutional environment. In the end, my thesis and its results are particularly dedicated to all Swiss workers actually worrying about their future pensions.

This thesis is composed of four and distinct chapters. *Chapter 1 describes the current Swiss occupational pension system with a focus on its governance aspects by emphasizing on the minimum guarantees established by the law, the governance-related requirements, and the most recent supervision framework. It documents in details how the various and different Swiss pension funds are organised and identifies six key structure characteristics to classify them. The major distinction with other country's pension systems is that pure defined-contributions plans do not exist in Switzerland. Finally, this chapter highlights some of the regulatory measures implemented recently to strengthen the trust of Swiss people in the present pension system.*

Chapter 2 reviews the literature on pension fund governance by focusing on the internal agency problems induced by the board of trustees and the sponsoring employer in pension funds around the world. It also uses insights from the corporate governance literature as a way to improve our current understanding of the topic. Overall, previous research places board effectiveness at the centre of pension fund governance and emphasizes on the employer's influence over pension fund asset allocation decisions.

[1] For this estimation, see e.g., the report Pension Markets in Focus (2016) from the OECD.

However, pension fund governance remains a new area of research. Little is known or investigated outside the U.S., only a few datasets are available in specific countries, additional explanatory work and more robustness in empirical studies are needed, and there is definitely the need to learn more about pension boards.

This literature review gives me the foundation to study the internal governance and board effectiveness of pension funds. It particularly leads me to several questions. What really makes a strong pension board? What drives and shapes its effectiveness? Does it matter for pension funds? And if yes, how and what matters exactly? These questions are empirically addressed in the following chapters with evidence from Switzerland. *Chapter 3 aims to analyse the sources and determinants of an effective pension board. Chapter 4 examines whether and to what extent it really matters and may impact pension fund asset allocation.* I focus on these two points as they are key to understand the effectiveness of pension boards but still need new rationale and empirical work. To conduct the empirical tests, I use a unique hand-collected dataset of Swiss pension funds describing their various structure characteristics as well as a new measure of pension board effectiveness including its different dimensions and directly applicable to Swiss pension funds. The results are presented below.

In Chapter 3, I show that there is heterogeneity in the Swiss pension fund landscape and that fund size is the key explanatory variable of the wide dispersion in the levels of board effectiveness and its dimensions including integrity, commitment, and competence. Large pension funds managing their administration internally seem to be associated with more effective and committed boards by investing in the desirable best-practices attributes. Moreover, fund size matters beyond other potentially relevant sources such as the legal form or plan type and seems to hold on the provisions voluntary chosen by Swiss pension boards. Overall, the results give to some extent support for the consolidation of the pension fund industry in Switzerland and other countries with still small dispersed pension funds. However, due to the data collection process and associated measurement, I cannot exclude transparency as an alternative explanation to the findings.

In Chapter 4, as part of a project with Carolina Salva, we empirically evaluate the relation between pension board effectiveness and its different dimensions with measures of asset allocation. We show that competent pension boards with a clear and detailed framework to take investment decisions seems to be what matters. In particular, such pension boards appear to be associated with more equity and less cash, translating in a higher investment risk-taking behavior. We also highlight the seemingly high levels of cash in Swiss pension funds and relate it with the lack of an investment framework. These results hold beyond known determinants of pension fund asset allocation while we cannot control and exclude liquidity needs reasons for our findings.

Along this thesis, I express the limitations of my analysis and results as well as point to several avenues for more research on the topic. Important ones should aim to answer the following questions: Does consolidation generally benefit the plan beneficiaries? What determines the optimal pension fund size? Is more investment risk necessarily better for plan beneficiaries? How Swiss pension funds manage their cash? Furthermore, additional empirical tests are needed with extended datasets and alternative measures of board effectiveness to validate my findings in Switzerland. Other empirical studies outside Switzerland are also necessary to generalize and expand them worldwide.

Lastly, I have conducted additional tests on operating costs and performance measures that I do not present in my thesis as their investigation resulted inconclusive. They have however the merit of opening more paths for further research. First, I used both the administration and investment costs as disclosed by Swiss pension funds in their annual financial statements [see OPP2 art. 48a]. Yet, there are measurement and transparency issues associated with pension fund costs in general [see e.g., Tan and Cam (2013); Tan and Cam (2015)] and particularly in Switzerland [see e.g., Mettler and Schwendener (2011) for investment costs; Hornung et al. (2011) for administration costs]. Recently has the High Supervision Commission (CHS/OAK) issued new instructions to increase the transparency of investment costs disclosed by Swiss pension funds [see the D-02 (2013) based on OPP2 art. 48a-1 and 3]. Therefore, further tests on the investment costs of Swiss pension funds should be examined after this new directive.

Second, I used several investment performance measures including net returns, abnormal returns (over the pension fund asset allocation as in the literature), returns on assets, as well as averaged and cumulated returns over the period of my sample. However, there are still important limitations associated with my measures of performance such as a short sample period and no adjustment for the pension fund liabilities side [see e.g., Plantinga and Huijgen (2000); Plantinga (2005); Bolla, Wittig, and Kohler (2016)]. Improved measures should still be included and applied to validate the current findings on the investment performance of pension funds around the world.

Chapter 1.

The Swiss occupational pension system:

A governance view

1.1. Introduction

Switzerland has a long-standing and well-developed old-age system that is highly regulated. It is one of the most sound and sustainable system around the world[2], partly due to its design along three pillars. The occupational or employer-based pension system is mandatory for Swiss workers since 1985 and represents the second pillar. It complements a state-based pay-as-you-go pension that aims to cover the minimum basic needs at retirement or in the case of disability or death (first pillar). The third pillar consists of voluntary and individual pension schemes with tax incentives that individuals can privately set up in financial institutions. Several papers present and detail the Swiss pension system over the years [see e.g., Queisser and Vittas (2000); Bütler and Ruesch (2007); Bütler (2014); Gerber and Weber (2007); Rocha, Vittas, and Rudolph (2010)]. This chapter differs from these studies and contributes to the existing literature by focusing on the current Swiss second pillar with a governance view. It aims to provide to researchers and practitioners the most recent information about the organisation and functioning of Swiss pension funds with respect to their institutional setting.

[2] See e.g., the Melbourne Mercer Global Pension Index (2014) from Australian Centre for Financial Studies and Mercer, the Pension Sustainability Index (2014) from Allianz, or the Global Pension Finance Watch (2014) from Towers Watson.

The particularity of the Swiss occupational pension system is that Swiss people cannot choose either their pension fund or an investment strategy to be implemented on their accumulated retirement savings. This is the sole responsibility and decision of the employer, alongside with the board of trustees of the pension fund. Therefore, Swiss plan beneficiaries must trust their pension fund and its board to deliver the promised pensions. Though, this concern might be mitigated by their equal representation in the board as legally required in Switzerland [see LPP art. 51-1]. Indeed, the employees and employer must be equally represented in Swiss pension boards.

Moreover, the Swiss pension fund landscape is highly fragmented, dispersed, and heterogeneous [see e.g., Gerber and Weber (2007)]. At the end of 2014, there are 1,866 pension funds managing CHF 777 billion of assets on behalf of more than 5 million of beneficiaries[3]. And each of these pension funds has different structure characteristics and its own governance mode. This specific setting coupled with the actual challenging environment of low expected returns and population ageing place governance aspects on the top of agendas. The guarantees, governance tools, and supervision setups are key to ensure that the guardians of Swiss people retirement money keep their promises.

This chapter is organised as follows. Section 1.2 presents the main Swiss legal requirements and institutional supervision framework. In Section 1.3, I detail the six key structure characteristics shaping Swiss pension funds and their organisation. This classification may also exist in other country's pension systems but sometimes differs in the exact definitions and implications. Additionally, Section 1.4 highlights particular regulatory measures taken recently, and their possible reasons, to strengthen the trust of Swiss people in the actual pension system. I then conclude in Section 1.5.

1.2. Legal requirements and institutional framework

1.2.1. Minimum guarantees

Since 1985, the Law on Occupational Old-age, Survivors, and Disability Pension Plans (LPP) establishes a set of minimum requirements (LPP art. 6 ss) in order to maintain the standards of living (LPP art. 1-1) for Swiss workers. As shown in Table 1.1, more than 5 million of Swiss plan beneficiaries are currently covered by the LPP, including about 4 million of active and contributing employees and more than 1 million of pensioners[4]. All pension accounts and promises are managed by 1,866 pension funds and represent CHF 777 billion of assets, without accounting for the collective insurance contracts. Over the last

[3] See OFS (Office Fédéral de la Statistique), 2016. La prévoyance professionnelle en Suisse : Principaux résultats de la statistique des caisses de pensions 2008-2014.

[4] The total employed population in Switzerland is about 5 million [see OFS (Office Fédéral de la Statistique), 2016. Indicateurs du marché du travail 2016.]. This means that approximatively 80% of the working population is covered by the Swiss second pillar.

years, the assets under pension fund management have kept increasing while it has been concentrated in a smaller but still large number of pension funds.

[Table 1.1: Main statistics of the Swiss second pillar]

Swiss pension funds are annually financed by the contributions made both by the employees and employers as well as the returns on investments (called "third" contributor). The LPP art. 16 settles minimums to be contributed from 7% to 18% depending on employees' age. However, the exact amount of contributions by each party is settled in the internal rules of the pension fund and the total contribution of the employer should be at least equal to the sum of the contributions of the employees (LPP art. 66). The benefits in case of retirement or following a disability or death event can be given under the form of annuities or as a lump sum payment with at least one-quarter of the available capital and prior notice (LPP art. 37). Withdrawals from each pension account are possible for targeted purposes such as housing, self-employment, or a permanent move out of Switzerland. As presented in Table 1.1, the total contributions into Swiss pension funds persistently exceeded their benefits to be paid, explaining in part the increasing total assets under management. As an order of magnitude, at the end of 2014, contributions and benefits amount for respectively CHF 54 billion and CHF 34 billion. And the difference remained constant over the past years.

To sustain the Swiss occupational pension system, funding requirements and its measurement are settled by legislators (OPP2 art. 44 and annex). In sum, the coverage ratio (or also called technical funding ratio) is defined as the pension assets available over the committed pension liabilities. A pension fund with a coverage ratio of 100% thus indicates that all its assets can today cover all its promises to the affiliated employees and pensioners. Every Swiss pension fund should be fully funded (LPP art. 65), except public entities that can be partially underfunded if they benefit from the government guarantee and have adopted the partial funding regime (LPP art. 72a ss). An annual survey by Swisscanto (2017) monitors the funding level of the major Swiss pension funds according to those legal requirements. As reported in Table 1.2, private pension funds constantly exhibit a coverage ratio above 100%. At the end of 2016, it is estimated to be on average of 109.7%. On the contrary, some public pension funds are at this time still underfunded with an average of respectively 102.1% and 77.5% for total and partial funding regimes.

[Table 1.2: The funding status of Swiss pension funds]

The value of the coverage ratio has to be taken with caution as its computation is sensitive to previous investment performance, depends on the liabilities structure as the proportion of pensioners among plan beneficiaries, and is subject to several assumptions as the technical rate and mortality table to be applied on the valuation of pension liabilities. In particular, the technical rate used in Switzerland is not

linked to current market rates and varies for each pension fund. For these different reasons, the "real" funding status of Swiss pension funds might actually be lower [see e.g., PPCmetrics (2016)].

On top of that, explicit minimum guarantees are specified in the LPP. The current level and historical evolution of the key ones are presented in Table 1.3. First, there is a legal entrance salary to the Swiss second pillar. According to LPP art. 11, all employees working in Switzerland with an annual salary of minimum CHF 21,150 (LPP art. 7-1) are obliged to be affiliated to an employer-based pension fund. This ensures that most Swiss workers are embedded into the occupational pension system, although it discriminates part-time and low-income workers. Second, a minimum annuity conversion factor to be applied on the mandatory portion of the accumulated retirement savings is set for defined-contributions pension plans (LPP art. 14-2) in order to smoothen pensions at retirement[5]. While a lot of discussions are still pending on this number, it is currently set at 6.80% for an ordinary retirement age and will have to decrease in the near future [see e.g., Cosandey (2013)]. Third, the Swiss Federal Council also sets a minimum interest rate to be applied on the pension investments to increase annually each beneficiary's account (LPP art. 15-2). Although kept at 4.00% for a long period, it today reflects more market conditions. For 2017, it has been set at a minimum of 1.00%.

[Table 1.3: History of the LPP minimum guarantees]

Moreover, in Switzerland, there is no binding requirements for the technical rate used to discount the future commitments and value pension liabilities. The Swiss Chamber of Pension Actuaries (CSEP/SKPE) establishes a national reference rate [see DTA 4 (2015)]. This rate is computed annually and based on the 10-year Swiss government yield as well as the past performance over 20 years of the pension fund industry. Swiss pension funds have then discretion to set their applied technical interest rate based on their expected return on pension assets as long as it does not exceed the national reference rate. For the financial statements of 2017, it has been set at 2.00% and has kept decreasing over the last years as a reflection of the evolution of the economic and financial environment.

In the end, the LPP provides minimum guarantees to the second pillar of Swiss people. Employers are free to offer more than these mandatory minimums and usually do so in practice [see e.g., Queisser and Vittas (2000); Swisscanto (2014)]. The enveloping part above the minimum requirements settled by the law (called above-mandatory benefits) represents a significant part of the beneficiaries' accounts in Switzerland. As mentioned in the annual survey of Swisscanto (2014), about 90% of the Swiss pension funds

[5] For example, a newly retired person who accumulated CHF 500,000 on its LPP account over its working life and can benefit from a conversion factor of 6% over all its savings will receive an annuity of CHF 30,000 during its retirement.

offer above-mandatory benefits to their plan beneficiaries. Moreover, 75% of them offer benefits of at least 20% higher than the LPP minimums. Public pension funds are also the most generous.

1.2.2. Governance and supervision

Governance considerations are also required by regulation. Since 2010, a structural reform of the Swiss occupational pension scheme has been implemented and in 2012, the LPP, OPP2 (Ordinance on Occupational Old-age, Survivors, and Disability Pension Plans), and OPP1 (Ordinance on Supervision of Occupational Pension Funds) include new and updated requirements with the goal of improving the transparency and governance of the whole system through a better supervision. An important modification is that Swiss pension funds have now to certify to the supervision authorities that executive boards and asset managers have the depth theoretical and practical knowledge in the field of occupational pensions (OPP2 art. 48f-l). Also, they must ensure the integrity and loyalty of the responsible persons (LPP art. 51b) and that there are no conflicts of interests for the transactions with related parties (LPP art. 51c).

The main change of this reform is related with supervision and concerns the direct supervision of all Swiss pension funds by regional supervision authorities (LPP art. 61 ss and OPP1 art. 2 ss), that report to the High Supervision Commission (CHS/OAK) for occupational pension funds (LPP art. 64 ss and OPP1 art. 5 ss)[6]. The Federal Social Insurance Office (FSIO/OFAS) is part of the regulation process and, among other duties, in charge of preparing the projects for the laws and ordinances. Figure 1.1 summarizes the new Swiss institutional supervision and regulation framework with these entities. Three other entities are also under the direct supervision of the CHS/OAK. These include the investment foundations through which Swiss pension funds can invest their assets under management, the LPP Guarantee Fund, and the Substitute Occupational Benefit Institution. The LPP Guarantee Fund helps to secure all plan beneficiaries and their second pillar pension assets in the case of employer's insolvency. It also provides subsidies for pension funds with an unfavorable beneficiaries' age structure and act as a central office for lost pension accounts. The Substitute Occupational Benefit Institution act as a safety net for the second pillar by accepting all unaffiliated employers and employees meeting the LPP legal requirements.

[Figure 1.1: Swiss institutional supervision and regulation framework]

Finally, since 2005, all Swiss pension funds must comply with the Swiss GAAP RPC 26 (2013) that imposes binding accounting rules for the presentation of their annual reports. According to OPP2 art. 47, they must prepare their financial statements annually including a balance sheet, an income statement, and

[6] The CHS/OAK also has the authority to issue directives for the regional supervision authorities, experts in occupational pensions, and auditors.

notes to the accounts in accordance with these accounting standards. The verification of the compliance has then to be done by both an auditor and an expert in occupational pensions (LPP art. 52a-1). Each year, an auditor must control the annual financial statements and monitor that the organisation, management, and investments comply with the law (LPP art. 52c and OPP2 art. 35). Periodically, an expert in occupational pensions must review the technical commitments of the fund to the plan beneficiaries (LPP art. 52e and OPP2 art. 41a). The independence of these two parties is reviewed and guaranteed by the related supervision authorities to ensure that their judgments remain objective (OPP2 art. 34 and OPP2 art. 40). Eventually, common accounting standards coupled with verification by two independent specialists improve the reliability in the reported numbers and the comparability across the various and different Swiss pension funds.

1.3. Pension fund structure characteristics

In Switzerland, pension funds differ according to several structure characteristics shaping their organisation. Figure 1.2 gives a simplified and synthetic representation of the organisation of Swiss pension funds with respect to their six most important structure characteristics. These include (1) private vs. public, (2) single-employer vs. multi-employer, (3) defined-benefits vs. defined-contributions, (4) autonomous vs. reinsurance, (5) administration: internal vs. external, and (6) investments: internal vs. external. Each of them is described in details in the following Sub-sections with their representative proportions in the Swiss pension fund landscape as reported in Table 1.4. The proportions for each structure characteristic are given relative to the number of pension funds. Note that these features also exist in other country's pension systems and that this classification may also be applicable to countries with a similar institutional setting to Switzerland. Only the exact definitions and implications may vary. This is particularly the case for the distinction between defined-benefits and defined-contributions as developed in Sub-section 1.3.2.

[Figure 1.2: Swiss pension fund organisation and structure characteristics]

[Table 1.4: Main statistics of pension fund structure characteristics]

1.3.1. Private vs. public and single-employer vs. multi-employer

Initially, Swiss pension funds are independent legal entities, separated from the employer, under the form of a foundation (or more rarely a cooperative society) for private pension funds founded by a corporation or under the form of a public institution for pension funds founded by a public authority (LPP art. 48-2). There are only 78 public pension funds in Switzerland, representing 4% of the whole population, but concentrating a large portion of assets and beneficiaries. Public pension funds are further separated according to whether they follow a total or partial funding regime. In the latest, with a government

guarantee, they are allowed to be partially underfunded (LPP art. 72a ss). Additionally, a private or public entity can be created in the own name of the employer (single-employer) or can be linked to multiple employers through affiliation contracts between each sponsor and the pension fund. Multi-employer pension funds can be organised as collective or common pension funds. The difference depends on whether the financial accounts are presented separately or not for the affiliated employers. In Switzerland, 37% of the pension funds are still considered as single-employer pension funds, despite the decreasing trend.

1.3.2. Defined-benefits vs. defined-contributions

Pension funds can offer various plans to its beneficiaries. These pension plans can refer to different hierarchical levels of employees or layers of additional benefits above the minimums required by the law. A key distinction among the types of plan is whether the beneficiaries enjoy secured benefits or not. In defined-benefits plans, the employer guarantees in advance the benefits to the beneficiaries that are computed by a formula based on salary evolution, tenure of service, and age. Such plans usually offer a good protection for beneficiaries as only the employer bears the direct costs of deficits and underfunding [see e.g., McCarthy and Miles (2013)]. Alternatively, in typical defined-contributions plans, benefits depend on the investment returns of pension assets each year. In that case, the employee faces uncertainty at retirement as the benefits are not guaranteed and depend on the performance of pension assets. The beneficiaries bear to some extent the risk related to the investments [see e.g., Besley and Prat (2003)][7].

The distinction between defined-benefits and defined-contributions as for long and extensively been studied [see e.g., Bodie, Marcus, and Merton (1988); Poterba, Rauh, Venti, and Wise (2007); Besley and Prat (2003); Gerrans and Clark (2013); Farrell and Shoag (2016)]. Previous literature is mainly U.S.-oriented, discusses the global shift from defined-benefits to defined-contributions, and cannot really conclude on which the best model is for plan beneficiaries. However, this distinction is of less relevance in Switzerland. The differences between the two plan types is smaller due to the minimum guarantees embedded by the law and the general employer responsibility [see e.g., Bütler (2014); Bütler and Ruesch (2007); Gerber and Weber (2007); Queisser and Vittas (2000)]. This is the reason why Swiss defined-contributions plans are often considered as like defined-benefits plans or cash-balance plans on the international ground [see e.g., Whitehouse (2006); OECD (2009); Willis Towers Watson (2016)]. In terms of system design, this is the key difference with other country's pension systems.

[7] There also exist hybrid plans that offer a mixture of defined-benefits and defined-contributions features depending on the type of treatment given to the retirement savings part and the risks of disability and death.

Although pure defined-contributions plans do not exist in Switzerland[8], the portion representing above-mandatory benefits is not guaranteed by all same LPP minimums and as such is subject to some extent to the same mechanisms as traditional defined-contributions plans[9]. As above-mandatory benefits remain an important part of Swiss beneficiaries' accounts [see e.g., Swisscanto (2014)], it is still a distinction worth making within the Swiss pension fund landscape. By looking at the representative proportions, there are today only 5% of the Swiss pension funds offering pure defined-benefits plans and about the same number that switched to defined-contributions plans during the last 4 years. Overall, this means that today 95% of the Swiss pension funds may add some uncertainty in the above-mandatory retirement benefits of Swiss plan beneficiaries.

1.3.3. Autonomous vs. reinsurance

Another important differential aspect across Swiss pension funds is how they hedge the risks there are exposed to. Pension funds have different options to hedge financial risks such as market and asset volatility, but also actuarial risks such as longevity, death, and disability (OPP2 art. 42). An autonomous pension fund is one that assumes or directly hedges itself all these risks (LPP art. 67-1). Alternatively, these risks can be partially or totally covered by an insurance company through a range of reinsurance products. This reinsurance could be from a limitation of the potential loss in the case of bad market and economic conditions (called stop-loss and excess-of-loss), or a partial insurance of the risks of disability and death, to a total reinsurance of the pension assets. In Switzerland, 20% of the pension funds are still autonomous in hedging their risks, while the others are reliant on insurance companies.

1.3.4. Administration and investments: internal vs. external

Finally, Swiss pension funds have their own competence for their organisation, investments, and benefits schemes as long as they comply with the minimum requirements established by the law (LPP art. 49). The board of trustees is the supreme body and has the fiduciary duty to serve and act in the best interests of the plan beneficiaries (LPP art. 51b-2). As legally required in Switzerland by LPP art. 51-1, pension boards are characterized by an equal representation between the employees and employer. All trustees are also personally and jointly responsible for the decisions they make, the administration of the pension fund, and the investment of its assets (LPP art. 52). In particular, in Switzerland, the board of trustees is responsible for the investment strategy and its related decisions (OPP2 art. 49a and OPP2 art. 50). Their tasks are common to all pension funds and precisely stated in the law (LPP art. 51a). However, on

[8] There is the exception of the "1e plans" (called after OPP2 art. 1e), which can be considered as pure defined-contributions plans as they do not apply on any minimum requirements.
[9] One important safeguard mechanism is the guarantee of the capital. Accordingly, a remuneration below 0% cannot be granted on retirement accounts, even for above-mandatory benefits over minimum requirements.

an operational basis, the board has to delegate internally or externally both the management of the pension fund administration and investments (LPP art. 51a-2-j). Therefore, Swiss pension funds could be managed internally through specialized committees and/or an internal manager and team and/or outsource to external experts such as asset managers. These possible delegations result in various governance modes and different types of management in practice[10].

1.4. The trust of Swiss people in the system

Within the Swiss occupational pension system, the retirement benefits granted to plan beneficiaries seem to be high and secured. The legal and regulatory setting is generally respected, funding is on average sufficient across all pension funds, and mechanisms are in place to control and avoid misaligned behaviors. For instance, measures are taken by the supervision authorities in case of law violations or pension underfunding. During the last years, particular regulatory measures have been implemented in order to sustain the pension system and strengthen the trust of Swiss people. Three important possible reasons and their resulting measures are described below.

First, governance scandals have clouded the Swiss landscape and the integrity of their pension fund managers. Probably the biggest one is the Gloor corruption and mismanagement scandal at the Zurich public pension fund (BVK) in 2010, where the chief investment officer lost and diverted an estimated amount of CHF 1.5 billion to the plan beneficiaries and taxpayers. For more than 15 years, the authority over investment decisions in one of the country's largest pension funds was in the hands of one man, no investment plan or strategy was available, and no thorough control was exercised by the government and authorities[11]. This major scandal gave rise, among other reasons, to the 2010-2012 structural reform of the Swiss occupational pension scheme with the main goal of improving the governance, transparency, and supervision of the system.

Second, citizen around the world may be concerned that asset managers and insurance companies might favor their personal gains over their interests and charge them with too high fees. In Switzerland, two particular measures have been implemented in the recent past in order to force transparency and restore public trust in finance professionals. The 2004 revision of the LPP particularly emphasized on the transparency of life insurance companies and introduced a legal quote of 90% to redistribute profits to Swiss pension funds [see e.g., Bütler and Ruesch (2007)]. More recently, based on OPP2 art. 48a-1 and 3, a

[10] To my knowledge and as alleged in Table 1.4, information on whether pension funds are managed internally or externally for both their administration and investments is not available.

[11] For more information about this scandal, please refer to newspapers articles such as "Le gouvernement sèchement remis à l'ordre", Tribune de Genève, 04.10.2012; "Switzerland: How to avoid Gloor 2.0", Investment & Pensions Europe, 01.12.2012; "Korrupter boss arrested at Swiss BVK fund", Top1000funds.com, 16.06.2010.

directive by the High Supervision Commission (CHS/OAK) clarifies that all fund asset managers with collective investments in Swiss pension funds to compute and disclose separately their fund total expense ratio (TER), increasing investment costs transparency in Swiss pension fund annual reports [see the D-02 (2013)].

Third, by law, some Swiss public pension funds can benefit from a preferential funding treatment [see LPP art. 72a ss]. The resulting underfunding situation [see e.g., Swisscanto (2017)] is sometimes so important that the cantonal governments, and by extension their taxpayers, have to pay extra contributions on top of other drastic measures. For instance, since 2014, the State of Neuchatel pays an extra CHF 30 million each year for at least the next 20 years to resorb an overdraft of about CHF 2 billion[12]. The Geneva public pension fund, which has one of the lowest funding level in Switzerland in which about CHF 6 billion are missing, currently costs to the State of Geneva an additional CHF 100 million each year[13]. One aspect of the 2010-2012 structural reform was to introduce clear rules for the financing of public pension funds. In particular, they had to decide whether to adopt a total or partial funding regime. Then, underfunded public pension funds under a partial funding regime are required to create a recapitalization plan to attain a minimum target funding level of 80% within a transition period of 40 years [see the LPP transitional provisions of the amendment of 17.10.2010]. In the meantime, underfunding situations in some Swiss public pension funds are pending and its costs might carry on to the next generations.

In addition, an ageing population and low expected returns threaten the current sustainability of the Swiss pension system. One highly-politicized solution is to decrease the minimum annuity conversion factor to a level that reflects better the current environment [see e.g., Cosandey (2013)]. However, it is difficult for Swiss workers to understand and accept a potential reduction of the promised retirement annuities if they do not trust the system and its participants. Bütler (2014) provides evidence to explain why Swiss voters refused at 73% the direct last attempt to reduce the annuity conversion factor to 6.4% in March 2010. The author shows that distrust was probably the most important factor in explaining the "no" vote. In September 2017, with the federal project "Prévoyance vieillesse 2020", Swiss people had to vote again on a reduction of the annuity conversion factor to 6%, among other aspects[14]. Similarly, the "no" result might be a reflection of a continuing mistrust of Swiss people in the actual pension system, despite the regulatory measures taken to restore it.

[12] See e.g., "La recapitalisation de Prévoyance.ne coûtera 30 millions par an à l'Etat", Arcinfo, 11.02.2013.
[13] See e.g., "Genève réforme ses caisses de pension sous tension", Le Temps, 03.05.2012; "Caisses de pension publiques : Genève lanterne rouge", L'Extension, 19.01.2013.
[14] For more details about the entire project, please refer to e.g., OFAS (Office Fédéral des Assurances Sociales), 2017. Prévoyance vieillesse 2020 : Le projet adopté; "Pensions in Switzerland: Make or break", Investment & Pensions Europe, May 2017.

1.5. Conclusion

This chapter describes the current Swiss occupational pension system with a focus on its governance aspects by emphasizing on the minimum guarantees established by the law, the governance-related requirements, and the most recent supervision framework. It documents in details how the various and different Swiss pension funds are organised and identifies six key structure characteristics to classify them. The major distinction with other country's pension systems is that pure defined-contributions plans do not exist in Switzerland. Finally, this chapter highlights some of the regulatory measures implemented recently to strengthen the trust of Swiss people in the present pension system.

In order to ensure that Swiss pension funds and their boards deliver the promised pensions, three avenues could be pursued by regulators. First, more flexibility could be granted to the many decentralized Swiss pension funds. With each pension fund having its unique organisation and needs, they are in a good position to find their own tailor-made solutions. Second, the promises made to Swiss plan beneficiaries should not be set too high and based on reasonable assumptions so they can be kept in the future. Third, there is the need to make sure that the guardians of Swiss people retirement money have the proper incentives and competence to keep and deliver their promises. Governance improvements in that last matter are important to sustain the Swiss pension system.

Figure 1.1.
Swiss institutional supervision and regulation framework.
Source: Author's own illustration

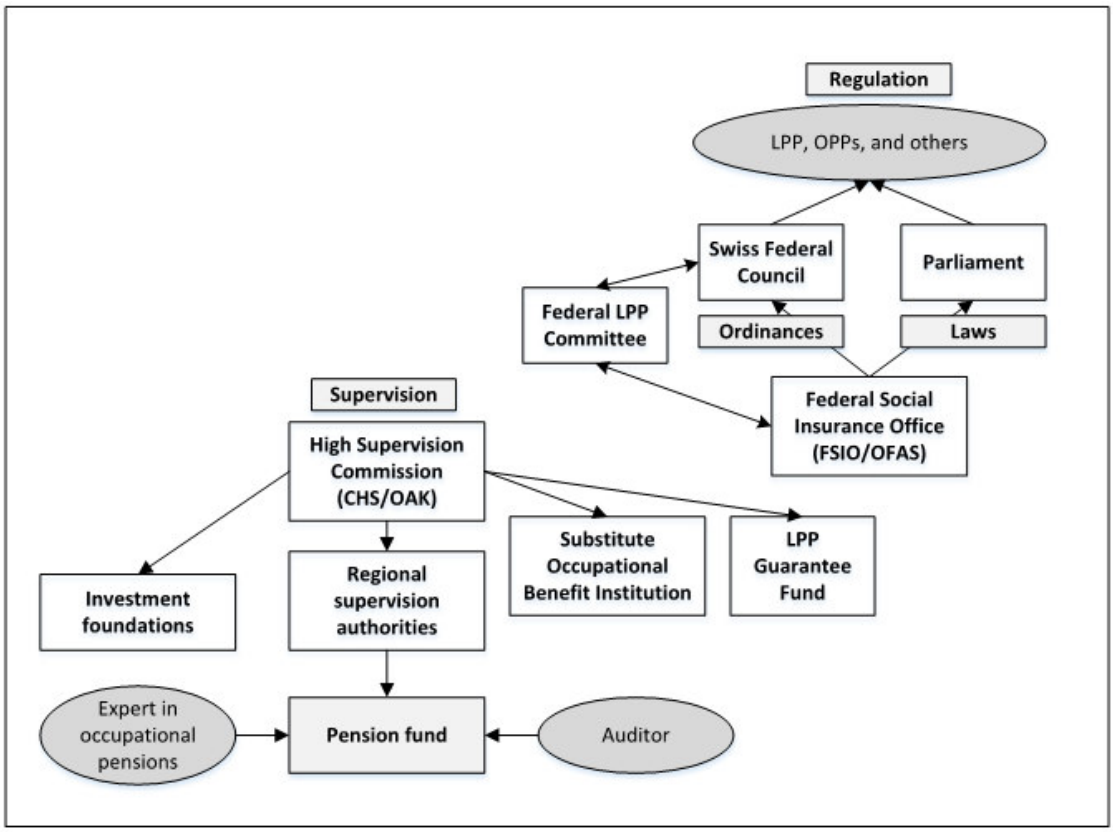


Figure 1.2.
Swiss pension fund organisation and structure characteristics.
Source: Author's own illustration

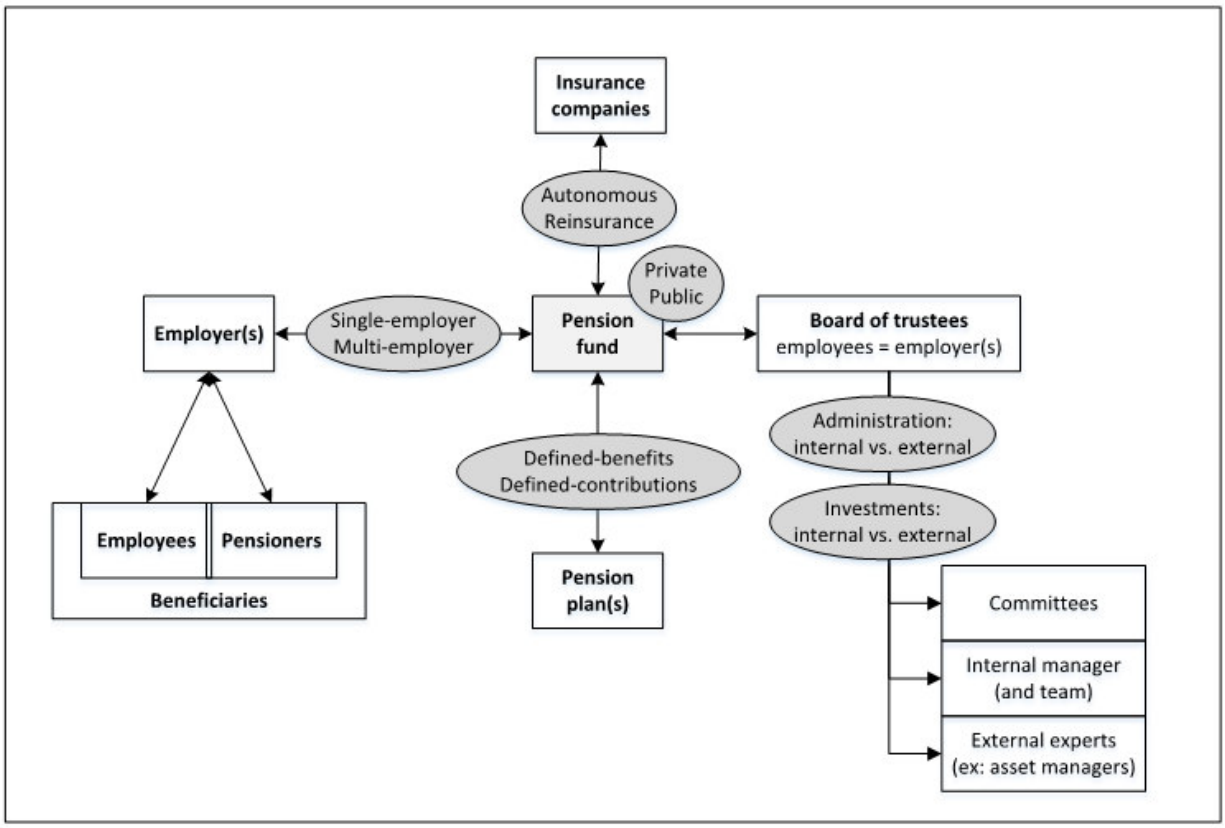


Table 1.1.

Main statistics of the Swiss second pillar.

Source: OFS (Office Fédéral de la Statistique), 2016, 2015. La prévoyance professionnelle en Suisse : Principaux résultats de la statistique des caisses de pensions.

This table presents the main statistics of the Swiss occupational pension system over the last years. Total assets include all assets under management by the Swiss pension funds, but exclude the assets/liabilities from collective insurance contracts. Contributions include all inputs from the employers and employees (K, Swiss GAAP RPC 26). Benefits include both regulatory and extra-regulatory annuities and lump sum payments (M+N, Swiss GAAP RPC 26). Employees include all active and contributing beneficiaries during the year. Pensioners include all passive beneficiaries who received benefits during the year. Beneficiaries is the sum between employees and pensioners.

	2014	2013	2012	2011	2010	2009	2008	2007
Number of pension funds	**1,866**	**1,957**	**2,073**	**2,191**	**2,265**	**2,351**	**2,435**	**2,543**
	-4.65%	*-5.60%*	*-5.39%*	*-3.27%*	*-3.66%*	*-3.45%*	*-4.25%*	
Total assets (CHF million)	**777,340**	**720,237**	**672,785**	**625,295**	**621,234**	**598,930**	**538,524**	**605,459**
	7.93%	*7.05%*	*7.59%*	*0.65%*	*3.72%*	*11.22%*	*-11.06%*	
Contributions (CHF million)	**+ 53,581**	**+ 54,253**	**+ 48,399**	**+ 47,823**	**+ 47,504**	**+ 45,352**	**+ 45,059**	**+ 44,455**
Benefits (CHF million)	**- 33,584**	**- 32,543**	**- 32,010**	**- 30,973**	**- 30,268**	**- 29,463**	**- 28,388**	**- 27,454**
Beneficiaries	**5,116,187**	**5,025,699**	**4,926,118**	**4,828,112**	**4,712,433**	**4,642,061**	**4,624,355**	**4,487,325**
Employees	4,000,077	3,932,187	3,858,803	3,787,263	3,696,045	3,643,340	3,651,984	3,545,571
Pensioners	1,116,110	1,093,512	1,067,315	1,040,849	1,016,388	998,721	972,371	941,754

Table 1.2.

The funding status of Swiss pension funds.

Source: Swisscanto, 2016, 2017. Etude sur les caisses de pension en Suisse.

This table presents the funding level of the major Swiss pension funds from the Swisscanto survey over the last years. The funding level is computed following the legal requirements as the coverage ratio (OPP2 art. 44 and annex) and averaged by weighting over total assets. Coverage ratio is given separately for private pension funds and for public ones under the two legal regimes (total funding regime or partial funding regime).

	2016	2015	2014	2013	2012	2011	2010
Coverage ratio (assets-weighted)							
Private	109.7%	110.4%	113.6%	110.3%	107.6%	102.8%	105.9%
Public (total funding regime)	102.1%	98.1%	103.5%	100.7%	100.0%	95.3%	98.1%
Public (partial funding regime)	77.5%	78.1%	83.6%	74.6%	73.7%	71.5%	74.1%

Table 1.3.

History of the LPP minimum guarantees.

Sources: (1) OFAS (Office Fédéral des Assurances Sociales), 2017. Chiffres repères dans la prévoyance professionnelle. (2) CSEP/SKPE (Swiss Chamber of Pension Actuaries), 2015. DTA 4 – Taux d'intérêt technique. (*) website disclosure.

This table presents the historical evolution of the key minimum guarantees given by the LPP from its implementation in 1985. Note that between 2005 and 2013, the annuity conversion factor was separated between men (m) and women (w).

	Legal entrance salary (CHF)	Annuity conversion factor	Minimum interest rate	National reference rate
2017	21,150	6.80%	1.00%	2.00% (*)
2016	21,150	6.80%	1.25%	2.25% (*)
2015	21,150	6.80%	1.75%	2.75% (*)
2014	21,060	6.80%	1.75%	3.00%
2013	21,060	6.85% (m) / 6.80% (w)	1.50%	3.00%
2012	20,880	6.90% (m) / 6.85% (w)	1.50%	3.50%
2011	20,880	6.95% (m) / 6.90% (w)	2.00%	3.50%
2010	20,520	7.00% (m) / 6.95% (w)	2.00%	4.25%
2009	20,520	7.05% (m) / 7.00% (w)	2.00%	3.75%
2008	19,890	7.05% (m) / 7.10% (w)	2.75%	4.00%
2007	19,890	7.10% (m) / 7.15% (w)	2.50%	4.50%
2006	19,350	7.10% (m) / 7.20% (w)	2.50%	4.50%
2005	19,350	7.15% (m) / 7.20% (w)	2.50%	4.50%
2004	25,320	7.20%	2.25%	
2003	25,320	7.20%	3.25%	
2002	24,720	7.20%	4.00%	
2001	24,720	7.20%	4.00%	
2000	24,120	7.20%	4.00%	
1999	24,120	7.20%	4.00%	
1998	23,880	7.20%	4.00%	
1997	23,880	7.20%	4.00%	
1996	23,280	7.20%	4.00%	
1995	23,280	7.20%	4.00%	
1994	22,560	7.20%	4.00%	
1993	22,560	7.20%	4.00%	
1992	21,600	7.20%	4.00%	
1991	19,200	7.20%	4.00%	
1990	19,200	7.20%	4.00%	
1989	18,000	7.20%	4.00%	
1988	18,000	7.20%	4.00%	
1987	17,280	7.20%	4.00%	
1986	17,280	7.20%	4.00%	
1985	16,560	7.20%	4.00%	

Table 1.4.

Main statistics of pension fund structure characteristics.

Source: OFS (Office Fédéral de la Statistique), 2016, 2014. La prévoyance professionnelle en Suisse : Statistique des caisses de pensions.

This table presents the number and percentage of Swiss pension funds under the different structure characteristics and over the last years. Information is given for pension funds which are public (vs. private), single-employer (vs. multi-employer), defined-benefits (vs. defined-contributions), autonomous (vs. reinsurance). Information on whether pension funds are managed internally or externally for both their administration and investments is not available.

	2014	2013	2012	2011
Pension funds (number)	1,866	1,957	2,073	2,191
inc. Public	78	89	91	92
	4.18%	*4.55%*	*4.39%*	*4.20%*
inc. Single-employer	686	754	821	892
	36.76%	*38.53%*	*39.60%*	*40.71%*
inc. Defined-benefits	99	133	154	183
	5.31%	*6.80%*	*7.43%*	*8.35%*
inc. Autonomous	376	400	414	428
	20.15%	*20.44%*	*19.97%*	*19.53%*

Chapter 2.

Pension fund governance:

A literature review around the board and the employer

2.1. Introduction

In this chapter, I review the literature on pension fund governance. Although corporate governance has been widely studied, previous research on pension fund governance is still scarce and at its early stages of development. This is mainly due for two reasons. First, very specific and complex country's institutional settings make it difficult to study the organisation and functioning of their pension funds. The large differences across pension systems also do not allow to develop a complete framework or draw general conclusions. Second and not least, there is a lack of available data to build empirical work resulting from low transparency in most countries. Despite these shortcomings, there are still significant studies examining the governance of pension funds for specific aspects and countries. Some findings from the corporate governance literature may also be applicable to pension funds and thereby bring fruitful insights for further research.

A review on pension fund governance is of particular interest in today's challenging environment where many governments and pension funds have put governance questions and issues on the top of their agenda. With different financial markets and economic conditions, the increase of the administrative burden and complexities, the general ageing of the population, and examples of fraud and excessive costs, appropriate governance is key to safeguard pensions to plan beneficiaries. There is also a growing interest

among researchers and practitioners. Many professional codes of best-practices pension fund governance and recommendations have been issued recently[15]. Worldwide regulatory reforms have been elaborated following, among others, the Myners Report (2001) in the U.K. or the Clapman Report (2007) in the U.S. Datasets have been made available in some countries and empirical work have been conducted on questions surrounding the governance of pension funds. In order to conduct further research, there is definitely the need to make the point on what has been done, what we know, and what is still missing.

To review the literature on this topic, I rely on the agency theory [see e.g., Eisenhardt (1989) for a review]. Following this approach, pension fund governance can be defined as the set of structures, processes, and incentives that help organising, managing, and monitoring a pension fund in order to protect pension assets and act on the interest of the plan beneficiaries[16]. The ultimate goal of any pension fund is thus the welfare of its plan beneficiaries and the security of their pensions. However, there are various agents at play with different interests who create variety of conflicts which could hinder this objective. As a reflection of previous research, two agents, and their resulting agency problems, have been shown to be key in the governance of pension funds around the world. Papers focusing on these two agents also share most of the literature on the topic. First, the *board of trustees* is the delegated entity to plan beneficiaries which is responsible for the pension fund management and may be subject to similar agency problems as corporate boards and managers. Second, the *sponsoring employer* is the major contributor to its workers' pension plans and is expected to limit its contributions, minimize the operating costs, or use pension assets for other company's desires.

Following the literature, I structure this review around the main agency problems of the board and the employer. Section 2.2 first concentrates on the board of trustees. Previous research highlights the importance of the board as an agent and its effectiveness as a control mechanism for the governance of pension funds. I then review the main empirical findings related with pension board effectiveness and elaborate further avenues for research on the topic. Finally, I list and classify common agency problems in pension boards around the world, including opportunism, shirking, and incompetence. Section 2.3 then focuses on the sponsoring employer. Based on previous literature, I describe potential misaligned behaviors by the employer that could impact its pension plans and their beneficiaries' interests. These agency

[15] These include for example the CFA Code of Conduct for Members of a Pension Scheme Governing Body (2008), the IOPS Guidelines for the Supervisory Assessment of Pension Funds (2008), the IOPS Principles of Private Pension Supervision (2010), the OECD Core Principles of Private Pension Regulation (2016), the OECD Guidelines on Pension Fund Asset Management (2006), the OECD Guidelines for Pension Fund Governance (2009), or the OECD-IOPS Good Practices for Pension Funds Risk Management Systems (2011).

[16] This definition is similar to others in the literature as Carmichael and Palacios (2004) who state that "governance refers to the systems and processes by which a company or government manages its affairs with the objective of maximizing the welfare of and resolving conflicts of interests among its stakeholders" or Clark (2004) who defines governance as "formal mechanisms by which an institution makes decisions, is held accountable to its stakeholders and beneficiaries, and acts in accordance with public and private standards".

problems relate to either a diversion of pension assets or a misconduct in financial distress. In particular, I present in details the case of own company stock as it has been extensively studied in the U.S. literature. To conclude, I briefly summarize in Section 2.4.

Many other agents that could play a role in pension systems and their governance have been left of this appraisal of the literature as only few research have been focusing exclusively on them so far [see e.g., Bird and Gray (2013) for an attempt]. This is for instance the case of pensioners who represent today a significant and growing part of the beneficiaries of pension plans. Previous studies are often interested in the best interests of the beneficiaries in its entirety or focus on the employees' welfare such as the literature on own company stock. However, these two groups of beneficiaries have in fact very different interests and insufficient distinction has been made between them in previous literature. Moreover, in practice, the board of trustees can and usually delegates the governance of the pension fund to an executive management. This delegation may then result in other types of agency problems which are left beyond the scope of this literature review. Finally, there is still a large literature focusing on the relationship with external asset managers mandated to invest beneficiaries' retirement assets [see e.g., Besley and Prat (2003); Lakonishok, Shleifer, and Vishny (1992); Bauer, Lum, Frehen, and Otten (2008); Del Guercio and Tkac (2002); Dvorak (2015)]. A PhD thesis by Cotellon-Rigot (2012) also examines the delegation of the investment of pension assets to external parties and in particular to hedge fund managers [see also Bouvatier and Rigot (2013)]. This chapter complements their approach as it focuses on the *internal* governance of pension funds and the proper incentives needed to hire, monitor, and fire *external* asset managers. In the end, this chapter aims to review what can potentially go wrong inside pension funds.

To my knowledge, there is no previous literature review on pension fund governance in a general and worldwide matter as it is still a new area of research. Few papers though aim to build in that direction and are worth mentioning. Hess and Impavido (2004) adopt a similar approach by applying the agency theory to public pension funds specifically and conclude on recommendations for pension boards. Besley and Prat (2003) build a model based on contract theory to show the different optimal governance arrangements depending on the plan type (defined-benefits vs. defined-contributions). Stewart and Yermo (2008) describe governance weaknesses, challenges, and possible solutions for policymakers worldwide. Other closely-related papers define best-practices pension fund governance generally [see e.g., Clark (2004); Clark and Urwin (2008, 2010)] or for national public pension funds [see e.g., Carmichael and Palacios (2004); Impavido (2002); Souto and Musalem (2012)].

Finally, this review tries to cover most of the literature, including all leading papers and working ones with important results as well as different views or methods. In addition, I include key papers from the corporate governance literature and the agency theory as a way to improve our current understanding of

pension fund governance. Both literature combined, the goal of this review is to provide a framework to study and develop more empirical work on the governance of pension funds. Though, its generality is limited by three important points. First, it necessarily reflects my own interests and includes mainly papers from the finance-related research. Second, pension funds present very different structure characteristics across and inside countries, limiting the general study of their governance. Therefore, some aspects reviewed in this chapter may only be applicable for certain types of pension funds such as whether there are public vs. private or offer defined-benefits vs. defined-contributions plans. These distinctions are particularly important for the agency problems of the employer and are mentioned in this review when relevant. Third, although it aims to remain applicable to worldwide pension funds, it is still biased towards specific countries. Indeed, a substantial amount of research is drawn from the U.S. environment and, as a result of my knowledge, some interpretation and insights are influenced by the Swiss pension system.

2.2. The board of trustees

Plan beneficiaries are the ultimate owners of the assets of pension funds and entrust the board of trustees to manage their retirement assets in their best interest. This delegation results in a classic agency problem of "separation of ownership and control" as first identified for modern corporations by Smith (1776) and Berle and Means (1932). In this setting, the beneficiaries delegate the management of the pension fund administration and investments to a board of trustees and expect that it will act in their interest. However, as for the relationship between shareholders and the manager in corporations, interests might diverge between the plan beneficiaries (principal) and the board of trustees (agent). As detailed by Jensen and Meckling (1976), agency costs necessarily result from such a "principal-agent relationship" with conflicting objectives. In particular for pension funds, this delegation leaves trustees with the greatest management power and discretion to initiate any misaligned behavior. In fact, they have more room to act in their self-interest and pursue other actions that maximize their own utility. On the other side, beneficiaries must trust the board to deliver the pensions at retirement. This is a typical "moral hazard problem", as trustees do not directly bear all the risks and any significant wealth effect associated with their decisions.

2.2.1. Why board effectiveness is key

As shown by Fama and Jensen (1983), when there is separation of the risk-bearing functions and the decision management, there is the need for an internal control mechanism. In this way, the authors justify the need of a board as a decision control system in any type of organisation, and especially when the principal is dispersed. Therefore, the board exists as an extra layer in the relationship between the plan

beneficiaries and the pension fund management to make sure that those managers act in their interests[17]. Yet, in pension funds, the board is not only a monitor and advisor as in corporations, but it is also the direct manager [see e.g. also, Hess and Impavido (2004)]. This is its role and responsibility. For example, in Switzerland, the board of trustees is the supreme body with the fiduciary duty, responsibility, and tasks of a manager as it is the case for a corporate manager [see e.g., LPP art. 51b-2; LPP art. 52; LPP art. 51a]. Then, in turn, the board of trustees delegates some tasks to other agents. In practice, it can and usually delegates to specialized committees, an internal manager and team, or external experts such as asset managers. In sum, the fact that both functions of decision control and decision management, as distinguished by Fama and Jensen (1983), are carried by the same agent is the main difference with modern corporations. In pension funds, the board of trustees is at the same time a control mechanism and the main agent.

Any trustees' misaligned behavior could be intensified when there is little transparency, when monitoring is costly, or when replacement is not easy. Remarkably, these three situations have characterized the pension fund environment till very recently, and still do in many jurisdictions. First, there is a general lack of transparency illustrated by the absence of integrated pension fund information and common accounting standards, the complexity and diversity of pension systems across countries, or the recent regulatory reforms that promote disclosure as in Finland, the Netherlands or Switzerland[18]. Second, direct monitoring by the plan beneficiaries is costly since they often do not have the necessary financial literacy [see e.g., Lusardi and Mitchell (2011); Lusardi and Mitchell (2014)], lack any immediate interest in future retirement considerations, have relatively small and dispersed stakes, and cannot usually freely choose their pension fund. Third, the firing and replacement of trustees is difficult or impossible due to the inherent connection with the employer, the limited market for pension managers, and a relatively low compensation offered in comparison with other financial and corporate institutions [see e.g., Ambachtsheer, Capelle, and Lum (2008); Ambachtsheer and McLaughlin (2015)][19]. In the end, this scenery may translate into inefficiencies, lower trust in the system, high costs, and ultimately threats to the performance, funding, and sustainability of pension funds. Establishing effective board governance is crucial for pension funds and for the agents involved in order to mitigate conflicts and align incentives.

[17] In Fama and Jensen (1983), the board is seen as an internal discipline device to align incentives in the same way as managerial ownership in Jensen and Meckling (1976) and the external wage revision process in Fama (1980).

[18] See for instance in Switzerland the 2010-2012 structural reform of the occupational pension scheme or the directive by the High Supervision Commission (CHS/OAK) for investment costs disclosure and transparency [see the D-02 (2013) based on OPP2 art. 48a-1 and 3], the 2014 pension fund governance reinforcement act and code in the Netherlands [see e.g., European Pensions, 16.07.2014. "Netherlands focus: Under pressure"], or the 2015 revision of the foundation law for pension funds in Finland [see e.g., Investment & Pensions Europe, 18.08.2014. "Finnish government submits bill on pension fund transparency, governance"; Investment & Pensions Europe, 09.12.2015. "Finnish foundation law set to strengthen governance"].

[19] For more discussion on compensation particularly in public pension funds, see also e.g., Pensions & Investments, 10.06.2013. "Paying for performance".

Effective board governance corresponds to a high degree of accountability, diligence, and should give the proper incentives to the trustees. Although there are many control mechanisms that can be put in place to achieve that, the effectiveness of the board of trustees itself plays a crucial role. Indeed, for pension funds, external factors are rather limited [see e.g. also, Hess and Impavido (2004)]. Instruments such as the market pressure, investor scrutiny, and even the law that plays an important role in corporate governance[20], are mostly absent or only recently developed in some countries. For example, important guidelines on best-practices pension fund governance as the Myners Report (2001) in the U.K. and the Clapman Report (2007) in the U.S. have come into the attention of the public and regulators, issues related to a lack of professionalism, unjustified investment costs, and significant conflicts of interests. Diverse guides have been issued by regulators as in the U.K. and Ireland in order to give some guidance to the pension board of trustees[21]. However, there does not seem to be control per se as there are usually no obligations and enforcement from the supervisors regarding governance considerations. For instance, speaking for the U.K. case, Clark (2004) argues that trustees have still scope for discretion, event after specific legislation targeting pension fund governance passed in the U.K. On top of that, most pension funds do not face a competitive environment, fear threats from a takeover market, have financial analysts to monitor them, or have large interested owners. In such setting, board effectiveness constitutes the key and only instrument to ensure and represent the interests of the plan beneficiaries.

A few studies also directly highlight the crucial importance of board effectiveness in pension funds. In particular, Besley and Prat (2003) and Hess and Impavido (2004) both demonstrate that, as beneficiaries are dispersed, there is a free-riding problem that reduces their vigilance and create the necessity for a strong, motivated, and well-functioning board of trustees. More specifically for public pension funds, Schneider and Damanpour (2002) provide evidence for the need of an effective board and explain it as a way to mitigate the impact of self-interested officials and public administrators. Despite these studies, rationale on the relevance of the board and its effectiveness remain limited. This contrasts with the abundant literature evaluating board effectiveness in corporations [see e.g., John and Senbet (1998); Hermalin and Weisbach (2003); Adams, Hermalin, and Weisbach (2010); Lipton and Lorsch (1992)] or in other entities such as mutual funds [see e.g., Adams, Mansi, and Nishikawa (2010)], banks [see e.g., De Andres and Vallelado (2008)], or life insurance companies [see e.g., Mayers, Shivdasani, and Smith (1997)].

[20] For the related literature on corporate governance, control mechanisms, and the importance of legal protection, see e.g., the surveys of Shleifer and Vishny (1997); Becht, Bolton, and Röell (2005); Denis and McConnell (2003); Denis (2001); Davis and Useem (2001); John and Senbet (1998); Bebchuk and Weisbach (2010); Gillan (2006); Netter, Poulsen, and Stegemoller (2009); Chau (2011).

[21] See e.g., the U.K. Pensions Regulator and the Ireland Pensions Board which have developed respectively the Trustee Knowledge and Understanding (TKU) (2009) and the Trustee Handbook (2012) to provide guidelines for the responsibilities, roles, and training of the board of trustees in pension funds.

2.2.2. The empirical findings

Most of the literature on pension boards is of empirical nature. Several empirical studies investigate the relation between governance measures related with board effectiveness and investment performance, asset allocation, operating costs, or funding level. Overall, there are two main, conclusive, and consistent findings. Initially, there seems to be a small positive relation between pension board effectiveness and investment performance for different countries and various datasets. This is the case for U.S. public pension funds [see e.g., Useem and Mitchell (2000); Albrecht and Hingorani (2004); Albrecht, Shamsub, and Giannatasio (2007); Hess (2005); Mitchell and Hsin (1994); Yang and Mitchell (2005); Harper (2008a); Harper (2008b); Schneider and Damanpour (2002)], Swiss pension funds [see e.g., Ammann and Zingg (2010); Ammann and Ehmann (2017)], defined-contributions pension plans in Poland [see e.g., Kowalewski (2012); Jackowicz and Kowalewski (2012)], and for an international dataset of large pension schemes [see e.g., Koedijk, Slager, and Bauer (2010); Ambachtsheer, Capelle, and Lum (2008); Ambachtsheer, Capelle, and Scheibelhut (1998)]. However, as a result of the remaining literature, those studies lack to explain why an effective board should initially matter and why there should be any relation in the first place.

Moreover, there are important measurement issues associated with investment performance which may invalidate this result. The general problem encountered is that the time-series of returns is usually not long enough (with annual data and a short number of observations) to compute Sharpe ratios or Jensen's alphas. This usually leads to measures applied to pension funds which are short-term oriented and which do not adjust at all or properly for risk. Ambachtsheer (1994) is one of the first to provide a solution with the concept of net value added (NVA) by adjusting for costs and risk with a benchmark based on the pension fund asset allocation. Others have then computed abnormal returns in the same spirit [see e.g., Ambachtsheer, Capelle, and Scheibelhut (1998); Albrecht and Hingorani (2004); Albrecht, Shamsub, and Giannatasio (2007); Bauer, Lum, Frehen, and Otten (2008); and also Brinson, Hood, and Beebower (1986); Brinson, Singer, and Beebower (1991)]. However, those studies focus on the assets side and still omit to account for developments from the liabilities side of pension funds. Specific measures have been developed to control for the pension liabilities [see e.g., Plantinga and Huijgen (2000); Plantinga (2005); Bolla, Wittig, and Kohler (2016)][22], but they have not been applied in previous work, probably due to data availability.

Another essential finding adds that asset allocation seems to be the channel through which pension board effectiveness matters [see e.g., Useem and Mitchell (2000); Albrecht and Hingorani (2004); Dobra

[22] In details, such measures of pension fund performance distinguish between surplus-driven and liability-driven assets [see e.g., Plantinga and Huijgen (2000)], nominal and real liabilities [see e.g., Plantinga (2005)], or account directly for beneficiaries' parameters [see e.g., Bolla, Wittig, and Kohler (2016)].

and Lubich (2013); Harper (2008a)]. The way trustees decide to invest and allocate pension assets seems to explain how an effective pension board may affect the pension fund performance. Nevertheless, these studies on asset allocation and the ones evaluating directly the relation with investment performance still lack robustness in their empirical setting and methodology. The samples remain small, with a short time-series, few pension funds, often based on a single country, and there are no endogeneity tests or causality assessments. There is definitely more empirical work needed to validate these current findings.

Additional studies are also needed to understand why and how board effectiveness should matter for pension funds. Operating costs may be an alternative channel although the results so far are not conclusive. Indeed, pension board effectiveness may have no direct impact on net performance as its influence might be on costs reduction through a better monitoring. For instance, favours to external experts or too high fees charged by asset managers might be avoided with more competent boards. This potential explanation should be of large interest as costs are an important component of pension fund sustainability due to the accumulation process resulting from the long-term nature of pension funds. Moreover, it is crucial in today's challenging environment where expected returns are low and costs reduction is a primary source of value for pension funds.

The hypothesis that lower operating costs are associated with more effective, small, and independent boards has been tested and confirmed for mutual funds [see e.g., Del Guercio, Dann, and Partch (2003); Tufano and Sevick (1997)]. The level of the total expense ratio is even considered as a direct measure of board effectiveness. Mayers, Shivdasani, and Smith (1997) also provide evidence for the impact of board composition in monitoring the expenses of life insurance companies. However, the lack of conclusive results for pension funds may be explained by two reasons. First, sound governance standards might be too costly. This concern is confirmed by the study of Tan and Cam (2015) on Australian pension funds who show that best-practices governance structures such as independent trustees and board committees do not benefit pension funds through a reduction of costs, and even find a strong positive link. Second, it could be that the level of operating costs might be primarily determined by fund size and governance considerations might have no influence beyond the important economies of scale experienced by large pension funds [see e.g., Bikker and De Dreu (2009); Dyck and Pomorski (2011); Bikker, Steenbeek, and Torracchi (2012); Bikker (2017)].

Finally, governance measures used for empirical studies are various. Some of them only focus on board composition and structure [see e.g., Jackowicz and Kowalewski (2012); Harper (2008a); Harper (2008b); Schneider and Damanpour (2002); Tan and Cam (2015)]. Others include additional variables related with, among others, investment rules and practices such as a prudent person approach or independent performance evaluations [see e.g., Useem and Mitchell (2000); Albrecht and Hingorani (2004);

Albrecht, Shamsub, and Giannatasio (2007); Dobra and Lubich (2013); Hess (2005); Mitchell and Hsin (1994); Yang and Mitchell (2005)]. More complete and integrated measures have also been developed including a large set of variables adding up turnover, expertise, codes, or fines [see Kowalewski (2012)], governance indices with a large spectrum of variables including investment design [see Ammann and Zingg (2010); Ammann and Ehmann (2017)], and a survey score based on CEO assessments on elements such as trustees compensation or mission clarity [see Ambachtsheer, Capelle, and Lum (2008); Ambachtsheer, Capelle, and Scheibelhut (1998)]. This plethora of measures raises an important question. Which one is the best to capture the effectiveness of pension boards? What really matters? Board composition cannot be the only aspect. Some measures also lack rationale as there are linked to the variables available in datasets.

In the end of this review of the empirical work related with pension board effectiveness, several questions remain unanswered. What makes a good and strong pension board? What are the desirable attributes of an effective pension board? To my knowledge, there is no clear identification of the agency problems in pension boards, an analysis of the potential solutions to mitigate them, or a study of their sources and determinants that may strengthen it. This is an important strand of the literature that is currently missing for pension funds and a path that needs to be particularly investigated in further research. It might also explain the diversity of the measures used to capture pension board effectiveness and could narrow down its definition.

2.2.3. Potential agency problems

Common agency problems of the board of trustees are neither clearly identified nor empirically investigated as such. Instead, previous empirical work on pension funds studies specific governance characteristics related with board effectiveness and, in some cases, mention related agency problems. The literature on corporate boards provide as well insights which may be applicable to pension funds. By combining both literature, the goal of this Sub-section is to review and list the key agency problems that may exist in pension boards around the world in order to build additional empirical work. I classify these potential agency problems in three distinct groups and label them “opportunism”, “shirking”, and “incompetence”. Each of them is described in details below[23].

2.2.3.1. Opportunism

A first important agency problem may arise in situations where trustees favor their own interest over beneficiaries’ one. This is for example the case when trustees decide to promote friends or families when it comes to allocate investment mandates to external parties. In addition of conflicts of interests, trustees’

[23] Note that this conceptualization is part of a larger and joint project with Carolina Salva.

opportunism might develop under different forms [see e.g., Shleifer and Vishny (1997)]. It could be through private benefits of control with pet projects or fancy offices, misallocation of funds till full expropriation, self-dealing by manipulating financial figures, or entrenchment of their positions. However, in comparison with the corporate governance literature, the so-called entrenchment or anti-takeover provisions might not be so important or even applicable for pension funds [see e.g., Shleifer and Vishny (1997); Gompers, Ishii, and Metrick (2003); Bebchuk, Cohen, and Ferrell (2009)]. Indeed, stock markets and takeover threats do not exist for pension funds and trustee's positions are often primarily linked with their employment.

Most work involving pension boards has been focusing on the agency problem of opportunism by looking at the board composition and the conflicting interests of its trustees. As discussed previously, empirical studies also include it, partially or exclusively, in their measurement of pension board effectiveness. Still, there are many other forms of opportunistic behaviors that are left unexplored. Moreover, most studies have focused the discussion on the independence of the board as a way to resolve the conflicts of interests. This approach is embedded with two serious concerns. First, the corporate literature questions board independence as an effective mechanism. Indeed, board independence, as proxy by the proportion of outsiders, as long and extensively been studied for corporations [see e.g., Bhagat and Black (1999); Bhagat and Black (2002); Harris and Raviv (2008); John and Senbet (1998); Hermalin and Weisbach (2003); Adams, Hermalin, and Weisbach (2010); Denis (2001); Denis and McConnell (2003)]. This literature offers mixed evidence and shows that outsiders may not necessarily act in shareholders' interest. In particular, Bhagat and Black (1999) and Bhagat and Black (2002) provide large evidence of no relation with corporate performance. A model developed by Harris and Raviv (2008) even shows that an outsiders-controlled board might not be the optimal choice in the first place and that an optimal board should be the result from the tradeoff between both agency problems of decision-making and information.

Second, this approach and the lessons from the corporate literature do not really apply to pension funds. Indeed, the primary question is not to be independent from the manager (as the board of trustees is by definition the direct internal manager) but more to represent the interests of the plan beneficiaries. Moreover, the proportion of outsiders cannot be a good proxy as trustee's positions are generally related with employment, not occupied by professionals, and plan outsiders might not even be allowed in some cases. Indeed, most trustees are by designation not external to plans and sit on pension boards either as a representative of the employer or employees. This is for example the case in militia systems such as in Switzerland where equal representation of the employees and employer is legally required in pension boards [see LPP art. 51-1]. In the end, it should be more a matter of representativeness for pension funds than of independence as for corporations.

2.2.3.2. Shirking

Trustees in pension funds tend to have full-time jobs or enjoy other mandates in parallel. As stressed by Lipton and Lorsch (1992), a lack of time and the inefficient way of using the few available is one of the major constraints on the effectiveness of corporate boards. Trustees may receive different kinds of compensation for their pension board representation. These may include performance-linked financial compensation, indemnity for attending, or counting the representation time within the regular working hours. Nevertheless, poor remuneration policies that are prevalent [see e.g., Ambachtsheer, Capelle, and Lum (2008); Ambachtsheer and McLaughlin (2015)] may not incentivize the most professional behaviors. As such, trustees may neglect their fiduciary duty and responsibility and favor the "path of least resistance", meaning that they may prefer passive and herding decisions regarding pension investments [see e.g., Choi, Laibson, Madrian, and Metrick (2002)]. Trustees may also prefer to enjoy a "quiet life" and avoid taking difficult decisions which might cause them additional time and effort [see e.g., Bertrand and Mullainathan (2003)]. Furthermore, trustees may be too "busy" with other tasks and behave as passive actors and less effective monitors [see e.g., Fich and Shivdasani (2006)]. Any of these passive behaviors could be classified under shirking and significantly impact the plan beneficiaries' welfare in the long term.

Motivation and commitment are soft factors that are hard to quantify and integrate in any governance measure. Still, there are empirical studies in the literature of pension boards identifying variables as mitigating the issue of shirking. For instance, the CEO survey score includes assessments based on time spending [see Ambachtsheer, Capelle, and Lum (2008); Ambachtsheer, Capelle, and Scheibelhut (1998)]. Other authors use as a proxy for motivated trustees the fact that there are elected as plan beneficiaries [see Hess (2005)] or that the chairman can be seen as a motivated insider [see Jackowicz and Kowalewski (2012)]. Appropriate compensation is a key incentive aiming at motivating trustees which is often studied [see e.g., Ambachtsheer and McLaughlin (2015); Ambachtsheer, Capelle, and Lum (2008); Ambachtsheer, Capelle, and Scheibelhut (1998); Ammann and Zingg (2010); Kowalewski (2012)].

Having small boards may also be a way to commit trustees to actively participate and take decisions, although this aspect of board structure is usually not explored for that reason. This last point is particularly worth further investigation as the literature on corporate board size supports the general positive impact of smaller boards on performance and the quality of decisions [see e.g., Yermack (1996); John and Senbet (1998); Hermalin and Weisbach (2003); Adams, Hermalin, and Weisbach (2010); Denis (2001); Denis and McConnell (2003); Davis and Useem (2001)]. On the other hand, and of relevance for pension funds, small boards are challenged by the need of representation of all participants.

2.2.3.3. Incompetence

Board competence is a crucial determinant of pension fund sustainability. However, since the Myners Report (2001) in the U.K., several authors highlight the general problem of a lack of competence of trustees in the investment decision-making process and strategic thinking [see e.g., Clark (2004); Clark, Caerlewy-Smith, and Marshall (2006, 2007); Ambachtsheer, Capelle, and Lum (2008)]. For instance, Clark, Caerlewy-Smith, and Marshall (2006, 2007) show an important heterogeneity in trustee competence, an absence of common approach, and an issue of consistency in decision-making regarding investments. Outside the boardroom, recent studies also provide evidence of a generally low level of financial literacy [see e.g. Lusardi and Mitchell (2011); Lusardi and Mitchell (2014)]. In brief, these studies show that people systematically fail in incorporating basic principles of time, risk, and diversification in investment decisions. As the complexity of the finance world requires today high levels of expertise and sophistication in investments, this agency problem could severely impair beneficiaries' retirement wealth. Moreover, Lipton and Lorsch (1992) highlight the complexity and amount of information as an important constraint on the effectiveness of corporate boards. The competence of the board is thus key to process all this information.

Despite being often mentioned in the pension fund literature, the issue of trustees' competence still need empirical investigation. Some studies have focused their attention on the existence of a designed framework for trustees to take investment decisions through several aspects as, for instance, estimations for the investment strategy or rules for the investment process [see e.g., Ammann and Zingg (2010); Ammann and Ehmann (2017); Useem and Mitchell (2000)]. Others examine diverse forms of expertise through education or experience and include it in their governance measures but it remains incomplete as detailed personal information on trustees are often absent from datasets [see e.g., Kowalewski (2012); Jackowicz and Kowalewski (2012) for an exception in Poland]. On the other hand, the literature on corporate boards delivers evidence of the importance and positive impact of financial expertise for the quality of board decisions. For example, Defond, Hann, and Hu (2005) show that the market reacts positively to appointments of accountants in audit committees, as these experts are expected to enhance the quality of financial reporting. Güner, Malmendier, and Tate (2008) show that bankers (with no other conflicting bank mandate) provide valuable financial expertise in corporate boards. Further, Gray and Nowland (2014) show that board diversity in professional expertise limited to accountants, bankers, lawyers, consultants, and other CEOs benefit shareholders[24]. For pension funds, board expertise in investments is expected to be even more relevant as the management of plan beneficiaries' pension assets actually characterizes their core business.

[24] Although not directly related with financial expertise, two other studies from the corporate boards literature also highlight the positive impact of specific expertise in boards: (1) Fich (2005) with other well-performing CEOs and (2) Agrawal and Knoeber (2001) with politically-related directors.

To conclude, a strong board needs not only to ensure the representation of the beneficiaries' interests but also to have the necessary expertise to manage millions of pension assets. Depending on the kinds of pension funds, it may include different skills from risk-return assessments to managerial ones such as in a multi-employer form. However, most trustees (and in particular the ones elected among the employees) usually do not have such expertise as they are not elected for this specific reason, which is a serious concern for the effectiveness of pension boards. This tradeoff between "representation" and "expertise" in pension boards is frequently mentioned and examined in the related literature [see e.g., Besley and Prat (2003); Hess (2005); Jackowicz and Kowalewski (2012); Clark (2007)][25]. It is especially developed in Clark (2007) with an application to the governance of U.K. pension funds. However, further research is needed to determine if one aspect generally outweighs the other, for different types of plan, or under which circumstances.

2.3. The sponsoring employer

Employers around the world choose and offer pension plans to their employees. Along with legal and accounting obligations, they are engaged in managing the most appropriate, well-performing, and sustainable plans for their current and past employees. They are also the most important money contributor to these plans although they cannot benefit from this money anymore. This leaves them with the most stringent incentives to help flourish the retirement assets of plan beneficiaries. However, the sponsoring employer (including governments and their politicians as well as companies and their managers) may have different goals. Overall, the employer may be more interested in minimizing its contributions to the plans and related operating costs than maximizing the plan performance and returns credited on the beneficiaries' accounts. He may also engage in different kinds of misaligned behaviors that could threaten the wealth of pension plan beneficiaries. Each of them is described in details in the following Sub-sections. In some cases, the employer's influence may be direct such as for U.S. corporate pension plans as their administration is usually run by the corporation itself. Ultimately for all pension funds around the world, the agency problems of the employer might concretize inside the boardroom through its seats and impact board decisions.

2.3.1. Diversions of pension assets

The employer may use pension assets for its own purposes and needs. As a result, beneficiaries' savings might be invested into loans to the employer, employer's buildings, or even employer's stock for listed corporations. For instance, one recent study by Atanasova and Chemla (2014) shows that companies

[25] A model for corporate boards by Wagner (2011) also focuses on a similar tradeoff between independence and competence. The author shows that a less competent board (in terms of information about projects quality) is related with inefficient loyalty to the CEO, harming shareholders' interests.

which are intensive in R&D, land, and buildings tilt the asset allocation of their pension plans towards more alternative investments. Although this decision might be explained by a familiarity bias, it eventually harms plan beneficiaries as the authors show that these sponsor-related assets produce negative returns. In the end, an asset allocation determined by the employer (whether a government or a company) has been shown to be inefficient for plan beneficiaries [see e.g., Besley and Prat (2003); Hess and Impavido (2004)]. However, this assessment still lack a general empirical support, while two specific cases have received a particular attention in the U.S. literature. First, for public pension funds, governments and their politicians may influence asset allocation decisions [see e.g., Hess (2005); Hess and Impavido (2004); Bradley, Pantzalis, and Yuan (2016); Dobra and Lubich (2013); Mohan and Zhang (2014)]. Political interference may even partly explain their underfunding [see e.g., Elder and Wagner (2015); Eaton and Nofsinger (2004)]. For instance, politicians may induce pension investments that favor local economic and social projects, limit certain types of investments, or pursue their own short-term political agenda.

Second, as extensively studied for corporate pension plans, listed companies might decide to invest a substantial part of their plan assets into their own stock. The specific case of sponsor allocation into "own company stock" came in the spotlights after dramatic stock price collapses and firm bankruptcies as the Enron case [see e.g., Poterba (2003); Mitchell and Utkus (2004); Benartzi, Thaler, Utkus, and Sunstein (2007)], and is still up-to-date[26]. However, outside the U.S., little is known about the case of own company stock. A first reason could be that data unavailability makes it difficult to build empirical work [see e.g., Lee, Liu, and Zhu (2007) for an exception in Taiwan]. Second, it could be that this problem might not even exist in other countries due to specific legal prescriptions. For example, in Switzerland, OPP2 art. 57-2 requires a 5% investment limit for all types of sponsor allocation, including own company stock. As a result of the substantial research, the findings from this U.S. literature are presented in the next Sub-section.

2.3.2. The case of own company stock in the U.S.

Diverse estimations highlight the size and potential impact of investing in the own stock of the company. Benartzi (2001) estimates that about one-third of large retirement 401(k) accounts are invested in the own company stock[27]. Poterba (2003) adds that about one-fourth of 401(k)s hold more than 20%. At the extreme, Mitchell and Utkus (2004) estimate that more than 5 million of Americans hold more than 60% of their future retirement invested in the single company there are currently working for. Although not all companies are concerned, this problem is particularly important as it involves large companies with a

[26] See e.g., a recent newspaper article building from the RadioShack case, The New York Times, 20.03.2015. "A scary movie: Filling your 401(k) with company stock".

[27] Note that in typical 401(k)s, the employees have to choose an investment strategy for their pension plan following the menu and options offered by the employer. Thus, there are two different types of investment choices under 401(k) pension plans.

large number of plan beneficiaries [see e.g., Mitchell and Utkus (2004); Poterba (2003); Even and Macpherson (2004)]. As evidenced by Even and Macpherson (2004), while only one-tenth of defined-contributions pension plans have any investment in their related company stock, one-third of all workers in this type of plans are affected by the problem.

Holding a significant portion of pension assets into own company stock contradicts modern portfolio theory and the core investment principle of diversification established since Markowitz (1952). With this investment, plan beneficiaries have to assume the additional volatility of holding a single stock that could be diversified in their retirement portfolio. This is called the idiosyncratic risk. There is also the risk for employees of having their current wages, present job, and human capital correlated with their future income and retirement assets. By being dependent of the company stock performance, an employee might lose both its job and wealth in the worst-case scenario. All studies on the topic agree that these are the main disadvantages and risks for corporate employees [see e.g., Mitchell and Utkus (2004); Benartzi, Thaler, Utkus, and Sunstein (2007); Even and Macpherson (2004); Poterba (2003); Benartzi (2001); Rauh (2006a)]. Some authors have even estimated the associated cost of this diversification issue [see e.g., Meulbroek (2005); Ramaswamy (2004); Poterba (2003); Poterba (2004); Even and Macpherson (2004); Even and Macpherson (2008)]. Even and Macpherson (2008) also particularly examine the consequences of this poor diversification. The authors give evidence that a high concentration of employer's stock reduces the risk-adjusted return performance, while modest holdings have a negligible impact[28].

Explanations for employers choosing to hold their own stock in the pension plans they offer to their employees are advanced in the associated literature [see e.g., Mitchell and Utkus (2004); Benartzi, Thaler, Utkus, and Sunstein (2007); Even and Macpherson (2004); Rauh (2006a); Beatty (1994)]. Initially, this form of employee ownership was encouraged to strengthen the loyalty and motivation of workers. The main purpose was to increase employee's productivity in order to maximize firm value[29]. This reason particularly explains the expansion of Employee Stock Ownership Plans (ESOPs) and KSOPs (which are a combination of ESOP and 401(k)) in the U.S. landscape. However, empirical studies provide mixed evidence for the productivity hypothesis. Although employee's motivation appears to be increased, results on corporate outcomes turn out to be inconclusive [see e.g., Mitchell and Utkus (2004); Benartzi, Thaler, Utkus, and Sunstein (2007); Even and Macpherson (2004)]. This might be explained by the free-riding problem of the impact of one worker's effort on the overall performance of the company [see e.g., Benartzi, Thaler, Utkus, and Sunstein (2007); Even and Macpherson (2004)].

[28] On the other hand, there are also associated benefits with this investment. These include monetary tax advantages, private information for discretionary contributions, and the feeling of being part of the team and owning a part of your own firm [see e.g., Benartzi, Thaler, Utkus, and Sunstein (2007); Mitchell and Utkus (2004)].

[29] This contradicts the initial goal of pension funds as being the interest of plan beneficiaries and in particular their retirement safety.

Other explanations are also advanced in the literature but they have all received little or no empirical support. These include (1) tax advantages as the deductibility of dividends in KSOPs [see e.g., Benartzi, Thaler, Utkus, and Sunstein (2007); Mitchell and Utkus (2004); Beatty (1994); Even and Macpherson (2004)], (2) financing reasons as stocks cost less than cash contributions [see e.g., Mitchell and Utkus (2004); Benartzi, Thaler, Utkus, and Sunstein (2007); Even and Macpherson (2004)], (3) behavioural motives as if the employer also offers other safer plans and their stock is a blue chip [see e.g., Mitchell and Utkus (2004)], and (4) the specific U.S. legal and accounting environment [see e.g., Benartzi, Thaler, Utkus, and Sunstein (2007)].

A hypothesis has received a particular attention and empirical support: "ownership for control" [see e.g., Rauh (2006a); Beatty (1994); Mitchell and Utkus (2004); Benartzi, Thaler, Utkus, and Sunstein (2007); Even and Macpherson (2004)]. According to this idea, employer's decision to invest in their own stock might be a defensive strategy from the company managers to protect themselves from a potential hostile takeover. Employee ownership might act as a substitute for managerial ownership if both employees and managers intentions are aligned together. In the case of a takeover threat, this is most likely to be true as both employees and managers should intend to focus on keeping their jobs. In the end, investing plan assets into the own company stock might be an alternative way to find managerial entrenchment without bearing the agency costs [see e.g., Rauh (2006a)]. The study of Beatty (1994) is the first to give some support for the anti-takeover hypothesis. It shows that ESOPs are more likely to be adopted by companies with a higher risk of a takeover. Using changes in state laws as a natural experiment, Rauh (2006a) also robustly shows that employee ownership is indeed effective in reducing takeover probabilities. Moreover, the author suggests that cross-sectional corporate governance might be an additional and promising hypothesis. Indeed, anti-takeover provisions put in place by corporate managers such as a staggered board is a way to entrench themselves from takeovers [see e.g., Gompers, Ishii, and Metrick (2003); Bebchuk, Cohen, and Ferrell (2009); Bebchuk and Cohen (2005); Faleye (2007)]. On the other hand, Comment and Schwert (1995) cast some doubts on the real deterrence effect of these anti-takeover provisions. There is definitely further research needed on this question.

Finally, behavioural reasons can explain why employees may voluntary choose to invest in their own company stock, despite the associated costs [see e.g., Even and Macpherson (2004); Benartzi (2001); Benartzi, Thaler, Utkus, and Sunstein (2007), Mitchell and Utkus (2004); Choi, Laibson, Madrian, and Metrick (2003)]. These explanations are specific to U.S. 401(k)s and applicable to other countries and cases where employees can freely choose the investment strategy of their pension plan[30]. A first reason might simply be a "familiarity bias". Indeed, it might feel and look like a good choice from the employee's

[30] In Switzerland, although they do not apply for the employer-based pension system (second pillar), they may exist in the voluntary third pillar in which individuals are left with their own investment choices.

perspective to invest in a company you know, are engaged to, and daily work for. Second, there might be an "endorsement effect" if employers offer in the first place their own stock in the investment menu (and with a high default options level) as well as match employees' contributions with their own stock[31]. Third, employees' myopia in the "risk assessment" of their own company stock and relatively to the stock market might be an additional explanation. For example, evidence by Benartzi, Thaler, Utkus, and Sunstein (2007) shows that employees underestimate the risk of owning their company stock in comparison with a diversified portfolio. Finally, a fourth important reason may be a "representativeness bias". As shown by Benartzi (2001) and Choi, Laibson, Madrian, and Metrick (2003), employees excessively extrapolate past company stock returns as an indicator of future performance. This leads them to allocate their discretionary contributions to employer's stock following high past returns. Indeed, as evidenced by Benartzi (2001), employees allocate 40% for best performers, while only 10% is allocated for worst performers.

2.3.3. Misconducts in financial distress

The employer may favor its own durability over its pension plans in particularly constrained or distressed situations. Specifically, for defined-benefits pension plans, the beneficiaries are protected and only the employer has to bear the extra payoffs due to deficits and the immediate consequences of underfunding [see e.g., McCarthy and Miles (2013); Besley and Prat (2003)]. The sponsoring employer is merely the residual claimant [see e.g., Lakonishok, Shleifer, and Vishny (1992)][32]. This payoffs asymmetry gives the employer the incentive to act in its own interest in order to prevent any additional contributions. And this problem is crucial for financially-distressed companies, i.e., for companies with a high debt leverage and/or low-funded pension plans. In cash-constrained situations and with mandatory pension contributions, companies' investments and capital expenditures may suffer [see e.g., Rauh (2006b); Franzoni (2009)]. Companies may also prefer to pay shareholders' dividends than refund their pension plans [see e.g., Webb (2007); Cocco and Volpin (2007)][33]. Governments may as well have other budgetary problems and urgent spending [see e.g., Hess (2005)].

[31] The plan design and investment menu offered by the employer to its employees also induce a plethora of behavioural biases for individual retirement decisions. A large literature discusses these biases [see e.g., the surveys of Choi (2015); Mitchell and Utkus (2003)] and provide evidence for different kinds of consequences on employees' retirement [see e.g., Brown, Liang, and Weisbenner (2007); Tang, Mitchell, Mottola, and Utkus (2010); Choi, Laibson, Madrian, and Metrick (2002); Madrian and Shea (2001); Sialm, Starks, and Zhang (2015); Benartzi and Thaler (2001); Huberman and Jiang (2006); Elton, Gruber, and Blake (2006); Bubb, Corrigan, and Warren (2015)].

[32] For public pension funds, taxpayers are in fact the last-resort residual claimant [see e.g., Pennacchi and Rastad (2011); Dobra and Lubich (2013)].

[33] Webb (2007) develops a model where a pension plan deficit is seen as a company debt, affects the company's real investment and capital structure, and depends on the institutional environment. The employer's incentive of choosing dividends over the funding of its pension plans is only one of the model implications.

In addition of reduced contributions, previous literature identifies two ways the employer may take costly decisions for the plan beneficiaries by transferring its financial risks to its pension plans. First, with funding issues, the employer could be suspected to manipulate its actuarial assumptions as the technical interest rate applied to value pension liabilities. This liability discount rate might be artificially set higher (and as such lower pension liabilities) in order to meet funding requirements, improve funding status, or simply reduce the due contributions. However, by setting a higher technical rate, pension funds need to assume a higher expected rate of returns on pension assets and thus increase investment risk. Several studies confirm that this "actuarial mechanism" is problematic for public pension funds [see e.g., Andonov, Bauer, and Cremers (2013); Mohan and Zhang (2014); Pennacchi and Rastad (2011); Eaton and Nofsinger (2004); Hess (2005)] as well as, to some extent, for corporate pension plans [see e.g., Bergstresser, Desai, and Rauh (2006); Kisser, Kiff, and Soto (2015); Cocco and Volpin (2007); Newell, Kreuze, and Hurtt (2002)]. Indeed, Newell, Kreuze, and Hurtt (2002) find a reverse causality between actuarial assumptions and funding status. Cocco and Volpin (2007) do not find support for this idea, probably due to specific U.K. regulation where this decision is rather in actuaries' than employers' hands.

If a higher investment risk is taken only to justify actuarial assumptions and hide underfunding, it can have severe implications for plan beneficiaries. For example, as shown by Andonov, Bauer, and Cremers (2013) on an international dataset, the resulting increased investment risk-taking in U.S. public pension funds is associated with underperformance. However, this result is mainly due to distinct U.S. regulation for public pension funds that ties the technical rate with the expected rate of returns on pension assets, and might not apply in other countries [see e.g., Andonov, Bauer, and Cremers (2013); Cocco and Volpin (2007)]. Yet, it could be very costly for any pension fund around the world if it further delays needed restructuring measures.

Second, financial distress may directly influence the employer's choice of the investment policy and risk-taking behavior of its pension plans. Two hypotheses compete in a large and still active literature. The "risk management hypothesis" advocates that companies experiencing high default risks and low funding ratios will take less risk (by allocating less into equity) in order to limit the costs of financial distress [see e.g., Rauh (2009); An, Huang, and Zhang (2013); Weller and Wenger (2009); Gerber and Weber (2007)]. For very poorly funded pension plans, McCarthy and Miles (2013) also show that sponsors have incentives to invest safely and Atanasova and Chemla (2014) provide evidence that they invest less in alternative investments. Related to corporate governance, Vafeas and Vlittis (2016) also show that a higher proportion of outside trustees in pension boards also supports the risk management hypothesis.

On the other hand, the "risk shifting (or transfer) hypothesis" stresses that companies in such situations will increase the equity allocation in their pension plans as a way to gamble for resurrection and

catch up with pension underfunding. This is the consequence of the actuarial mechanism as described previously. Accordingly, the behavior of public pension funds facing funding issues usually supports this hypothesis [see e.g., Andonov, Bauer, and Cremers (2013); Mohan and Zhang (2014); Pennacchi and Rastad (2011)]. However, a study by Park (2014) may also suggest that this increased risk-taking behavior is not constant over time and may change during difficult periods. Indeed, following the 2008 financial crisis, public sponsors facing mandatory pension contributions shifted their behavior by investing less into equity. Additionally, this hypothesis also appears to be supported for companies in extreme financial distress [see e.g., An, Huang, and Zhang (2013); Guan and Lui (2016)], when corporate managers have incentives to manipulate corporate earnings [see Bergstresser, Desai, and Rauh (2006)], or when pension boards include a higher proportion of corporate directors [see Cocco and Volpin (2007)].

2.4. Conclusion

Pension fund governance studies the participating agents and their diverging incentives which could harm plan beneficiaries' best interests. This chapter reviews its literature by focusing on the internal agency problems induced by the board of trustees and the sponsoring employer in pension funds around the world. It also uses insights from the corporate governance literature as a way to improve our current understanding of the topic. Overall, previous research places board effectiveness at the centre of pension fund governance and emphasizes on the employer's influence over pension fund asset allocation decisions. However, pension fund governance remains a new area of research. Little is known or investigated outside the U.S., only a few datasets are available in specific countries, additional explanatory work and more robustness in empirical studies are needed, and there is definitely the need to learn more about pension boards.

This chapter is also a foundation to build more empirical work on the governance of pension funds and in particular on the effectiveness of their pension boards. Several avenues for further research have been highlighted along this review. The following and remaining chapters of this thesis focus on some of them. Specifically, Chapter 3 aims to analyse the sources and determinants of an effective pension board. For that purpose, it also designs a new measure of pension board effectiveness. Chapter 4 examines whether and to what extent it really matters and may impact pension fund asset allocation.

Chapter 3.

What are the sources of an effective pension board?

Evidence from Switzerland

3.1. Introduction

An effective pension board is supposed to act on the best interests of its plan beneficiaries. In particular, its integrity, commitment, and competence should ensure that pension assets are properly managed and the pensions are guaranteed. However, several sources may drive the board away from its main goal or on the contrary strengthen its effectiveness. Legal constraints may force pension boards to adopt attributes diverting them from their optimum. A public employer may be associated with more conflicts of interests and thus a less effective board. Pension funds offering defined-benefits plans may protect better their beneficiaries. Likewise, larger pension funds may have the necessarily means and resources from scale economies to invest in best-practices standards such as training or compensation, enhancing their board effectiveness.

This chapter aims to analyse the determinants of the effectiveness of pension boards. Using the Swiss framework, it is the first study that focuses on this question for pension funds[34]. In contrast, the literature on the determinants of effective corporate boards is large. Previous surveys emphasize on the

[34] Note that a PhD thesis by Njuguna (2010, 2011) looks at the determinants of pension fund efficiency through the governance question in pension funds in Kenya. However, this work is specific to a particular emerging economy very different from Switzerland and other countries with professionalized systems.

endogenous and optimal nature of strong boards [see e.g., Hermalin and Weisbach (2003); Adams, Hermalin, and Weisbach (2010); John and Senbet (1998)]. Empirical studies particularly examine the factors shaping the size and composition of corporate boards and give support to some of them such as the size of the firm or growth opportunities [see e.g., Boone, Field, Karpoff, and Raheja (2007); Lehn, Patro, and Zhao (2009)]. This study contributes to this strand of research in two ways. First, Hermalin and Weisbach (2003) conclude that relatively little is known for other entities than corporations. Although optimality might be a common feature across boards, the relevant sources of board distortions for pension funds are expected to be different due to another agency setting and institutional environment. New rationale and empirical work are needed specifically for pension funds. Second, Boone, Field, Karpoff, and Raheja (2007) show that a lot remains unexplained following established theories. Therefore, the results from this study may, to some extent, complement the unexplained variation in corporate boards and add further understanding to the shaping of boards in general.

Boone, Field, Karpoff, and Raheja (2007) also suggest that the unexplained variation in boards may lie in entity-specific factors affecting different board characteristics. For this reason, I focus the analysis of potentially relevant sources on pension fund variables such as fund size and structure characteristics including, among others, legal form and plan type. Due to the importance of the endogeneity of boards and the country's system for pension funds, I also emphasize on the legal provisions and their potential effect on pension board effectiveness. I then empirically assess what drives and shapes strong pension boards by looking at various dimensions of board effectiveness including integrity, commitment, and competence. This represents a broader set of board characteristics than the usual concentration on aspects of board structure such as size and composition [see e.g., Boone, Field, Karpoff, and Raheja (2007); Lehn, Patro, and Zhao (2009)].

To conduct empirical tests, I use a unique hand-collected dataset of Swiss pension funds and develop a new measure describing the effectiveness of pension boards directly applicable to Swiss pension funds. To construct the measure, I gather a comprehensive list of 24 desirable attributes meeting best-practices criteria and classified in each of the dimensions of board effectiveness. I also identify seven out of the 24 attributes as legally binding provisions for pension funds in Switzerland. I then aggregate the related attributes into an equally-weighted index of board effectiveness as well as sub-indices for each dimension, the provisions which are legally binding, and the ones which can be complied on a voluntary basis.

Previous studies also investigate pension fund governance in Switzerland while they focus on its relation with investment performance using surveys [see Ammann and Zingg (2010); Ammann and Ehmann (2017)]. This chapter complements their work by analysing the determinants of an originally superior level of governance using a new dataset including the smallest Swiss pension funds. As constrained by my

dataset, I cannot directly replicate their measures. Instead, I build another measure that may bring additional governance insights in Switzerland. Mostly, it includes attributes representing a subset of their indices and adding relevant elements of board structure and representativeness.

With data collected directly from Swiss pension fund annual reports and other important files covering the period 2010-2012, I describe the levels of board effectiveness and its dimensions of 210 unique pension funds for a full sample of 614 fund-year observations. Compared to surveys, this data collection process from reported files has the advantages of remaining based on objective information and without positive selection bias. On the other hand, I can only focus on what is available and collectable in Swiss pension fund files. The information disclosed and its level of transparency will necessarily influence the measurement of pension board effectiveness as well as the interpretation of the results.

Overall, I observe a high diversity in the Swiss pension fund landscape. In my sample, Swiss pension funds can manage less than CHF 100,000 in assets to almost CHF 8 billion, have up to 3,888 affiliated employers, offer 15 different pension plans, and have a number of beneficiaries varying from 1 to 76,687. Moreover, 5% are public entities and 15% offer defined-benefits plans which is representative of the Swiss pension market in that matter. There are also large differences in the desirable attributes and level of effectiveness of Swiss pension boards, where some of them seem to be less common. For instance, descriptive results show that only 22% of the pension funds offer a compensation to trustees, 56% mention a training of the trustees, and 66% have an internal manager for the daily operations of the administration and/or the investments. Moreover, most pension boards do not have the recommended organisation and still lack to clearly establish a detailed framework to take investment decisions.

The results from the analysis show that fund size is the key explanatory variable of my measure of board effectiveness and that it matters beyond other potentially relevant sources. In particular, large pension funds managing their administration internally seem to be associated with more effective and committed boards. This is consistent with the hypothesis that pension funds with a sufficient scale have the economies to invest in best-practices attributes and to build an in-house administration team[35]. Although the plan type distinction (defined-benefits vs. defined-contributions) does not seem to be initially relevant in Switzerland, fund size matters beyond the legal form of the pension fund (private vs. public). This conclusion is also robust for all three dimensions of board effectiveness, whether fund size is proxy in terms of assets or beneficiaries, by excluding public pension funds or funds planning a liquidation procedure, and across the three years included in the sample.

[35] In this study, I show that an in-house administration team is associated with my measure of board effectiveness. However, I do not claim any causality or that it is necessarily the best solution for all types of pension funds and in particular the smallest ones.

Following these results, fund size seems to be an important determinant. However, it could be endogenously determined. In particular, multi-employer pension funds may decide to invest in high standards of governance in order to attract more employers and grow in size. On the contrary, in Switzerland, single-employer pension funds have their size constrained by the size of the employer. Fund size is given as exogenous. On a sub-sample of this particular kind of pension funds, the results are qualitatively similar, which lowers to some extent the concern of reverse causality.

Furthermore, the results hold when focusing on the provisions voluntary chosen by Swiss pension boards. However, this claim has to be taken with caution as Swiss pension funds do not seem to comply with the attributes identified as legally binding provisions. The major reason for this puzzling result is linked to the data collection process and transparency in Swiss pension fund files. From a practical perspective, non-documentation is different from non-implementation. This important limitation associated with the measurement of pension board effectiveness prevents me from concluding on whether legal constraints are a relevant source of pension board distortions in Switzerland.

As a final point, I cannot exclude transparency as an alternative explanation to the findings. This is especially relevant as fund size is particularly a significant and important explanatory variable for a sub-sample of the smallest pension funds, which are also usually the ones with less documentation and disclosed information. Therefore, governance considerations cannot be clearly dissociated from transparency aspects in this study. It remains that pension fund governance, its board effectiveness, and transparency seem to be mainly a question of fund size. As such, this study gives to some extent support for the consolidation of pension funds in Switzerland as well as other countries with a similar institutional environment and still small dispersed pension funds. Nevertheless, I do not show that consolidation is necessarily better for plan beneficiaries and pension fund sustainability, but rather leave that for further research.

This chapter is organised as follows. Using previous literature, Section 3.2 develops the new rationale for the potential sources of effective boards in pension funds. Section 3.3 presents the unique hand-collected dataset of Swiss pension funds and gives summary statistics on pension fund variables. The new measure of board effectiveness is developed and constructed in Section 3.4, including its three dimensions and the list of its desirable attributes for Swiss pension funds. This Section also gives descriptive results regarding the organisation and functioning of Swiss pension boards. Section 3.5 provides the results of the empirical analysis of the determinants using univariate tests and multivariate regressions. I also discuss the significance of the results for the consolidation of the Swiss pension fund industry. I conclude in Section 3.6.

3.2. The potential sources of an effective pension board

3.2.1. Optimal solution and legal constraints

What is an effective pension board? As commonly believed among authors on the topic [see e.g., Mitchell and Hsin (1994); Hess and Impavido (2004); Ammann and Zingg (2010)], there is no universal and one-size-fits-all solution for a strong board of trustees. In fact, there is an optimal board specifically for each pension fund. Its attributes of effectiveness are endogenously chosen by the board of trustees as the optimal solution with respect to the constraints the pension fund faces [see e.g., Hermalin and Weisbach (2003); Adams, Hermalin, and Weisbach (2010); John and Senbet (1998)]. In particular, it is the result of an internal optimal decisional problem that solves the tradeoff between pension-level benefits with the costs of monitoring [see e.g., Lehn, Patro, and Zhao (2009); Boone, Field, Karpoff, and Raheja (2007)] and the costs of implementation given the country's institutional environment [see e.g., Ferreira, Kirchmaier, and Metzger (2011); Doidge, Karolyi, and Stulz (2007); Larcker, Ormazabal, and Taylor (2011)].

From another perspective, Clark and Urwin (2008) point that governance considerations can first be considered as a strategic and long-term investment for pension funds. Therefore, best-practices attributes can also be seen as an investment where its return depends on the agency costs of its setting [see e.g., Adams, Mansi, and Nishikawa (2010)]. In pension funds, significant agency costs might exist for some attributes and explain why they may not be the optimal choice for all of them. For instance, an annual compliance with codes of a long list of best-practices for all trustees and managers might add an excessive administrative burden and divert trustees' time from more important tasks. Also, having a full-time internal manager, offering specific training and appropriate compensation to trustees, or using a myriad of tools and experts to support investment decisions might actually be very costly. As summarized by Hess and Impavido (2004), a well-governed pension fund should choose the optimal attributes at the lowest cost. Therefore, what appear to be poor governance choices might still be the result from the constrained optimization problem [see e.g., Adams, Hermalin, and Weisbach (2010)].

Most of all, pension funds are dependent on the country where it evolves [see e.g., Mitchell and Hsin (1994)], and this in turn affects the governance and shaping of boards [see e.g., Boone, Field, Karpoff, and Raheja (2007); Ferreira, Kirchmaier, and Metzger (2011); Doidge, Karolyi, and Stulz (2007); Larcker, Ormazabal, and Taylor (2011)]. Indeed, as illustrated by these authors, country-specific characteristics such as the nature of the competitive environment, the legal protection for minorities, and the level of economic and financial development have an influence on board composition and size. Favourable systems actually create an environment where pension funds are willing to invest more in their own governance simply as they can directly benefit from their investment. With no legal protection, there is absolutely no guarantee that they would receive the due return from their investment [see e.g., Doidge, Karolyi, and Stulz (2007)].

In this setting, legal provisions are given by the institutional environment as the key constraints and thus might deviate the board decisions from its optimum [see e.g., Mayers, Shivdasani, and Smith (1997); Hermalin and Weisbach (2003); Ferreira, Kirchmaier, and Metzger (2011); Larcker, Ormazabal, and Taylor (2011)]. For example, Bhagat and Black (1999) show that the external pressure to comply with a sufficient proportion of outsiders to increase board independence might not be optimal for all entities. Overall, by limiting board managerial discretion, attributes which are legally binding might reduce monitoring by the board and its general effectiveness [see e.g., De Andres and Vallelado (2008); Connelly and Limpaphayom (2004)]. On the other hand, attributes which can be complied on a voluntary basis are decisions which should have been optimally chosen by the board of trustees. Chhaochharia and Laeven (2009) show indeed that governance provisions chosen above country norms have a positive impact on firm valuations. Ammann, Oesch, and Schmid (2011) confirm that the valuation effect of governance increases when legal provisions are excluded from the analysis. In the end, the distinction "legally binding" and "voluntary compliance" among attributes is an important one when studying the effectiveness of pension boards. The effect of country-level provisions needs to be dissociated in order to capture what is actually related with the board decisions at the pension fund level.

3.2.2. Fund size and economies of scale

Large pension funds benefit from important economies of scale for their operating costs [see e.g., Bikker and De Dreu (2009); Dyck and Pomorski (2011); Bikker, Steenbeek, and Torracchi (2012); Bikker (2017)]. Especially for administrative costs, Bikker, Steenbeek, and Torracchi (2012) provide strong evidence that there are still worldwide unused economies of scale. This is even true for pension funds in countries as the U.S. and Netherlands with already large pension funds, a professionalized system, and optimized costs levels. Following these authors, consolidation should increase the cost-efficiency of worldwide pension funds and strengthen their long-term performance. Indeed, as shown by Dyck and Pomorski (2011), "bigger is better" for the investment returns of pension funds.

Fund size may also directly impact the effectiveness of pension boards[36]. Foremost, as argued by Stewart and Yermo (2008), means and resources from scale economies could be dedicated to more investment in the internal governance of pension funds. This includes for instance a complete and detailed training for trustees in order to ensure that they have the sufficient expertise in investments to manage pension assets. Larger pension funds also usually have preferential access and bargaining power with external investment experts [see e.g., Harper (2008a)]. At some point, pension funds become large enough

[36] For corporations, Lehn, Patro, and Zhao (2009) and Boone, Field, Karpoff, and Raheja (2007) provide evidence that firm size is an important determinant of board structure. They show that large firms have larger and more independent boards. However, the rationale is different and not directly applicable to pension funds.

to be internally managed by a full-time internal manager and an in-house team [see e.g., Ambachtsheer, Capelle, and Scheibelhut (1998)] as well as to attract and employ the best talents and most competent staff [see e.g., Clark (2004)][37]. Finally, with more affiliated employers and employees, they have a largest pool of potentially good candidates to sit on their board [see e.g., Stewart and Yermo (2008)]. Therefore, small pension funds that grow or consolidate to obtain a sufficient scale are expected to invest in the desirable attributes of board effectiveness.

3.2.3. Pension fund structure characteristics

Several structure characteristics originally shaping the organisation of pension funds may also drive the level of board effectiveness. First, public (vs. private) pension funds usually involve more agents in the decisions process and very often directly on board seats. However, politicians and officials are external to plans with no direct stake and may have shorter term goals with policy matters. This should translate in additional conflicts of interests and issues of representativeness towards plan beneficiaries' best interests. Therefore, public pension funds are projected to have less effective boards[38]. Second, pension funds offering defined-benefits (vs. defined-contributions) plans are expected to be related with stronger governance as such arrangement guarantees benefits and appears to protect better plan beneficiaries [see e.g., McCarthy and Miles (2013); Besley and Prat (2003)]. However, this distinction is sensitive to the country under study. Particularly in Switzerland, it should be of less relevance as pure defined-contributions plans do not exist and are rather embedded with minimum guarantees established by the Law on Occupational Old-age, Survivors, and Disability Pension Plans (LPP) [see e.g., Bütler (2014); Bütler and Ruesch (2007); Gerber and Weber (2007); Queisser and Vittas (2000)][39].

Third, single-employer (vs. multi-employer) pension funds are more dependent on the one and only sponsoring employer which might lower their board effectiveness. As the employer may have different incentives, sufficient weight to employees in pension boards is important in order to prevent conflicts of interest [see e.g., Hess and Impavido (2004); Harper (2008a); Harper (2008b)]. Fourth, pension funds using reinsurance products (vs. autonomous) have a part or the totality of their risks covered by an insurance company which create additional conflicts and costs. In addition, autonomous pension funds are expected to exercise sufficient vigilance and care as well as have the proper competence to manage and bear all

[37] This point has implications for the costs and performance of pension funds. For example, Dyck and Pomorski (2011) show that large pension funds managed internally cost at least three times less than the ones externalizing their asset management and that internal management is the main identified determinant of the outperformance of the largest pension funds.

[38] Dyck and Pomorski (2011) also study the impact of better-governed pension funds on economies of scale. To measure strong governance, the authors simply proxy for private pension funds (by assuming that public ones are subject to weaker governance) and show that it is related with higher scale economies.

[39] For more discussion on this point and the structure characteristics of Swiss pension funds in general, please refer to Chapter 1 of this thesis.

these risks. Finally, internal (vs. external) management of both administration and investments generally involves a more committed internal manager and team for the daily operations. It might also be associated with reduced conflicts and costs [see e.g., Dyck and Pomorski (2011)]. In opposition, support from external investment experts may add professionalism and expertise in pension boards. The net effect on board effectiveness is thus of empirical matter.

3.3. The dataset of Swiss pension funds

3.3.1. Data collection and final sample

Worldwide empirical research on pension fund governance and board effectiveness is scarce due to a lack of data accessibility. Complete and objective information on pension funds is usually not publicly available. In Switzerland, the information contained in pension fund annual reports and other fillings are not necessarily available online. Instead, Swiss pension funds have to report to regional supervision authorities. Following an exclusive access, I collect pension fund data directly from the As-So, the supervision authority that covers the cantons of Vaud, Valais, Neuchatel, and Jura[40]. All data are manually gathered from the paper files that the pension funds under their supervision send them. Specifically, these include (1) the audited annual reports under Swiss GAAP RPC 26 (balance sheet, income statement, and notes to the accounts), (2) the foundation statutes (or laws for public pension funds), and (3) the internal rules regarding the organisation and investments.

I start by collecting the list of all pension funds under the supervision of the As-So and a set of individual variables including board governance features for the period 2010-2012. Collecting information over a three-year period helps to minimize errors during the data collection process and as such increases data quality. Pension funds under liquidation within LPP art. 53c are excluded from the sample since the reported numbers can be misleading according to the exact procedure followed. Accordingly, a fund-year observation is not collected if the variable “total assets” or “total beneficiaries” is equal to zero. The full sample contains 210 unique pension funds that are registered to follow the minimum requirements settled in the Swiss law [see LPP art. 48-1 and OPP1 art. 3-2-a] and that were active from 2010 to 2012, i.e. with audited annual reports for at least one of these years. Including all the pension funds that were active during the period 2010-2012 guarantees that there is no survivorship bias as even the pension funds that have been liquidated during that time period are included at the beginning of the sample period, before the start of the liquidation procedure. In the end, the final sample represents a significant unbalanced

[40] For the purpose of data collection and information sharing, a collaboration agreement with the As-So (Autorité de Surveillance LPP et des fondations de Suisse Occidentale) was settled in July 2013 in Lausanne.

panel dataset of 614 fund-year observations[41]. All data collected from the various files include the pension fund and governance variables used in this study, but also performance, costs, and asset allocation information for further research. The variables of this study are listed and defined in Appendix 3.1.[42]

3.3.2. Descriptive statistics of Swiss pension funds

Table 3.1 presents summary statistics of the Swiss pension funds included in the sample. This shows how diverse the Swiss pension fund landscape is with pension funds managing less than CHF 100,000 in assets to almost CHF 8 billion and an equally-weighted mean of about CHF 300 million. On average, pension funds are fully funded with an assets-weighted mean coverage ratio of 103.46% for private pension funds, while some are still underfunded. These include mainly 11 public pension funds with an average of 68.80% due to the preferential funding treatment granted by the Swiss law [see LPP art. 72a ss][43]. To value pension liabilities, the technical rate oscillates between 4.5% and 2% during the period under study. For 2012, the average technical rate disclosed by pension funds is of 3.44% (not reported), which is slightly below the national reference rate set for this year at 3.5% [see DTA 4 (2015) of the Swiss Chamber of Pension Actuaries (CSEP/SKPE)]. It is also important to note that the funding level and related total of the balance sheet are sensitive to the year under study, as in 2012 when pension funds significantly increased their assets under management during the year.

[Table 3.1: Summary statistics of pension fund variables]

Furthermore, I can observe from Table 3.1 that the Swiss pension funds under study are on average 39 years old and thus the majority of them were founded before the enactment of the LPP in 1985. Specifically, for this sample, most pension funds (64%) and their assets (67%) are located in the canton of VD with relatively facilitated access to financial services. I can also give support to a consolidation phenomenon in Switzerland. Indeed, 7.65% of the included Swiss pension funds have a liquidation procedure in progress or have planned to liquidate in a foreseeable future. These include mainly very small pension funds as this number drops to 0.46% when weighting over total assets. Moreover, the number of affiliated employers, pension plans, and participating beneficiaries differs a lot across entities. Some pension funds have up to 3,888 different employers and offer 15 pension plans, while others are only

[41] Two other points regarding the sample selection deserve to be mentioned. First, the sample does not include the pension funds that have been liquidated before the end of 2012. This means that some pension funds with reports in 2010 and 2011 are not included in the sample. It is a minor concern as it represents less than 10 pension funds. Second, only the pension funds that have presented all their files in French are included in the sample. Four pension funds with a presentation in German have been eliminated accordingly.

[42] Note that this dataset of Swiss pension funds is part of a larger and joint project with Carolina Salva.

[43] As alleged in Table 3.1, information on whether public pension funds follow a total or partial funding regime is not available in the dataset and can thus not be described further here.

composed of active employees or passive pensioners. The number of beneficiaries can thus vary from 1 to 76,687 with an equally-weighted mean of 2,455 beneficiaries. In relative terms, there are at the median about 4 employees for one pensioner to sustain a Swiss pension fund. I call this measure “beneficiaries ratio”. Additionally, Swiss pension funds hold at the median about 2 times more capital of employees than capital of pensioners at their immediate disposal for investments.

With a sample of about 200 pension funds that jointly manage more than CHF 61 billion in 2012, this study covers about 10% of all Swiss pension funds and 9% of the pension fund assets under management in Switzerland [see OFS (2014)]. Therefore, a potential concern could be that the sample is biased towards specific location characteristics as culture and language. To lessen this concern, I show, in Table 3.2, that my sample is representative of the Swiss pension market in terms of structure characteristics and fund size. In the full sample, 95% are private entities (vs. public), 15% offer defined-benefits plans (vs. defined-contributions), 20% have a multi-employer form (vs. single-employer), 14% are autonomous in hedging their risks (vs. reinsurance), and 21% and 25%, respectively, manage their administration and investments internally (vs. external). When comparing the sample in 2012 with the complete universe of Swiss pension funds surveyed by the OFS (2014), I see that proportions regarding the legal form, plan type, and hedging type are similar. Nonetheless, it appears that the sample is biased towards single-employer pension funds. More importantly, my sample is unbiased towards fund size, as measured by total assets. Indeed, in 2012, the average pension fund manages CHF 314 million which is almost identical to the CHF 325 million reported by the OFS (2014).

[Table 3.2: Comparison of pension fund structure characteristics]

To my knowledge, there are only two studies that evaluate the governance of pension funds particularly in Switzerland. Using surveys, Ammann and Zingg (2010) and Ammann and Ehmann (2017) investigate empirically the governance quality of Swiss pension funds and its relation with investment performance. In comparison, as shown in Table 3.2, my sample includes a larger number of pension funds (210 vs. 96 and 139) and is not titled towards large public defined-benefits pension funds. On the other hand, it covers less pension fund assets (about CHF 61 billion vs. 194 and 286) and is thus less representative of the whole Swiss universe in that matter. By specifically including the smallest Swiss pension funds, my dataset enables me to account for the wide dispersion across Swiss pension funds in terms of fund size. This spectrum of small pension funds is often not studied in previous studies but is important if we want to get the full picture and a better understanding of the governance and board effectiveness of pension funds in Switzerland.

Finally, three limitations are embedded with this specific dataset of Swiss pension funds. First, the sample remains small and as such restricts the empirical design and tests to be implemented. In particular,

it remains limited in time-series by only including three years as well as by the number of pension funds given their variation in structure characteristics. Second, the sample period of 2010-2012 coincides with a structural reform in Switzerland affecting Swiss pension fund organisation, supervision, and transparency. This may influence the results of the analysis. Third, the information contained in my sample remains free of any subjectivity and positive selection bias as with targeted surveys. However, it is constrained by the amount and type of information disclosed in Swiss pension fund files, their transparency, and degree of details. This may also influence the results as well as the measurement of board effectiveness in Swiss pension funds.

3.4. The measure of board effectiveness

3.4.1. The approach

For this study, I design a new measure of pension board effectiveness. I aim to proxy for aspects of the organisation and functioning of pension boards that are consistent with best-practices governance standards and the best interests of plan beneficiaries. As an optimal board cannot be defined specifically for each pension fund, I rather focus on a set of best-practices attributes that are generally accepted as good governance for different kinds of pension funds and for which each attribute belongs to one specific dimension of board effectiveness.

I build governance indices capturing pension board effectiveness and its three key dimensions, namely integrity, commitment, and competence. The methodology applied to construct the indices follows the idea and spirit of the pioneer and widely-used corporate governance indices from Gompers, Ishii, and Metrick (2003) as well as Bebchuk, Cohen, and Ferrell (2009). I construct indices despite the usual shortcomings advanced in the corporate governance literature [see e.g., Bhagat, Bolton, and Romano (2008)]. Although such indices are imperfect instruments, they have the advantages to provide a synthetic view of the multi-dimensional nature of governance considerations and to provide a simple measure to conduct empirical tests. With that measure, I can thus determine empirically what drives and shapes strong pension boards along its different dimensions. Moreover, this methodology is comparable to previous integrated measures of pension fund governance as developed by Ammann and Zingg (2010) and Ammann and Ehmann (2017) in Switzerland, although they differ in their content and classification. As such, my measure may also bring additional governance insights for Swiss pension funds.

With a new dataset of Swiss pension funds, I cannot directly replicate measures from previous empirical studies and in particular the ones of Ammann and Zingg (2010) and Ammann and Ehmann (2017). Instead, I adopt the following approach. To identify desirable attributes, I start by listing the governance characteristics used and investigated in previous empirical work on pension funds that have received the

most attention in the literature. Then, I apply two filters to this list. First, as constrained by my dataset, I keep the variables applicable to Switzerland with respect to the pension funds' institutional environment. For instance, the question of the proportion of employees' representatives in pension boards studied in other countries is less relevant in Switzerland due to the legal requirement of equal representation between the employees and employer [see LPP art. 51-1]. This measure is thus developed specifically for Switzerland and directly applicable to Swiss pension funds.

Second, I remove the variables not available in the reported files of Swiss pension funds or that cannot be collected in a consistent and reliable manner. Compared to surveys, focusing on what is available and collectable may facilitate replication for further research. However, this approach significantly reduces the number of variables and in particular their degree of details. As an example, while Ammann and Zingg (2010) and Ammann and Ehmann (2017) can ask if board financial compensation is linked to performance, I collect whether the board receives any indemnity for attending board meetings. In the end, I identify 24 quantifiable desirable governance attributes classified in each of the three dimensions of board effectiveness. They are described in details in the next Sub-section. The list and classification are summarized in Figure 3.1 and the exact definitions are given in Appendix 3.1.

[Figure 3.1: Board effectiveness and its desirable attributes]

3.4.2. Dimensions and desirable attributes

Pension board effectiveness embraces three key dimensions. First, *integrity* in boards should prevent any opportunistic behavior as well as conflicts of interests. Second, active *commitment* should ensure that trustees devote enough time and effort to their fiduciary duty and responsibility. Third, board *competence* in investments should guarantee a sufficient expertise and detailed framework to manage pension assets. For each dimension, specific solutions and desirable attributes may exist and be implemented by pension funds to strengthen their overall board effectiveness[44].

In order to ensure integrity, trustees firstly can and should comply with codes of best-practices. Such codes usually include aspects related with the proper conduct and ethical behavior but also disclosure practices of conflicts of interests. For that purpose, some countries have established legal and regulatory requirements and/or have elaborated their own code such as the ASIP charter and directive (2011) in Switzerland. Elements linked to the representativeness of trustees could also secure that the board acts towards plan beneficiaries' best interests. With a direct financial interest, political independence, and by

[44] For more details on each of these dimensions, please refer to the review of the main agency problems in pension boards in Chapter 2 of this thesis.

still being professionally active, employees-trustees are the best candidates to prevent any conflict of interest [see e.g., Hess and Impavido (2004); Harper (2008a); Harper (2008b)]. Therefore, sufficient weight in pension boards should be granted to employees with a fair election procedure and an effective representation power. For example, an equal representation of the employees and employer as legally required in Switzerland [see LPP art. 51-1] could ensure that beneficiaries have a seat and voice as well as a balance of the diverging interests. However, such a rule can sometimes be cosmetic and employees can feel the pressure or stress of losing their job when negotiating and taking decisions alongside with the employer. A chairman position might help to reduce that fear by giving more power to the employees rather than to the employer. Additionally, external trustees with no direct stake in pension plans such as the internal manager or politicians should be avoided.

Furthermore, to promote the commitment and motivation of trustees, I could identify two solutions. First, appropriate compensation is one of the most obvious incentives but others may as well ultimately apply. For instance, an internal manager should take care of daily operations and avoid board micro-management [see e.g., Ammann and Zingg (2010); Koedijk, Slager, and Bauer (2010); Harper (2008b); Ambachtsheer, Capelle, and Lum (2008)]. Women representatives should sit on the board since women seem to allocate more effort to monitoring and contribute in making boards more effective [see e.g., Adams and Ferreira (2009); Choudhury (2014)]. A sufficiently long board tenure should be the promise of a minimum moral commitment and care as well as enough information accumulated over the years to take adequate decisions [see e.g., Bonini, Deng, Ferrari, and John (2017)]. Lastly, board meeting frequency should reflect the intensity of board activities and certify that trustees devote sufficient time to it [see e.g. Vafeas (1999)].

Second, a specific organisation for decision-making can also force commitment. With a small board and committees, trustees have no choice but to actively participate in board decisions and might even feel the peer pressure if they fail to do so. Therefore, such organisation should increase the personal commitment of each individual trustee. It might also partly solve two important issues. First, problems related with coordination, consensus building, and inertia in decision-making should be reduced in small and specialized units [see e.g., Clark (2007); De Andres and Vallelado (2008)]. Second, delegation of the decisional controls to committees might help the board to focus on its strategic and monitoring tasks as well as reduce potential micro-management [see e.g., Koedijk, Slager, and Bauer (2010); Harper (2008b); Ambachtsheer, Capelle, and Lum (2008)]. In particular, a dedicated investment committee should help the board to coordinate all the parties involved with the investment process and take quicker investment decisions.

According to the last dimension of competence, all trustees should be elected from a procedure based on their expertise in addition of the representation criteria. In practice, a sufficient expertise in investments could also be guaranteed with a basic and continuous training for the trustees as well as the availability of external investment experts to support the board decisions. Moreover, a clear framework for the investment process is necessary for trustees to actually take decisions. In that matter, an investment policy stating the strategy and beliefs is cornerstone [see e.g., Carmichael and Palacios (2004); Koedijk, Slager, and Bauer (2010)]. Best-practices also consistently recommend detailed investment objectives for the asset allocation, specific and global benchmarks, a risk policy, and an asset-liability management (ALM) study for the strategy. In the end, both suitable expertise and framework should help to foster board competence regarding investments decisions.

In comparison with previous empirical studies on pension fund governance in Switzerland, 18 out of these 24 attributes represent a subset of the index of governance quality developed since Ammann and Zingg (2010). Although focusing on Swiss pension fund files may decrease the level of accuracy of the collected attributes compared to designed surveys, it has the advantage of being applicable for different kinds of pension funds. For example, for some attributes as compensation, looking at any form of indemnity may be less restrictive than performance-linked financial compensation. This is especially important for small pension funds in Switzerland in which this question may not apply. However, despite being generally less restrictive on the definitions of the attributes, I cannot exclude that some of them might not completely fit the needs of the smallest pension funds. The remaining 6 attributes not included in the former Swiss studies add elements of board structure and representativeness due to their importance in the previous literature. As relevant for Swiss pension boards, I add, for instance, equal representation, women representatives, and board tenure.

In terms of content, the indices of Ammann and Zingg (2010) and Ammann and Ehmann (2017) comprise many other attributes not studied here and included in my measure. These are mainly related with detailed target settings, management objectives, and monitoring. They also incorporate directly elements related with the transparency and disclosed information of Swiss pension funds. As a last point, the index of Ammann and Ehmann (2017) contains comprehensive aspects of the investment process and in particular risk management. While these authors dedicate an entire sub-index to this question, I only have one attribute assessing whether the pension board has developed any type of risk policy, regardless of the types of risks monitored.

3.4.3. Construction of governance indices

To build the governance indices related with board effectiveness and its different dimensions, I apply the following methodology. For a matter of aggregation, the collected board governance features are

translated into the 24 desirable attributes meeting best-practices criteria. As such, each attribute is equal to one if the pension fund complies with best-practices, and zero otherwise. When a board governance feature is not mentioned, meaning that the information is missing in the files, the attribute is translated as if the best-practices criteria was not met. For example, to evaluate whether a pension fund offers a training program to its trustees, I look for either an explicit mention of training in the fillings or whether there is a non-null line in the income statement accounting for training expenses. Therefore, I cannot guarantee that a non-disclosure means that there is no implemented training for the trustees in practice. As such, my measure also captures indirectly for the level of transparency and disclosed information in Swiss pension fund files. As shown by Ammann, Oesch, and Schmid (2011), the valuation effect of governance indices should increase when missing values are treated as zero in the index construction. On the other hand, this construction implies that any uncover association with the governance indices may be due to governance considerations but also transparency aspects. These two elements cannot be clearly dissociated and this may influence the results from the analysis and their interpretation.

Then, assuming that all attributes matter equally and complement each other, the 24 attributes are aggregated into an additive equally-weighted index and scaled to one. I call this general index "effectiveness". Following this construction, a higher level of "effectiveness" thus proxies for a superior level of governance associated with a more effective pension board. To capture the different dimensions, similar governance indices are constructed for the three key dimensions (namely "integrity", "commitment", and "competence") as well as the six potential solutions to strengthen them (namely "compliance", "representativeness", "incentives", "organisation", "expertise", and "framework"). Each sub-index includes the attributes classified in their respective dimension and solution.

Further, to analyse separately the governance attributes which are legally binding from the ones which can be complied on a voluntary basis, I construct two additional indices named "legally binding" and "voluntary compliance". I split the general index "effectiveness" in two parts and identify seven out of the 24 attributes as legally binding provisions for pension funds in Switzerland. In details, LPP art. 51 on joint management explicitly states that "election procedure available" (3) and "equal representation" (4) are the basis of the Swiss militia system. Then, the tasks of the board given in LPP art. 51a list, among others, the attributes "compensation for attending" (9), "training of the trustees" (18), "investment policy available" (20), and "ALM study for the strategy" (24). Finally, "own code of best-practices" (1) is tied with the requirements given by LPP art. 51b, LPP art. 51c, and OPP2 art. 48f-l. Other attributes are as well mentioned or recommended in the Swiss law but are not considered as binding ones and thus not included.

An equal weighting scheme to construct indices may seem an arbitrary choice although it is common practice in the corporate governance literature[45]. To lessen this concern, some studies have taken an additional approach to the aggregation of a large number of variables called principal component analysis [see e.g., Ammann, Oesch, and Schmid (2011); Boone, Field, Karpoff, and Raheja (2007); Larcker, Richardson, and Tuna (2007)]. This alternative approach has also been performed to reduce the initial number of variables and understand better the dimensionality of the sample. Following this statistical procedure, the first principal component is a linear combination of the initial variables that may explain the largest possible variation in the dataset. The different loadings can then be used to construct an alternative index set to be equal to the first principal component [see e.g., Ammann, Oesch, and Schmid (2011)].

I conduct a principal component analysis on all 24 attributes included in my dataset. The results can be visualized from the scree plot of Figure 3.2 which shows the associated eigenvalues to the principal components. Following either the scree plot or the Kaiser criterion[46], 10 principal components should be selected. Moreover, the extracted 10 principal components can explain 65.83% of the variation, while the first one only explains 13.83%. Overall, these results restrict me from constructing an alternative index with this approach but they confirm that there is significant variation in the initial dataset of all the attributes to be aggregated into an index[47].

[Figure 3.2: Scree plot from the principal component analysis]

3.4.4. Descriptive statistics of Swiss pension boards

In the sample, the proportions of pension funds meeting each of the governance attributes are shown in Table 3.3. Primarily, Swiss pension funds appear to comply with codes of best-practices by either following the legal and regulatory requirements (73%) and/or the equivalent ASIP charter and directive (21%). These numbers increased from respectively 70% to 78% and 19% to 24% during the sample period of 2010-2012, probably as a result of the structural reform of the Swiss occupational pension scheme. In terms of representativeness, some attributes do not seem to be met by a majority of the Swiss pension funds. These include an "election procedure available" (42%), "chairman employees representative" (17%), and "chairmanship alternation" (23%). On the other hand, the equal representation between the employees and employer as stated in the Swiss law is almost always respected (90%) and most boards do not provide a seat for the internal manager (76%) and external trustees (90%). Further, Swiss pension

[45] Another concern may come from the assumption of complementarity when aggregating into indices. In unreported results, I compute the pairwise correlations between the sub-indices and see that there are all positively but not significantly related. There is one exception with a significant but still positive coefficient of correlation of 0.34 between "integrity" and "competence" (and correspondingly of 0.37 between "compliance" and "framework").
[46] According to the Kaiser criterion, all principal components with eigenvalues larger than one should be selected.
[47] Note that this measure of board effectiveness is part of a larger and joint project with Carolina Salva.

boards usually have women representatives (64%), as well as sufficient board tenure (94%) and board meetings (80%).

[Table 3.3: Summary statistics of governance attributes]

Remarkably, these statistics also show five interesting facts in Switzerland. First, 22% of the pension funds offer any kind of financial compensation to trustees for attending board meetings. Second, training of the trustees is only mentioned by 56% of the pension funds, and this despite the minor 1% having an election procedure based on expertise. Instead, most of them seem to have access to external investment experts (87%). Third, most pension boards do not have the recommended organisation. It appears that 64% have a small number of trustees, 43% have committees (19% in small pension funds), and 41% have in particular a separated investment committee (18% in small pension funds). The non-conformity to a small board size also seems to be more important for large pension funds (40%) than for small pension funds (89%), which can be explained by the need of representation of a larger number of participants. Fourth, 66% of the pension funds have an internal manager for the administration and/or the investments. This means that in one-third of the cases, the board still has to run the daily administration and investments of the pension fund by itself. Fifth and last, the majority of pension boards seems to lack to clearly establish a framework to take investment decisions including investment benchmarks (41%), a risk policy (12%), and an ALM study for the strategy (24%). On the other hand, most of them have at least defined an investment policy (94%) as well as investment objectives (81%) for their asset allocation[48].

By looking at the distribution of the governance indices, it appears that the level of effectiveness of Swiss pension boards is also heterogeneous. As discussed by Adams, Hermalin, and Weisbach (2010), as Swiss pension funds are various in their structure characteristics and fund size, then it is expected to have heterogeneity in the solutions chosen in terms of governance. In Table 3.4, summary statistics confirm large differences across Swiss pension funds, with the general index “effectiveness” ranging from 21% to 83%, with an average of 54%, and most sub-indices having values from 0% to 100%. More details about the distribution of the main indices are given in Appendix 3.2. Additionally, the governance indices seem to be related with fund size. Large pension funds are in general associated with higher levels of board effectiveness (59% vs. 49% for small pension funds) and this statement holds for its different dimensions.

[48] In unreported results, the pairwise correlations between the 24 attributes show four other insights. First, by construction, the attributes “manager not a trustee” and “existence of a manager” are negatively correlated (-0.41). Second, when a structure of committees exists, it almost surely includes an investment committee (0.95). Third, board size (“small number of trustees”) is as expected negatively correlated with “existence of committees” and “existence of an investment committee” (-0.52 and -0.50). Fourth, the coefficient of correlation between the two governance codes is not significant (0.25), which illustrates that one of the two solutions is usually chosen by Swiss pension funds.

However, despite a slight improvement of the indices levels over the three-year period under study, the variation across time for a single pension fund remains low.

[Table 3.4: Summary statistics of governance indices]

From Table 3.4, I can also analyse the separated effect of "legally binding" and "voluntary compliance" attributes on the level of board effectiveness. Regarding the index "voluntary compliance", pension funds seem to follow best-practices beyond provisions given in the Swiss law, with a mean of 53%. Therefore, their boards seem to be willing to invest in high standards of governance, despite their associated costs. However, the level of the index "legally binding" is not high. On average, the pension funds in the sample comply at 57% with the identified Swiss legally binding provisions. As such important law violations are unlikely to exist in practice, these results are puzzling.

Two explanations for this apparent non-compliance to legal provisions by Swiss pension funds may be advanced. First, five out of the seven provisions that I identified as legally binding are in fact the consequences of the 2010-2012 structural reform in Switzerland which are not in application at the beginning of my similar sample period[49]. Although all of them should be effective for the exercise year of 2012, implementation may take time in practice and explain why some Swiss pension funds do not comply with them. This timing issue due to the different speeds of adjustment to legal changes is an important limitation related to the sample period of my dataset. Second, as highlighted previously, these apparent law violations may simply be the result of the data collection process linked to the transparency in Swiss pension fund files. This explanation due to measurement is probably the one behind the attribute "election procedure available" already in application before the Swiss structural reform. Indeed, it is not because a Swiss pension fund does not document one that it does not implement it in practice. In the end, timing and transparency are most likely to explain these results and prevent me from assessing whether Swiss pension funds comply or not, and today, with Swiss legally binding provisions. Therefore, I cannot analyse here the effect of Swiss legal constraints as a relevant source of pension board distortions[50].

[49] In details, the provision (1) own code of best-practices is in application since 08.2011, while the other four provisions (9) compensation for attending, (18) training of the trustees, (20) investment policy available, and (24) ALM study for the strategy are in application since 01.2012. The remaining two provisions (3) election procedure available and (4) equal representation are both in application since 04.2004.

[50] Note also that the apparent compliance to legal provisions by Swiss pension funds improved during the sample period of 2010-2012. This can be explained either as it coincides with the implementation time following the Swiss structural reform or by the data collection process as for these specific attributes, when the information was found in any reported file, it was assumed to hold thereafter. There is the exception of the information to build the attribute "equal representation" which was found in the annual reports and can thus be assessed each year based on the turnover and vacancy of board seats.

As conclusion, these first results remind a central limitation associated with this measure of board effectiveness to be used to analyse its determinants. Transparency aspects cannot be clearly dissociated from governance considerations. Furthermore, as for previous Swiss studies, my measure remains applicable to Swiss pension funds and may not generalize to other countries. Finally, as for all previous empirical studies, I cannot exclude that what appears to be a poor level of board effectiveness might actually be the result of an optimal choice for some pension funds [see e.g., Adams, Hermalin, and Weisbach (2010)].

3.5. Analysis of the determinants of board effectiveness

In this Section, I empirically assess the potential sources of the effectiveness of pension boards in Switzerland. For that purpose, I analyse a set of pension fund variables including fund size and structure characteristics on the level and dimensions of my measure of board effectiveness. Other variables which may generally influence the governance framework of Swiss pension funds are also tested. My panel dataset of Swiss pension funds enables me to account for the wide dispersion across pension funds, both in terms of fund and governance aspects. However, due to the low time-variation of governance indices, I present univariate tests and multivariate regressions on the mean (or median for dummies) over the period 2012-2010[51]. By looking at the cross-sectional differences, it will also allow me to study directly what type of pension fund is generally associated with a more effective board and thus a superior level of governance.

3.5.1. Univariate tests

The first step of the analysis is to conduct individual and univariate tests on the levels of board effectiveness and its dimensions. To perform the tests, the variables under study are split in two groups based on the median (or directly used as such for the dummies). For each variable, the results of the statistical tests in the mean difference between the two groups are presented in Table 3.5 for "effectiveness" and in Table 3.6 for "integrity", "commitment", and "competence". Qualitatively similar results are given for two-group mean-comparison tests (t-test) and Wilcoxon rank-sum tests (z-test) which account for potential non-normal distributions. For the t-test, the null hypothesis to be tested is that the means of the two groups are equal while the z-test relaxes the assumption of normality and test whether the distributions of the populations in the two groups are equal.

[Table 3.5: Univariate tests on board effectiveness]

[Table 3.6: Univariate tests on integrity, commitment, and competence]

[51] As robustness test, I also perform the base regressions for each of the three years separately. See Table 3.9 for more details and the results.

Overall, the results highlight the importance of fund size for governance considerations. Swiss pension funds with a higher level of board effectiveness are generally autonomous (60% vs. 53%), manage their administration internally (60% vs. 52%), are large both in terms of assets and beneficiaries (59% vs. 49%), have more active employees (59% vs. 49%), passive pensioners (58% vs. 50%), affiliated employers (58% vs. 50%), pension plans (57% vs. 53%), and did not plan a liquidation procedure (55% vs. 47%). Large pension funds, in terms of assets, beneficiaries, employees, or pensioners, have higher levels of board integrity, commitment, and competence. Pension funds with more affiliated employers are also in general associated with a stronger board across all three dimensions. Moreover, autonomous pension funds managing their administration internally are related with more committed and competent boards.

On the other hand, other variables such as the employer administrative form, management of the investments, foundation age, canton urban location, and variables linked to the liabilities side of the pension fund (coverage ratio, beneficiaries ratio, capital ratio, and technical rate) do not seem to be relevant for my measure of effectiveness of Swiss pension boards. There is one exception. Swiss pension funds managing their investments externally, with a low coverage ratio, and a high technical rate seem to be related with more competent boards. Though, this result could be explained as Swiss pension funds in an underfunding situation might need to hire specific external investment experts and develop a restructuring investment framework, which would artificially increase the level of the index "competence". Further, as expected, I do not observe significant differences between defined-benefits and defined-contributions plans in Switzerland. This result is consistent with the fact that this distinction is of less relevance for Swiss plan beneficiaries due to the minimum guarantees established by the Swiss law.

My findings also show that public pension funds seem to be associated with more effective (60% vs. 54%, although not significant with the z-test) and in particular committed (69% vs. 59%) boards. This result is unexpected and counterintuitive [see e.g., Dyck and Pomorski (2011)]. With more agents involved and political connections at work, it should be that private pension funds act better towards the best interests of their plan beneficiaries. On the other hand, public pension funds are large enough to have the means and resources to invest in costly attributes behind the index "commitment" such as compensation or internal manager. Therefore, public pension funds may appear to have stronger governance simply because there are also usually larger[52]. This idea and the results from the other relevant sources highlighted in the univariate tests raise an important question. What if fund size was actually capturing the whole dispersion in the level of effectiveness of Swiss pension boards?

[52] An alternative explanation for why public pension funds and pension funds with more affiliated employers may have stronger governance is related with marketing. These two types of pension funds particularly need to give a "good" image to respectively the taxpayers and the employers they want to attract. One way to do that is through "good" standards of governance.

As a preliminary answer, I compute and present in Table 3.7 the pairwise Pearson's correlation coefficients between the pension fund variables under analysis. The correlation coefficients show that large pension funds are in general public, autonomous, internally managed for their administration, have more affiliated employers, and a lower coverage ratio. Except for the coverage ratio, these are the same variables that explain the differences in the levels of "effectiveness", "integrity", "commitment", and "competence". By looking at the other pairwise correlations with the coverage ratio, the only significant coefficient is with the legal form. As expected, a pension fund with a low coverage ratio is also most likely to be a public one (as it benefits from a preferential funding treatment in the Swiss law) and thus a larger one. Eventually, as the same variables that explain the levels of board effectiveness and its dimensions seem to also be driven by the size of the pension fund, there is the need to conduct multivariate tests. Fund size might in fact be the main and only determinant.

[Table 3.7: Pairwise correlation coefficients between pension fund variables]

The magnitude of the correlation coefficients between the pension fund variables also raises a multicollinearity issue. In particular, because of significantly high coefficients, I do not include all the variables under study in the model specification for the multivariate regressions. First, to measure fund size, I initially keep "total assets" and exclude "total beneficiaries" (0.688), "active employees" (0.580), and "passive pensioners" (0.929)[53]. Second, the information related with "affiliated employers" (0.483) and "pension plans" (0.456) are by definition redundant with "multi-employer" and thus not included in the base regressions. Moreover, with a mean VIF of 1.35, the sample seems to only suffer from low partial multicollinearity[54]. This appears to be a result of the model specification and is likely to be a common feature outside of this sample.

3.5.2. Multivariate regressions

The second step of the analysis is to perform multivariate regressions on my measure of board effectiveness in order to determine which variables can explain globally the dispersion. Specifically, it will help me to assess if fund size is the overall and single source or if other variables might still be relevant for the levels of board effectiveness and its dimensions. By using cross-sectional OLS regressions, I indeed show that the key explanatory variable is fund size. This suggests that fund size is an important determinant. Table 3.8 presents the estimated regressions with a constant and robust standard errors on the main

[53] In the robustness tests, I also use total beneficiaries as proxy for fund size (instead of total assets) and distinguish between active employees and passive pensioners among beneficiaries. See Table 3.9 for more details and the results.
[54] The variance inflation factor (VIF) test is a post-estimation test for multicollinearity on multivariate regressions estimated with OLS. The result of the test on the base model yields a mean of 1.35 and a maximum of 1.93 for the legal form, which is considered below the critical threshold of 5 or 10.

governance indices[55]. Standard errors are robust as heteroskedasticity-consistent following Huber-White estimation and, for a matter of scale, "total assets" is transformed by taking the natural logarithm[56].

[Table 3.8: Multivariate regressions on governance indices]

As expected, the distinctions private vs. public, multi-employer vs. single-employer, and autonomous vs. reinsurance do not seem to be relevant anymore. The previously found univariate relations are most likely to be captured by fund size. Indeed, the results show that large pension funds managing their administration internally are usually associated with a more effective board. Moreover, fund size is the only variable that can explain the whole dispersion across all three dimensions of board effectiveness. It is even the only significant variable for the estimated regression on the level of "integrity". However, this last claim has to be taken with caution due to a low adjusted R-squared of 2.77%. Note also the large differences in adjusted R-squared along the three dimensions and the significance of the constant. These suggest that there is still a large part of the dispersion that remains unexplained.

These results are consistent with the hypothesis that a sufficient scale provides the economies to invest in attributes increasing the level of board effectiveness as well as to build an in-house team to administrate the pension fund. Moreover, the internal management of the administration seems to be associated with a higher level of "commitment" and not a lower level of "competence". This means that, in Switzerland, and for this dataset and measure, the benefits of administrating the pension fund internally with a committed team seem to outweigh the benefits of external expertise and professionalism. In addition from previous univariate tests, Swiss pension funds which have a lower capital ratio (so more capital of pensioners than capital of employees) seem to be related with more competent boards. This finding is in line with the same hypothesis as a lower capital ratio is usually associated with older and thus automatically larger pension funds.

Finally, an alternative explanation for these results may be related with the construction of the measure of pension board effectiveness and in particular its data collection process. Transparency may as well explain the results. Indeed, I can expect that larger pension funds are also the ones with the resources and incentives to have a better documentation and more disclosed information in their reported files.

[55] I also run similar multivariate regressions on the six solution indices. The results from the estimated regressions show that fund size remains a significant explanatory variable in three out of the six ("compliance", "expertise", and "framework"). However, the adjusted-R squared is in some cases very low and too few attributes are included in the indices to be reliable measures of pension board effectiveness. For the same reason, I do not run any regression on the 24 attributes directly.

[56] For the linear estimation, note that one observation containing only one pensioner among its beneficiaries and thus an excessively high "capital ratio" is omitted. This particular pension fund is facing a liquidation procedure and is liquidated by 2012.

Consistent with previous univariate results, public pension funds also tend to have a more detailed documentation as they are accountable to the taxpayers. Consequently, the alternative explanation of transparency aspects instead of governance considerations cannot be excluded here.

In unreported results, I also estimate similar multivariate regressions on the additional indices "legally binding" and "voluntary compliance". From a theoretical perspective, dissociating the effect of country legal provisions from the ones on which the board has a decisional power and might actually have an influence should strengthen the precision of the results. I would expect the index "voluntary compliance" to be a more reliable measure of pension board effectiveness beyond the legal provisions given by the country. The estimated regression on "voluntary compliance" shows that fund size is again a significant explanatory variable of the voluntary chosen attributes by Swiss pension boards. This result holds either with an estimation on the mean over the period 2012-2010 or in 2012 only, when all legal provisions are in application and effective for Swiss pension funds. However, as shown in my previous descriptive results, the identified Swiss legally binding provisions still suffer from a timing issue of implementation as well as the same transparency concern than the remaining governance attributes. Therefore, I cannot rely on this test to assess whether this distinction is relevant or not, for Switzerland, in practice, and today.

To conclude, several concerns might question the robustness of the results and in particular the importance of fund size for governance considerations. In Table 3.9, using a similar methodology, I present robustness tests including alternative specifications and restricted samples. For each test, the significant explanatory variables of each multivariate regression on the main governance indices are presented with their respective sign[57]. The first row recalls the base result *(1)* and all the tests *(2-11)* are developed in details below.

[Table 3.9: Robustness tests of the multivariate regressions]

(2-3) Due to the relevance of fund size for the results, I also use alternative proxies. First, I use "total beneficiaries" instead of "total assets" in the regressions. The results are qualitatively similar. Second, I distinguish between active and passive beneficiaries by adding "active employees" and "passive pensioners" both in the same regression, instead of "total assets". Despite a high correlation coefficient between these two variables, there are not significant, with the exception of passive pensioners for board competence. This may illustrate that what really matters is fund size in the aggregate and that it is not specifically related with the kind of beneficiaries.

[57] For reasons explained previously, the estimated regressions on the six solution indices, 24 attributes, and additional indices "legally binding" and "voluntary compliance" are not presented in Table 3.9.

(4-5) Due to the high dispersion in size for Swiss pension funds, I split the sample in two groups based on the median of "total assets" and I run the regressions separately for each group. For large pension funds, fund size does not seem to be relevant anymore although the internal management of the administration still significantly explains higher levels of board effectiveness and commitment. On the contrary, fund size is particularly a significant and important explanatory variable for levels of board effectiveness and its dimensions for the smallest pension funds in Switzerland.

(6) Public pension funds have a specific agency setting, benefit from a preferential funding treatment in the Swiss law, and are disproportionally large in comparison with private entities. In particular, the sample includes 11 public pension funds with an assets-weighted mean coverage ratio of 68.80% (vs. 103.46% for private ones) and on average 10 times larger in assets (CHF 1,888 million vs. CHF 186 million for private ones). As this category of pension funds might influence the results, I re-estimate the regressions without the public pension funds. The results remain qualitatively unchanged.

(7) Pension funds planning a liquidation procedure could have anticipated the procedure and as such have influenced the reported numbers of assets and/or beneficiaries. They might also have initially considered this procedure to consolidate due to their relatively small size. Consequently, the regressions are re-estimated without the funds in liquidation procedure. Despite the critical nature of this point, the results are qualitatively similar.

(8) Fund size may endogenously determine the levels of board effectiveness and is dimensions. For instance, as illustrated previously, pension funds with more affiliated employers may invest in their own governance and good standards in order to attract more employers and grow in size. This reverse causality is most likely to exist in multi-employer pension funds as, in Switzerland, single-employer pension funds have their size given as exogenous by the size of the employer. Accordingly, for this test, I exclude multi-employer pension funds in order to assess whether the results hold when focusing on pension funds where fund size seems to be an exogenous determinant. The results remain qualitatively unchanged.

(9-11) As a last test, I also perform the base cross-sectional regressions for each of the three years in the sample separately (instead of an estimation on the mean over the period 2012-2010). For the years under consideration in this study, the main result is unaffected and thus seems to be robust.

3.5.3. Discussion on consolidation

Pension fund governance, its board effectiveness, and transparency seem to be mainly a question of fund size. This is an important finding as it may indicate that an efficient way of improving the organisation and functioning of pension boards in Switzerland and in countries with a similar institutional environment is

through the consolidation of the pension fund industry. In this study, I do not investigate directly this relation or claim that consolidation should be better for pension funds, their funding, and sustainability. I leave that for further research. Rather, by analysing the determinants of pension board effectiveness using the Swiss framework, I empirically show for the first time that it is related with fund size and that it matters beyond other potentially relevant sources. In this Sub-section, I discuss consolidation for Switzerland, as mentioned in previous literature [see e.g., Ammann and Zingg (2010); Ammann and Ehmann (2017); Stewart and Yermo (2008)].

The consolidation of the Swiss pension fund landscape is not something new and is a long-standing phenomenon. Because of the increasing administrative burden and the complexities of the law, regulation, and investments, this process has been started a long time ago. According to the survey of the OFS (2014), the number of Swiss pension funds decreased from 2,935 in 2004 to only 2,073 in 2012 (and even 1,866 in 2014 for the most recent OFS (2016) survey). This means that more than 35% of the Swiss pension funds liquidated during the last decade. Moreover, in my sample, 7.65% of them report at the end of 2012 that they have planned to liquidate in a foreseeable future, including mainly very small pension funds (0.46% by weighting over total assets). Pension experts in Switzerland support that this ongoing consolidation of the landscape is likely to continue[58]. Prof. Ambachtsheer even argues that 20 Swiss pension funds should be enough[59]. Following his Canadian model of governance, large pension funds managed internally should have reduced conflicts of interests and managing costs, as well as ultimately better performance[60].

Based on the recent ORAb (2014)[61] on pension fund activism in Switzerland, larger players should also strengthen the governance of Swiss listed companies. In particular, they should have more voice to actually have a say-on-pay of boards and executives of those corporations. However, previous studies on institutional activism are sceptic about the effectiveness of this control mechanism for U.S. corporations [see e.g., the review of Romano (2001)]. Von Arx and Schäfer (2007) develop a model to show that the dispersion of stock holdings by pension funds might explain the little or no effect of such activism. According to these authors, coalition building would be necessary for any action to actually work, explaining the low occurrence and probability of success in the past. Faccio and Lasfer (2000) also empirically confirm the negligible value added of U.K. pension funds on corporate governance and performance improvements. Overall, previous research emphasizes that it might be easier for pension funds to simply sell the stock and exit the market instead of actively force corporate changes.

[58] See e.g., “Les experts prévoient une forte baisse du nombre de caisses de pension”, Le Temps, 17.11.2016.
[59] See e.g., “Selon le pape de la prévoyance, la Suisse doit réduire à 20 le nombre de caisses de pension”, Le Temps, 21.09.2016.
[60] See e.g., “Les caisses de pension suisses sous-performent et sont mal dirigées”, Le Temps, 14.08.2017.
[61] See ORAb, 2014. Ordonnance contre les rémunérations abusives dans les sociétés anonymes cotées en bourse du 20 novembre 2013. Etat le 1er janvier 2014.

Nevertheless, a strand of the literature shows that large pension funds with reduced conflicts of interests should have a positive impact on firm value [see e.g., Del Guercio and Hawkins (1999); Woidtke (2002)]. Del Guercio and Hawkins (1999) show that large and active U.S. public pension funds can be successful through shareholder proposals. Although these authors find no evidence of agency problems inside public pension funds [see e.g., Romano (1993); Romano (1995)], Woidtke (2002) provide evidence of a negative effect of public pension funds (in comparison with a positive effect of private pension funds) due to conflicts of interests inherent with different objectives than increasing firm value. Therefore, large pension funds with strong governance seem to be better activists for the governance of corporations. Accordingly, I could expect that a consolidation of the Swiss pension fund industry including larger players with high standards of governance to be linked to the success of the ORAb (2014).

As an end point, consolidation may not be beneficial for all plan beneficiaries and protect their best interests. Consolidation also has its drawbacks suggesting that there is not only an optimal board for each pension fund but also an optimal size and scale [see e.g., Bikker (2017)]. For instance, as argued by Andonov, Bauer, and Cremers (2012), larger pension funds tend to invest in more costly investment vehicles such as active mandates and illiquid assets, offsetting the associated benefits for the net investment performance. Large pension funds also usually have higher communication costs and important short-term liquidity needs. Although supervision efficiency is increased with consolidation [see e.g., Queisser and Vittas (2000)], they may face more supervisory pressure from the authorities or scrutiny by the media. Their organisation can become complex and the coordination difficult for the agents involved. Likewise, with too large pension funds, the representation of all participants' interests become impossible. Pension arrangements cannot be tailor-made anymore and each plan beneficiary becomes inevitably anonymous.

3.6. Conclusion

Using a unique dataset of Swiss pension funds and a new measure of pension board effectiveness, I aim to analyse the determinants of effective boards in pension funds. I show that there is heterogeneity in the Swiss pension fund landscape and that fund size is the key explanatory variable of the wide dispersion in the levels of board effectiveness and its dimensions including integrity, commitment, and competence. Large pension funds managing their administration internally seem to be associated with more effective and committed boards by investing in the desirable best-practices attributes. Moreover, fund size matters beyond other potentially relevant sources such as the legal form or plan type and seems to hold on the provisions voluntary chosen by Swiss pension boards. Overall, the results give to some extent support for the consolidation of the pension fund industry in Switzerland and other countries with still small dispersed

pension funds. However, due to the data collection process and associated measurement, I cannot exclude transparency as an alternative explanation to the findings.

The generalization of my results is limited as follows. First, additional empirical tests need to be implemented on extended samples. Such sample includes either more cross-sectional data collected from other regional supervision authorities or a longer time-series of data after the Swiss structural reform. Second, alternative approaches to measure pension board effectiveness, in which transparency reasons can be clearly dissociated, are necessary to validate the findings. Third and last, country matters for the governance and board effectiveness of pension funds. The applicability of my results to other countries thus depends on the specificities of their institutional environment and similarities with the Swiss pension system. Other empirical studies should be conducted and other measures should be developed outside Switzerland.

Ultimately, following this study, further research should focus on whether and why consolidation should be better for pension funds and their plan beneficiaries. In particular, there is the need to determine the optimal pension fund size [see e.g., Bikker (2018)]. More empirical work is also needed to understand to what extent board effectiveness really matters for pension funds. In the following chapter, I aim to test whether it impacts pension fund asset allocation as well as what matters exactly among its different dimensions.

Appendix 3.1: Variables of the study

This table presents all the variables used in this study, including both the pension fund variables (Panel A) and the pension governance variables (Panel B), with their respective definitions and computations. More information about the data collection process of these variables is available upon request.

Panel A: Pension fund variables

Pension fund structure characteristics	**Definitions:**
Legal form – PRIVATE	Legal form of the pension fund is PRIVATE (cooperative society or foundation) vs. PUBLIC (public institution)
Plan type – DEFINED-BENEFITS	Plan type of the pension plans is DEFINED-BENEFITS vs. DEFINED-CONTRIBUTIONS (defined-contributions or hybrid)
Administrative form – MULTI-EMPLOYER	Administrative form of the pension fund is MULTI-EMPLOYER (collective or common) vs. SINGLE-EMPLOYER
Hedging type – AUTONOMOUS	Hedging type of the risks is AUTONOMOUS vs. REINSURANCE (partial or total)
Management administration – INTERNAL ADMIN.	Management of the administration part of the pension fund is INTERNAL ADMIN. vs. EXTERNAL ADMIN. as mentioned in fillings
Management investments – INTERNAL INVEST.	Management of the investments part of the pension fund is INTERNAL INVEST. vs. EXTERNAL INVEST. as mentioned in fillings

Other pension fund variables	**Definitions:**
Total assets (in mio CHF)	Total assets of the pension fund, with the assets/liabilities from collective insurance contracts (in million CHF)
Total beneficiaries	Number of total beneficiaries, computed as active employees plus passive pensioners
Active employees	Number of active employees
Passive pensioners	Number of passive pensioners (retired, disabled, and survivors)
Foundation age	Age of the pension fund, computed from the foundation year
Affiliated employers	Number of affiliated employers or sponsoring companies to the pension fund
Pension plans	Number of pension plans offered by the pension fund as mentioned in fillings
Coverage ratio (in %)	Coverage ratio or technical funding ratio of the pension fund, defined as the pension assets available over the committed pension liabilities (OPP2 art. 44 and annex) (in %)
Beneficiaries ratio	Ratio of active over passive beneficiaries, computed as active employees over passive pensioners (and is equal to active employees if passive pensioners is zero)
Capital ratio	Ratio of active over passive capital, computed as capital of employees (in million CHF) over capital of pensioners (in million CHF) (and is equal to capital of employees if capital of pensioners is zero)
Technical rate (in %)	Applied technical interest rate for valuation of pension liabilities (in %)
Canton urban (dummy)	Canton of location of the pension fund is VD with facilitated access to financial services vs. NE/VS/JU
Liquidation procedure (dummy)	Liquidation procedure of the pension fund is in progress or expected in a foreseeable future

Panel B: Pension governance variables

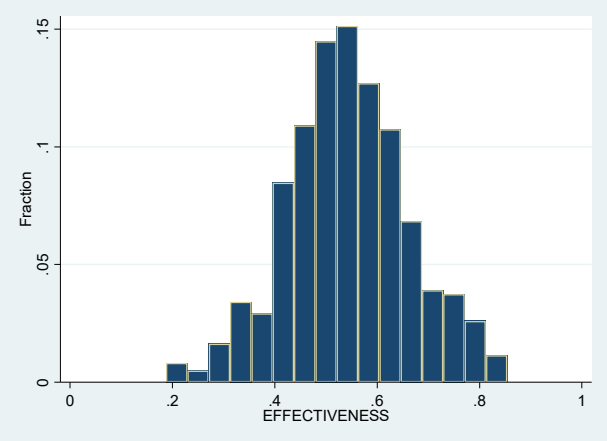
Governance indices	**Computed as sum of governance attributes scaled to 1:**
EFFECTIVENESS	General index, including the 24 governance attributes (1-24)
INTEGRITY	Dimension index, including 8 governance attributes (1-8)
COMMITMENT	Dimension index, including 8 governance attributes (9-16)
COMPETENCE	Dimension index, including 8 governance attributes (17-24)

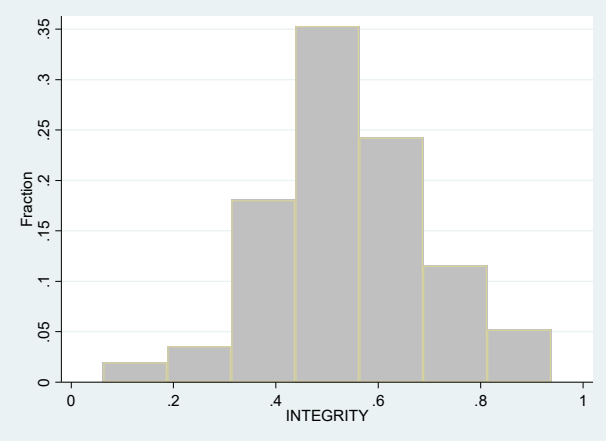
Compliance	Solution index, including 2 governance attributes (1-2)
Representativeness	Solution index, including 6 governance attributes (3-8)
Incentives	Solution index, including 5 governance attributes (9-13)
Organisation	Solution index, including 3 governance attributes (14-16)
Expertise	Solution index, including 3 governance attributes (17-19)
Framework	Solution index, including 5 governance attributes (20-24)
Legally binding	Additional index, including all the governance attributes which are legally binding (1-3-4-9-18-20-24)
Voluntary compliance	Additional index, including all the governance attributes which are not legally binding

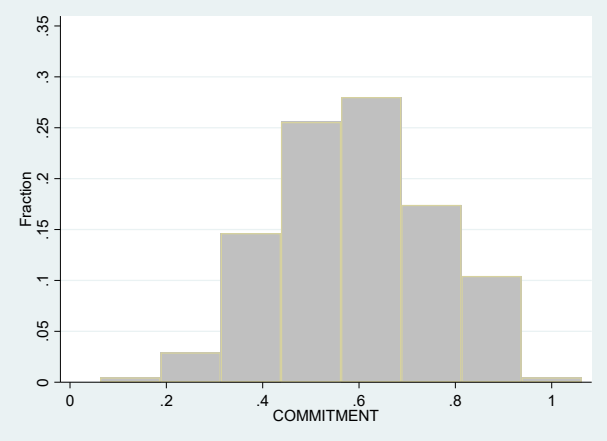
Governance attributes	**Equal to 1 if following conditions apply:**
(1) own code of best-practices	The pension fund has its own code of conduct, ethic, and disclosure practices built on the legal and regulatory requirements of LPP art. 51b, LPP art. 51c, OPP2 art. 48f-l
(2) ASIP charter and directive	The pension fund follows the prevalent ASIP charter and directive (based on duties, material benefits, and conflicts of interests)
(3) election procedure available	The board is constituted according to an election procedure for the selection and nomination of its trustees (LPP art. 51)
(4) equal representation	The number of trustees representing the employer equals the ones of the employees (and/or pensioners) (LPP art. 51-1)
(5) chairman employees representative	The chairman is a representative of the employees
(6) chairmanship alternation	The chairmanship is lead alternately by a representative of the employees and the employer (as recommended in LPP art. 51-3)
(7) manager not a trustee	The internal manager is not a trustee (or the attribute is equal to one if existence of a manager is equal to zero)
(8) no external trustees	The percentage of trustees in the board representing industry professionals, the state for public pension funds, or the founding sponsoring company for multi-employer pension funds is zero (as discussed in OPP2 art. 48h)
(9) compensation for attending	The trustees are compensated with at least an indemnity for attending board meetings as mentioned in fillings (LPP art. 51a-4)
(10) existence of a manager	An internal manager is available for the administration and/or investments of the pension fund
(11) women representatives	The percentage of women in the board is greater than zero
(12) board tenure at least three years	The minimum board tenure is three years
(13) board meets at least once per year	The minimum number of board meetings per year is one (to validate the annual financial statements)
(14) small number of trustees	The number of trustees is below or equal to six (with a lower bound of four following OPP2 art. 33)
(15) existence of committees	The number of committees to support the board of trustees is greater than one (as recommended in LPP art. 51a-3)
(16) existence of an investment committee	A separated investment committee exists
(17) election procedure based on expertise	The board election procedure is based on the expertise and competence of the candidates and trustees
(18) training of the trustees	A basic and continuous training is offered by the pension fund to the trustees as mentioned in fillings (LPP art. 51a-2-i)
(19) investment experts available	External investments experts are available to the pension fund (managers, consultants, specialists)
(20) investment policy available	An investment policy is mentioned in the financial statements (or there is a reference to the rules of investments) (LPP art. 51a-2-m and based on LPP art. 71-1)
(21) investment objectives defined	Investment objectives related to the strategic and tactical asset allocation are defined
(22) investment benchmarks defined	Investment benchmarks for each asset class or a global reference index for the portfolio are defined
(23) risk policy available	A risk policy is mentioned in the financial statements (or in the rules of investments)
(24) ALM study for the strategy	An ALM study to control the matching of the assets with the liabilities is used as basis for the investment policy (LPP art. 51a-2-n)

Appendix 3.2: Distribution of the main governance indices

These figures present the histograms of the general index “effectiveness” and the dimension indices “integrity”, “commitment”, and “competence” on the full sample (2012-2010).







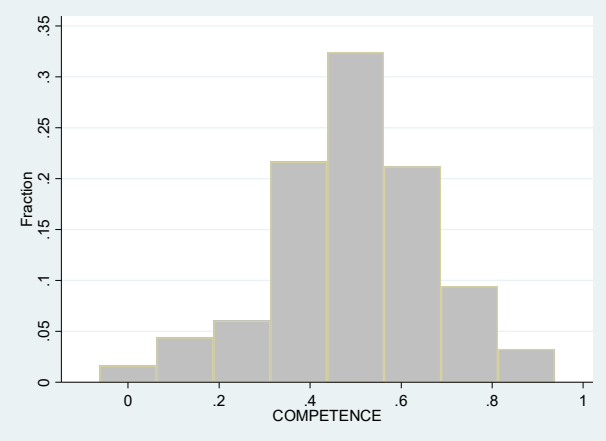


Figure 3.1.
Board effectiveness and its desirable attributes.
Source: Author's own illustration

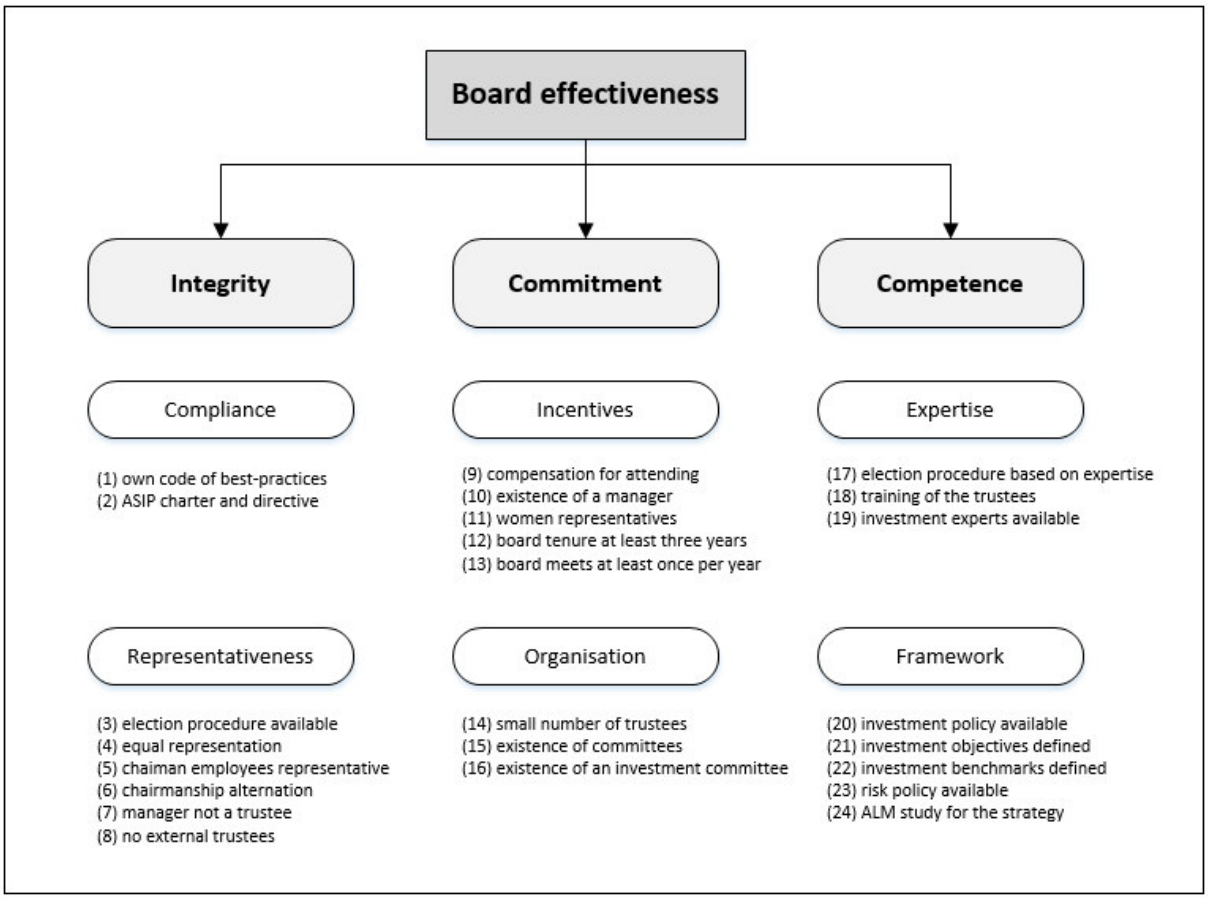


Figure 3.2.

Scree plot from the principal component analysis.

This figure presents the scree plot of the eigenvalues from the principal component analysis on the 24 governance attributes included in the general index "effectiveness" on the full sample (2012-2010). As a matter of interpretation, the number of principal components associated to the eigenvalues must be retained above the scree, i.e. before the slope becomes flat. Alternatively, with the Kaiser criterion, all principal components with eigenvalues larger than one should be selected.

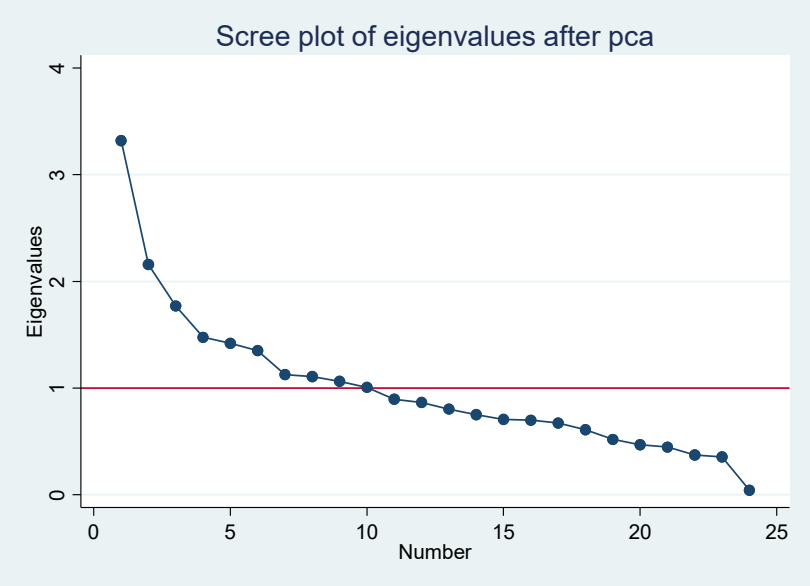


Table 3.1.

Summary statistics of pension fund variables.

This table presents summary statistics of pension fund variables for the full sample (2012-2010) and each year for total assets. Means are also computed by weighting over total assets. Summary statistics for the coverage ratio are given separately for private pension funds and for public ones due to different legal funding treatment. Information on whether public pension funds follow a total or partial funding regime is not available. The variables are detailed in Appendix 3.1.

	Full sample (2012-2010)						
	Obs.	Sd	Min	Median	Mean	Mean (assets-weighted)	Max
Total assets (in mio CHF)	614	802.0612	0.09	43.27	281.52	2562.89	7846.39
In 2012	*195*	*861.4167*	*0.09*	*48.60*	*313.83*	*2666.15*	*7846.39*
In 2011	*210*	*767.0151*	*0.17*	*39.57*	*266.03*	*2466.93*	*7349.93*
In 2010	*209*	*781.8035*	*0.37*	*42.00*	*266.94*	*2545.71*	*7422.74*
Total beneficiaries	614	7394.4505	1	287	2455	16887	76687
Active employees	614	6338.4264	0	222	1973	12409	73033
Passive pensioners	614	1514.0235	0	53	481	4478	15070
Foundation age	614	20.8564	0	38	39	53	114
Affiliated employers	609	501.1620	0	3	124	452	3888
Pension plans	609	1.9083	1	1	2	2	15
Coverage ratio (in %)							
Private	*570*	*18.6643*	*67.70*	*103.55*	*106.00*	*103.46*	*278.44*
Public	*32*	*17.3135*	*55.20*	*66.47*	*74.93*	*68.80*	*102.58*
Beneficiaries ratio	614	14.4496	0.00	4.38	8.93	4.90	196.00
Capital ratio	614	245.3639	0.00	1.90	25.17	12.58	5428.49
Technical rate (in %)	543	0.3811	2.00	3.50	3.60	3.66	4.50
Canton urban (dummy)	614	0.4818			63.52%	66.85%	
Liquidation procedure (dummy)	614	0.2661			7.65%	0.46%	

Table 3.2.

Comparison of pension fund structure characteristics.

This table presents a comparison of pension fund structure characteristics between relevant studies in Switzerland and my sample for the full sample (2012-2010) and the sample each year. "Pension funds" give the number of pension funds included in each sample, "Exercise years" give the years under study for each sample, "Sum of total assets (in mio CHF)" is computed as the sum of the total assets of all pension funds, "Assets per fund (in mio CHF)" is computed as the sum of the total assets of all pension funds divided by the number of pensions funds included. The definitions of the variables related to the structure characteristics are detailed in Appendix 3.1. Their proportions are computed over non-missing values and over the number of pension funds, as for the OFS (2014) survey for comparison. Note that the study of Ammann and Ehmann (2017) also provide information about the proportions of multi-employer and autonomous pension funds. There are not shown and compared here due to different definitions.

	Sample (2010)	Sample (2011)	Sample (2012)	Full sample (2012-2010)	OFS (2014)	Ammann and Zingg (2010)	Ammann and Ehmann (2017)
Pension funds	209	210	195	614	2,073	96	139
Exercise years	2010	2011	2012	2010-2012	2012	2006	2012
Sum of total assets (in mio CHF)	55,790	55,867	61,197	172,854	672,785	193,696	286,495
Assets per fund (in mio CHF)	267	266	314	282	325	2,018	2,061
Legal form – PRIVATE	95%	95%	95%	95%	96%	81%	78%
Plan type – DEFINED-BENEFITS	16%	15%	15%	15%	7%	33%	15%
Administrative form – MULTI-EMPLOYER	20%	20%	21%	20%	60%		
Hedging type – AUTONOMOUS	13%	14%	14%	14%	20%		
Management administration – INTERNAL ADMIN.	22%	21%	22%	21%			
Management investments – INTERNAL INVEST.	25%	25%	25%	25%			

Table 3.3.

Summary statistics of governance attributes.

This table presents the mean or proportions of the governance attributes for the full sample (2012-2010), large vs. small pension funds, and each year (2012, 2011, and 2010). Large and small pension funds are split in two groups based on the median of total assets. The variables are detailed in Appendix 3.1. Note that by construction all the variables have a number of observations of 614.

	Full sample (2012-2010)					
	Mean	Mean (large)	Mean (small)	Mean (2012)	Mean (2011)	Mean (2010)
INTEGRITY						
Compliance						
(1) own code of best-practices	73%	74%	72%	78%	72%	70%
(2) ASIP charter and directive	21%	30%	13%	24%	20%	19%
Representativeness						
(3) election procedure available	42%	48%	36%	45%	40%	40%
(4) equal representation	90%	89%	90%	91%	90%	88%
(5) chairman employees representative	17%	22%	13%	18%	17%	17%
(6) chairmanship alternation	23%	26%	21%	24%	23%	23%
(7) manager not a trustee	76%	85%	67%	76%	75%	76%
(8) no external trustees	90%	91%	89%	91%	90%	90%
COMMITMENT						
Incentives						
(9) compensation for attending	22%	30%	14%	24%	21%	21%
(10) existence of a manager	66%	78%	54%	68%	65%	65%
(11) women representatives	64%	65%	64%	62%	65%	66%
(12) board tenure at least three years	94%	93%	95%	94%	94%	94%
(13) board meets at least once per year	80%	77%	83%	81%	80%	80%
Organisation						
(14) small number of trustees	64%	40%	89%	64%	66%	64%
(15) existence of committees	43%	68%	19%	45%	42%	42%
(16) existence of an investment committee	41%	64%	18%	43%	40%	40%
COMPETENCE						
Expertise						
(17) election procedure based on expertise	1%	1%	1%	1%	1%	1%
(18) training of the trustees	56%	61%	50%	61%	54%	53%
(19) investment experts available	87%	93%	82%	89%	87%	87%
Framework						
(20) investment policy available	94%	99%	90%	95%	94%	94%
(21) investment objectives defined	81%	86%	76%	83%	80%	80%
(22) investment benchmarks defined	41%	52%	30%	43%	41%	40%
(23) risk policy available	12%	17%	7%	13%	12%	11%
(24) ALM study for the strategy	24%	32%	15%	25%	24%	22%

Table 3.4.

Summary statistics of governance indices.

This table presents summary statistics of the governance indices for the full sample (2012-2010), large vs. small pension funds, and each year (2012, 2011, and 2010). Large and small pension funds are split in two groups based on the median of total assets. The variables are detailed in Appendix 3.1. Note that by construction all the variables have a number of observations of 614.

	Full sample (2012-2010)									
	Sd	Min	Median	Mean	Max	Mean (large)	Mean (small)	Mean (2012)	Mean (2011)	Mean (2010)
EFFECTIVENESS	0.1197	21%	54%	54%	83%	59%	49%	56%	54%	53%
INTEGRITY	0.1569	13%	50%	54%	88%	58%	50%	56%	53%	53%
Compliance	0.2906	0%	50%	47%	100%	52%	43%	51%	46%	45%
Representativeness	0.1753	0%	50%	56%	100%	60%	53%	57%	56%	56%
COMMITMENT	0.1656	13%	63%	59%	100%	64%	54%	60%	59%	59%
Incentives	0.1891	20%	60%	65%	100%	68%	62%	65%	65%	65%
Organisation	0.2790	0%	33%	49%	100%	57%	42%	50%	49%	48%
COMPETENCE	0.1767	0%	50%	50%	88%	55%	44%	51%	49%	48%
Expertise	0.2101	0%	67%	48%	100%	52%	45%	50%	47%	47%
Framework	0.2284	0%	60%	50%	100%	57%	44%	52%	50%	49%
Legally binding	0.1884	14%	57%	57%	100%	62%	52%	60%	56%	55%
Voluntary compliance	0.1206	18%	53%	53%	76%	58%	48%	54%	53%	53%

Table 3.5.

Univariate tests on board effectiveness.

This table presents univariate tests on the general index "effectiveness" on the mean over the period 2012-2010 based on different group splits. To perform the tests, "total assets", "total beneficiaries", "active employees", "passive pensioners", "foundation age", "affiliated employers", "pension plans", "coverage ratio", "beneficiaries ratio", "capital ratio", and "technical rate" are split in two groups based on the median. The first column [Mean (1)] gives the mean level of the index for pension funds in the group (1). The second column [Mean (0)] gives the mean level of the index for pension funds in the group (0). The third column [t-test] gives the results of the two-group mean-comparison tests performed to assess the statistical significance in the mean difference between the two groups. The null hypothesis to be tested is that the means of the two groups are equal. The fourth column [z-test] gives the results of the Wilcoxon rank-sum tests which account for potential non-normal distributions. The null hypothesis to be tested is that the distributions of the populations in the two groups are equal.

	EFFECTIVENESS			
			Diff (0-1)	
	Mean (1)	Mean (0)	t-test	z-test
PRIVATE (1) vs. PUBLIC (0)	54%	60%	1.67	1.37
DEFINED-BENEFITS (1) vs. DEFINED-CONTRIBUTIONS (0)	53%	55%	0.52	0.52
MULTI-EMPLOYER (1) vs. SINGLE-EMPLOYER (0)	56%	54%	-1.12	-0.80
AUTONOMOUS (1) vs. REINSURANCE (0)	60%	53%	-2.72	-2.64
INTERNAL ADMIN. (1) vs. EXTERNAL ADMIN. (0)	60%	52%	-3.86	-4.00
INTERNAL INVEST. (1) vs. EXTERNAL INVEST. (0)	53%	55%	0.97	0.56
Total assets: large (1) vs. small (0)	59%	49%	-6.44	-5.61
Total beneficiaries: large (1) vs. small (0)	59%	49%	-6.51	-5.76
Active employees: large (1) vs. small (0)	59%	49%	-6.21	-5.39
Passive pensioners: large (1) vs. small (0)	58%	50%	-5.66	-5.21
Foundation age: old (1) vs. young (0)	55%	53%	-1.38	-1.40
Affiliated employers: lot (1) vs. few (0)	58%	50%	-4.78	-4.40
Pension plans: lot (1) vs. few (0)	57%	53%	-2.23	-1.90
Coverage ratio: high (1) vs. low (0)	55%	55%	0.05	-0.34
Beneficiaries ratio: high (1) vs. low (0)	53%	55%	0.82	0.75
Capital ratio: high (1) vs. low (0)	55%	54%	-0.55	-0.35
Technical rate: high (1) vs. low (0)	56%	54%	-1.04	-0.90
Canton urban: yes (1) vs. no (0)	54%	55%	0.73	0.98
Liquidation procedure: yes (1) vs. no (0)	47%	55%	2.91	2.51

Table 3.6.

Univariate tests on integrity, commitment, and competence.

This table presents univariate tests on the dimension indices "integrity", "commitment", and "competence" on the mean over the period 2012-2010 based on different group splits. To perform the tests, "total assets", "total beneficiaries", "active employees", "passive pensioners", "foundation age", "affiliated employers", "pension plans", "coverage ratio", "beneficiaries ratio", "capital ratio", and "technical rate" are split in two groups based on the median. The first column [Mean (1)] gives the mean level of the index for pension funds in the group (1). The second column [Mean (0)] gives the mean level of the index for pension funds in the group (0). The third column [t-test] gives the results of the two-group mean-comparison tests performed to assess the statistical significance in the mean difference between the two groups. The null hypothesis to be tested is that the means of the two groups are equal. The fourth column [z-test] gives the results of the Wilcoxon rank-sum tests which account for potential non-normal distributions. The null hypothesis to be tested is that the distributions of the populations in the two groups are equal.

	INTEGRITY				COMMITMENT				COMPETENCE			
			Diff (0-1)				Diff (0-1)				Diff (0-1)	
	Mean (1)	Mean (0)	t-test	z-test	Mean (1)	Mean (0)	t-test	z-test	Mean (1)	Mean (0)	t-test	z-test
PRIVATE (1) vs. PUBLIC (0)	54%	56%	0.60	0.68	59%	69%	2.00	1.91	49%	55%	1.01	1.08
DEFINED-BENEFITS (1) vs. DEFINED-CONTRIBUTIONS (0)	53%	54%	0.41	0.33	57%	60%	0.80	1.06	50%	50%	-0.06	-0.19
MULTI-EMPLOYER (1) vs. SINGLE-EMPLOYER (0)	54%	54%	-0.09	-0.09	62%	58%	-1.40	-1.74	51%	49%	-0.88	-1.13
AUTONOMOUS (1) vs. REINSURANCE (0)	57%	53%	-1.19	-1.21	66%	58%	-2.53	-2.33	56%	48%	-2.08	-2.03
INTERNAL ADMIN. (1) vs. EXTERNAL ADMIN. (0)	56%	53%	-0.93	-0.90	70%	56%	-5.21	-4.96	54%	48%	-2.21	-2.49
INTERNAL INVEST. (1) vs. EXTERNAL INVEST. (0)	53%	54%	0.41	-0.07	61%	58%	-1.09	-1.05	44%	51%	2.63	1.94
Total assets: large (1) vs. small (0)	58%	50%	-3.74	-3.54	64%	54%	-4.60	-4.39	55%	44%	-4.95	-4.49
Total beneficiaries: large (1) vs. small (0)	57%	51%	-2.92	-2.70	64%	54%	-4.72	-4.56	56%	43%	-5.74	-5.58
Active employees: large (1) vs. small (0)	57%	51%	-3.16	-2.97	64%	54%	-4.76	-4.56	55%	44%	-4.91	-4.71
Passive pensioners: large (1) vs. small (0)	57%	50%	-3.41	-3.13	63%	55%	-4.04	-4.17	54%	44%	-4.34	-4.33
Foundation age: old (1) vs. young (0)	55%	53%	-1.17	-1.19	60%	58%	-0.77	-0.92	51%	48%	-1.06	-0.75
Affiliated employers: lot (1) vs. few (0)	58%	50%	-4.20	-3.79	63%	55%	-3.42	-3.50	53%	46%	-2.64	-2.80
Pension plans: lot (1) vs. few (0)	55%	53%	-0.91	-1.00	63%	57%	-2.46	-2.26	52%	48%	-1.42	-1.30
Coverage ratio: high (1) vs. low (0)	55%	53%	-1.12	-1.45	60%	59%	-0.59	-0.66	48%	52%	1.67	1.54
Beneficiaries ratio: high (1) vs. low (0)	53%	54%	0.53	0.54	59%	59%	0.33	0.45	48%	50%	0.90	0.98
Capital ratio: high (1) vs. low (0)	54%	53%	-0.38	-0.35	58%	60%	0.68	0.65	51%	48%	-1.43	-0.99
Technical rate: high (1) vs. low (0)	56%	54%	-0.67	-0.83	59%	59%	0.10	0.09	53%	49%	-1.71	-1.66
Canton urban: yes (1) vs. no (0)	53%	55%	0.72	1.38	59%	60%	0.53	0.27	49%	50%	0.37	0.80
Liquidation procedure: yes (1) vs. no (0)	45%	55%	2.82	3.24	55%	60%	1.25	1.40	41%	50%	2.24	1.37

Table 3.7.

Pairwise correlation coefficients between pension fund variables.

This table presents the pairwise Pearson's correlation coefficients between the pension fund variables potentially used in the multivariate regressions on the mean over the period 2012-2010. The statistical significance at 1% of the correlation coefficients is highlighted with (*).

	-1-	-2-	-3-	-4-	-5-	-6-	-7-	-8-	-9-	-10-	-11-	-12-	-13-	-14-	-15-	-16-	-17-	-18-	-19-
-1- PRIVATE	1																		
-2- DEFINED-BENEFITS	-0.316*	1																	
-3- MULTI-EMPLOYER	-0.257*	-0.083	1																
-4- AUTONOMOUS	-0.340*	0.212*	0.110	1															
-5- INTERNAL ADMIN.	-0.242*	0.072	0.203*	0.161	1														
-6- INTERNAL INVEST.	0.038	0.068	0.131	-0.105	0.162	1													
-7- Total assets	-0.480*	0.146	0.162	0.470*	0.290*	0.011	1												
-8- Total beneficiaries	-0.348*	0.065	0.324*	0.303*	0.285*	0.112	0.688*	1											
-9- Active employees	-0.276*	0.033	0.331*	0.232*	0.273*	0.127	0.580*	0.988*	1										
-10- Passive pensioners	-0.542*	0.182*	0.195*	0.506*	0.249*	0.016	0.929*	0.751*	0.637*	1									
-11- Foundation age	-0.342*	0.197*	-0.046	0.215*	0.182*	0.026	0.248*	0.166	0.137	0.238*	1								
-12- Affiliated employers	-0.098	-0.096	0.483*	0.097	0.231*	0.170	0.226*	0.572*	0.604*	0.262*	0.064	1							
-13- Pension plans	-0.070	-0.115	0.456*	0.016	-0.012	-0.001	0.109	0.219*	0.228*	0.114	-0.097	0.363*	1						
-14- Coverage ratio	0.346*	-0.141	-0.141	-0.099	-0.105	0.085	-0.243*	-0.201*	-0.167	-0.282*	0.027	-0.039	-0.121	1					
-15- Beneficiaries ratio	0.102	-0.215*	0.176	-0.159	0.041	0.004	-0.103	0.004	0.031	-0.112	-0.397*	0.092	0.182*	-0.046	1				
-16- Capital ratio	0.030	-0.055	0.198*	-0.050	0.007	-0.017	-0.023	-0.009	-0.004	-0.032	-0.146	0.042	0.155	-0.050	0.397*	1			
-17- Technical rate	-0.193*	0.196*	-0.084	-0.004	-0.117	-0.010	0.078	0.105	0.090	0.138	0.008	-0.047	-0.036	-0.314*	-0.064	-0.066	1		
-18- Canton urban	0.134	-0.071	-0.020	0.043	-0.041	-0.109	0.022	0.026	0.026	0.018	0.017	0.048	0.099	0.086	-0.102	0.010	-0.129	1	
-19- Liquidation procedure	0.078	-0.099	-0.048	-0.087	-0.019	-0.010	-0.110	-0.099	-0.093	-0.095	-0.115	-0.069	-0.045	0.045	0.093	0.184*	0.036	0.119	1

Table 3.8.

Multivariate regressions on governance indices.

This table presents the multivariate regressions on the governance indices "effectiveness", "integrity", "commitment", and "competence" on the mean over the period 2012-2010. For a matter of scale, "total assets" is transformed by taking the natural logarithm. Each regression is estimated with cross-sectional OLS, a constant, and robust standard errors. Standard errors are robust as heteroskedasticity-consistent following Huber-White estimation. For the linear estimation, note that one observation containing only one pensioner among its beneficiaries and thus an excessively high "capital ratio" is omitted. For each explanatory variable and the constant, the first row gives the coefficient estimates from the cross-sectional OLS regressions and the second row gives the robust standard errors of the coefficient estimates. Additionally, the number of observations, the statistical value from the F-test, and the adjusted R-squared are given for each regression. For the F-test, the null hypothesis to be tested is that all coefficient estimates are equal to zero.

*Statistical significance: * p<0.05, ** p<0.01, *** p<0.001*

	EFFECTIVENESS	INTEGRITY	COMMITMENT	COMPETENCE
PRIVATE	0.0268	0.0055	-0.0201	0.0952
	0.04	*0.06*	*0.06*	*0.06*
DEFINED-BENEFITS	-0.0354	-0.0298	-0.0659	-0.0105
	0.02	*0.03*	*0.03*	*0.03*
MULTI-EMPLOYER	-0.0291	-0.0305	-0.0342	-0.0228
	0.02	*0.03*	*0.03*	*0.03*
AUTONOMOUS	-0.0017	-0.0129	0.0191	-0.0113
	0.02	*0.03*	*0.04*	*0.03*
INTERNAL ADMIN.	0.0601**	0.001	0.1335***	0.0458
	0.02	*0.03*	*0.03*	*0.03*
INTERNAL INVEST.	-0.0067	0.0147	0.0119	-0.0468
	0.02	*0.02*	*0.03*	*0.03*
Total assets (ln)	0.0271***	0.0204*	0.0222*	0.0386***
	0.01	*0.01*	*0.01*	*0.01*
Foundation age	-0.0004	-0.0008	-0.0002	-0.0003
	0.00	*0.00*	*0.00*	*0.00*
Coverage ratio	-0.0004	-0.0002	-0.0002	-0.0007
	0.00	*0.00*	*0.00*	*0.00*
Beneficiaries ratio	-0.0003	-0.0013	-0.0007	0.0011
	0.00	*0.00*	*0.00*	*0.00*
Capital ratio	-0.0002	-0.0001	-0.0002	-0.0003**
	0.00	*0.00*	*0.00*	*0.00*
Technical rate	-0.0163	-0.0061	-0.0658	0.023
	0.03	*0.04*	*0.04*	*0.04*
Canton urban	-0.0264	-0.0175	-0.0281	-0.0337
	0.01	*0.02*	*0.02*	*0.02*
Liquidation procedure	-0.0075	-0.0569	0.0092	0.025
	0.03	*0.04*	*0.04*	*0.05*
constant	0.5592***	0.5799**	0.8028***	0.295
	0.11	*0.18*	*0.19*	*0.17*
# Obs.	184	184	184	184
F-test	6.97	1.55	6.25	4.25
Adj. R-squared	22.51%	2.77%	19.36%	14.25%

Table 3.9.

Robustness tests of the multivariate regressions.

This table presents the robustness tests of the multivariate regressions on the governance indices "effectiveness", "integrity", "commitment", and "competence" on the mean over the period 2012-2010. For a matter of scale, "total assets", "total beneficiaries", "active employees", and "passive pensioners" are transformed by taking the natural logarithm. Each regression is estimated with cross-sectional OLS, a constant, and robust standard errors. Standard errors are robust as heteroskedasticity-consistent following Huber-White estimation. For the linear estimation, note that one observation containing only one pensioner among its beneficiaries and thus an excessively high "capital ratio" is omitted. For each test, the significant explanatory variables of each multivariate regression on the governance indices are presented with their respective sign (+ or -) as well as the number of observations. The first row recalls the base result (1) and all the tests (2-11) are developed in details in the body of the chapter. In terms of methodology, the rows (9-11) present the estimated regressions for each of the three years in the sample separately (instead of an estimation on the mean over the period 2012-2010).

Statistical significance: (+)(-) p<0.05, (++)(--) p<0.01, (+++)(---) p<0.001

	# Obs.	EFFECTIVENESS	INTEGRITY	COMMITMENT	COMPETENCE
(1) Base result	184	(++) INTERNAL ADMIN. (+++) Total assets	(+) Total assets	(+++) INTERNAL ADMIN. (+) Total assets	(+++) Total assets (--) Capital ratio
(2) Total beneficiaries as proxy for fund size (instead of total assets)	184	(++) INTERNAL ADMIN. (+++) Total beneficiaries	(+) Total beneficiaries (-) Beneficiaries ratio	(+++) INTERNAL ADMIN. (+) Total beneficiaries	(+++) Total beneficiaries (-) Capital ratio
(3) Distinction between active and passive beneficiaries	179	(+) INTERNAL ADMIN.	nothing	(+++) INTERNAL ADMIN. (-) Technical rate	(+) Passive pensioners (-) Capital ratio
(4) Large pension funds (total assets)	102	(++) INTERNAL ADMIN. (+) Liquid. procedure	(-) Foundation age (+) Coverage ratio (---) Liquid. procedure	(+) AUTONOMOUS (+++) INTERNAL ADMIN. (-) Canton urban (+++) Liquid. procedure	nothing
(5) Small pension funds (total assets)	82	(++) Total assets	(--) INTERNAL ADMIN. (-) Coverage ratio (+) Capital ratio	(-) DEFINED-BENEFITS (--) AUTONOMOUS (++) INTERNAL ADMIN. (+) Total assets (-) Beneficiaries ratio (-) Technical rate	(++) Total assets
(6) Without public pension funds	173	(-) DEFINED-BENEFITS (+++) Total assets	(-) DEFINED-BENEFITS (++) Total assets	(+++) INTERNAL ADMIN. (++) Total assets	(+++) Total assets (--) Capital ratio
(7) Without funds in liquidation procedure	168	(++) INTERNAL ADMIN. (+++) Total assets (-) Canton urban	(++) Total assets (-) Beneficiaries ratio	(+++) INTERNAL ADMIN. (+) Total assets	(+++) Total assets (-) Capital ratio
(8) Without multi-employer pension funds	147	(-) DEFINED-BENEFITS (+) INTERNAL ADMIN. (+++) Total assets	(-) DEFINED-BENEFITS (++) Total assets (+) Capital ratio	(+++) INTERNAL ADMIN. (+++) Total assets	(++) Total assets (-) Capital ratio
(9) Estimation 2010	181	(+) INTERNAL ADMIN. (+++) Total assets	(+) Total assets (--) Liquid. procedure	(+++) INTERNAL ADMIN. (+) Total assets	(+++) Total assets (+) Liquid. procedure

(10) Estimation 2011	180	(++) INTERNAL ADMIN. (+++) Total assets (-) Coverage ratio (-) Capital ratio	(+) Total assets	(+++) INTERNAL ADMIN. (+) Total assets	(+++) Total assets (-) Coverage ratio (--) Capital ratio
(11) Estimation 2012	171	(-) DEFINED-BENEFITS (+) INTERNAL ADMIN. (+++) Total assets (-) Canton urban	(++) Total assets (-) Liquid. procedure	(-) DEFINED-BENEFITS (+++) INTERNAL ADMIN. (+) Total assets	(+++) Total assets (+) Beneficiaries ratio (--) Capital ratio

Chapter 4.

What really matters in board effectiveness for pension fund asset allocation?

Evidence from Switzerland[62]

4.1. Introduction

In pension funds, various governance considerations may impair the best interests of its plan beneficiaries. For example, the persons responsible may lack integrity and favor their own interest. They could also do not actively commit to their fiduciary duty and have the necessary competence in investments to manage the pension assets. In this chapter, we investigate whether and to what extent pension fund governance matters. To this end, we aim to examine the impact of board effectiveness and its different dimensions on pension fund asset allocation.

We focus on this association for four reasons. First, pension fund governance is at the top of the agenda of regulators. Challenging global economic conditions, financial markets, and ageing populations threaten the funding and sustainability of pension funds worldwide. Together with cases of fraud and excessive costs make governance a critical element to secure and maximize the wealth of plan beneficiaries. Recognizing that governance is key for the future of pension systems, best-practices recommendations and regulatory reforms have been put in place recently. Still, we do not understand well

[62] This chapter is part of a project in collaboration with Carolina Salva. Note that the writing, interpretation, and errors are my own.

what governance attributes are relevant and if the law and policymakers have focused on the ones that really matter. This study aims to bring some additional light.

Second, asset allocation is the main driver of pension fund performance and, therefore, critical for their sustainability [see e.g., Pennacchi and Rastad (2011); Brinson, Hood, and Beebower (1986); Brinson, Singer, and Beebower (1991); Blake, Lehmann, and Timmermann (1999); Hood (2005); Ibbotson and Kaplan (2000); Ambachtsheer (1994)]. According to Brinson, Hood, and Beebower (1986), over 90% of investment returns are explained by a fund asset allocation policy over time. Another strand of the literature suggests that asset allocation is also the channel through which governance matters for pension funds [see e.g., Useem and Mitchell (2000); Albrecht and Hingorani (2004); Dobra and Lubich (2013); Harper (2008a)]. Following these authors, governance considerations may impact performance indirectly through the way pension assets are invested and in particular allocated towards equity and abroad. As evidenced by Useem and Mitchell (2000), this effect might enhance the fund financial performance up to 2 percentage points, despite the additional risk taken[63]. A recent study by Andonov, Hochberg, and Rauh (2016) also gives specific evidence for that channel. They show that the proportion of politicians in boards of public pension funds impact investments in private equity, ultimately explaining part of pension fund underperformance. Therefore, evaluating whether pension fund governance shapes asset allocation decisions can help us understanding the likely effect on the performance and sustainability of pension funds.

Third, there is limited evidence on how governance considerations can explain pension fund asset allocation beyond the studies mentioned above and to what extent it really matters. Research on pension fund governance is still in its infancy mostly due to the lack of easily accessible data. Moreover, most of existing studies evaluate directly the relation between governance and performance. Although the literature concentrates on different countries and plan characteristics, the majority of the studies shows consistently a small positive relation between characteristics of board effectiveness and the investment performance of pension funds[64]. However, some conclusions have to be taken with caution due to measurement issues associated with investment performance such as the absence to account for the liabilities side of pension funds. Most of the studies also lack to explain how it matters and remain inconclusive regarding what is critical and relevant.

[63] On the contrary, McCarthy and Miles (2013) demonstrate that inefficient excess risk-taking in investments might exist when payoffs asymmetries in sharing surplus and deficits between the sponsoring employer and beneficiaries are important. In that case, the beneficiaries (through their board positions) might be willing to take too much risk as they do not directly support the downward risk. Sound pension fund governance which reduces such asymmetries is thus crucial, and particularly in Switzerland where all pension funds offer minimum legal guarantees.

[64] See e.g., Useem and Mitchell (2000); Albrecht and Hingorani (2004); Albrecht, Shamsub, and Giannatasio (2007); Hess (2005); Mitchell and Hsin (1994); Yang and Mitchell (2005); Harper (2008a); Harper (2008b); Schneider and Damanpour (2002); Ammann and Zingg (2010); Ammann and Ehmann (2017); Kowalewski (2012); Jackowicz and Kowalewski (2012); Koedijk, Slager, and Bauer (2010); Ambachtsheer, Capelle, and Lum (2008); Ambachtsheer, Capelle, and Scheibelhut (1998).

Fourth, we focus on the board of trustees and its effectiveness as the board is actually the direct manager in most pension funds and at the centre of governance and investment policies. In most institutional environments around the world, the board is the fiduciary and responsible of the management of the pension fund and its assets. It also normally takes all asset allocation decisions and should make sure that the investment policy remains focused on serving the beneficiaries' interests. In particular, the benchmark portfolio should be one that better immunizes the risks of the liabilities while adhering to the basic principles of diversification and reasonable risks. Still, there are situations where the pension board may deviate from this goal and lack integrity, commitment, or competence. We conceptualize and identify ways the absence of any of these three key dimensions of pension board effectiveness may impact asset allocation decisions and, in general, the investment risk-taking behavior of pension funds.

We use the Swiss framework to empirically investigate the relevance and importance of these three different dimensions of board effectiveness. Switzerland is an ideal setup to study that question as pension boards are the persons responsible for the investment strategy[65] and have the wide discretion to do so[66]. We measure board effectiveness and capture its different dimensions with a general index and additional sub-indices. These governance indices are constructed with 24 desirable best-practices governance attributes for Swiss pension funds and built as additive equally-weighted indices. Largely, this measure helps us to distinguish what matters exactly in pension board effectiveness. However, due to the data collection process and associated measurement, governance and transparency matters cannot be clearly dissociated with this measure. As such, the disclosure of information and level of transparency could as well be an alternative explanation to governance considerations.

Furthermore, to empirically evaluate how board effectiveness and its different dimensions relate to pension fund asset allocation, we measure the proportions invested in (1) equity as proxy for investment risk-taking, (2) sponsor-related assets, and (3) cash as proxy for liquidity. We then estimate a model of three regressions while controlling for several other factors including known determinants of pension fund asset allocation. For the estimation, we use OLS and a fractional response model [see Papke and Wooldridge (1996, 2008); Gallani, Krishnan, and Wooldridge (2016)], giving qualitatively similar results. By alternatively using fractional logit regressions, we can account for values of our asset allocation measures which are bounded in the unit interval [0;1] as well as close to and including zero[67]. To perform our tests,

[65] In Switzerland, the board of trustees is the supreme body with the fiduciary duty and responsibility for the investment strategy and its related decisions [see LPP art. 51b-2; LPP art. 52; OPP2 art. 49a; OPP2 art. 50].
[66] This point is balanced with the fact that pension boards in Switzerland have to deal with specific investment restrictions [see OPP2 art. 53ss]. However, as Swiss pension boards can deviate from these legal limits by extending their investment possibilities [see OPP2 art. 50-4], they still have a wide scope to implement investment decisions.
[67] Our measures of asset allocation are close to zero mainly as the result from the variables construction (especially for cash) and investment restrictions given by the Swiss law (especially for sponsor). Please refer to the body of this chapter for more details.

we use a unique hand-collected dataset of Swiss pension funds counting many variables. Our sample includes 210 pension funds over the period 2010-2012 for a total of 614 fund-year observations.

We find that governance considerations do matter for the asset allocation of pension funds in Switzerland. In particular, board competence in investments with a clear and detailed framework to take investment decisions seems to be what matters. Such pension boards are generally related with more equity and less cash, translating in a higher risk-taking behavior. Overall, this associated higher investment risk-taking should benefit the plan beneficiaries and the long-term performance and sustainability of pension funds. However, in this study, we do investigate why more risk should necessarily be better as well as claim or assess this causality, but rather leave that for further research.

By using other data, these results contribute and are similar to the ones of Ammann and Zingg (2010) and Ammann and Ehmann (2017) who examine the governance and investment performance of Swiss pension funds. Indeed, these authors highlight elements as target setting, investment strategy, and risk management to be associated with investment performance. We particularly complement the study of Ammann and Ehmann (2017) which could not find any significant relation with asset allocation in a second part of their study, by bringing additional light on how it might be of importance. Lastly, to our knowledge, we are the first to highlight the seemingly high levels of cash in Swiss pension funds and empirically show that they seem to be associated with weak governance through the lack of an investment framework.

Our results hold through several robustness tests. For example, they hold by excluding either public pension funds or funds planning a liquidation procedure, as these have very particular settings which may influence the investment process and decisions. Moreover, it could be that these are higher risk-taking pension funds that put in place and develop an investment framework allowing them to better manage risks. To mitigate to some extent concerns of reverse causality, we additionally estimate the model by lagging the independent variables and find virtually the same results. On the other hand, some robustness tests highlight limitations to our findings. For instance, the results do not seem to hold when including in the model the technical rate to value pension liabilities.

Finally, despite a large set of control variables, there are omitted variables we cannot control in our model and that could as well explain our findings. These include other determinants of asset allocation such as the age structure of plan beneficiaries or cash-flow variables as the promised benefits to be paid. In particular, we cannot exclude liquidity needs as an alternative explanation to pension fund cash levels in Switzerland. Large unexpected liquidity needs related to the Swiss regulatory setting such as lump sum payments at retirement and free pass transfers of vested benefits may as well explain high levels of cash. The sample period of 2010-2012 under study is also characterized by specific financial markets conditions such as low yields on bonds. This could also explain the uncovered associations.

This chapter is organised as follows. Section 4.2 develops potential impacts of the three different dimensions of board effectiveness on pension fund asset allocation. The dataset and measurement of the variables needed to conduct the empirical tests are presented in Section 4.3. This Section also provides summary statistics. Section 4.4 presents our model, its estimation, and the included control variables. The main results and additional robustness tests are given in Section 4.5. We also discuss further the findings on cash levels in Swiss pension funds in this Section. And Section 4.6 concludes.

4.2. Why and how may board effectiveness impact asset allocation

Pension board effectiveness includes three key dimensions that we particularly investigate in this study. First, more *integrity* in boards should mean reduced conflicts of interests and representativeness towards the beneficiaries' interests. Second, appropriate incentives and organisation should ensure the active *commitment* of trustees to their fiduciary duty and responsibility. Third, board *competence* in investments should be related with sufficient expertise and a clear framework to manage pension assets. In the absence of any of these features, it may lead to situations where the board may not function well, entailing poor governance and decision-making. It may particularly impact the pension fund asset allocation and the risk-taking behavior with the investments of beneficiaries' wealth. Potential impacts on asset allocation decisions from a lack of board integrity, commitment, and competence are described below[68].

4.2.1. Integrity

A lack of board integrity may exist when pension boards are controlled by the employer or under the influence of politicians. In the first case, board positions dominated by the employer may bend towards investing more in sponsor-related assets such as loans to the employer or employer's shares. An asset allocation determined by the employer may not be efficient [see e.g., Besley and Prat (2003); Hess and Impavido (2004)]. For instance, sponsor allocation subjects beneficiaries to an excessive exposure to their employer and prevents them from sufficient diversification. Also, deviations from a desirable asset allocation policy such as extreme conservatism or risk-taking can hurt beneficiaries' wealth in the long term.

In the second case, mostly in public pension funds, politicians may as well affect asset allocation decisions. For instance, this could be through their own short-term policy goals, translating into more risk-taking and thus more equity [see e.g., Hess (2005); Hess and Impavido (2004); Bradley, Pantzalis, and Yuan (2016); Dobra and Lubich (2013); Mohan and Zhang (2014)]. Politicians may also favor local economic and

[68] For more details on each of these dimensions and their respective solutions, please refer to both Chapters 2 and 3 of this thesis.

social projects and thus allocate excessive funds to real estate or domestic assets, resulting in poor diversification. Moreover, Andonov, Hochberg, and Rauh (2016) show that personal and political conflicts of interests from politicians in pension boards lead to poor decisions in private equity leading partly to public pension fund underperformance[69].

4.2.2. Commitment

Less committed boards may devote few time and low effort in making decisions to manage the pension investments. For example, as shown by Choi, Laibson, Madrian, and Metrick (2002), trustees may follow the "path of least resistance", meaning that they may prefer passive and herding investment decisions. Trustees may also prefer to enjoy a "quiet life" and avoid taking difficult and risky decisions which might involve additional dedication [see e.g., Bertrand and Mullainathan (2003)]. Moreover, without proper incentives and organisation, such as, for instance, a separated investment committee, trustees may be too slow with the investment process. Overall, trustees may be less dynamic and less reactive, which could have significant implications in the allocation of the pension assets such as holding excessive liquid assets and cash, and thus low equity and insufficient diversification.

4.2.3. Competence

Pension boards may lack the financial competence to guide the investment process and actually take asset allocation decisions. It could be for instance through the absence of a detailed framework including an investment policy, objectives, and benchmarks. The issue of competence in investments has been highlighted specifically for trustees several times in the literature [see e.g., Myners Report (2001); Clark (2004); Clark, Caerlewy-Smith, and Marshall (2006, 2007); Ambachtsheer, Capelle, and Lum (2008)]. As such, trustees may miss potential returns from complex asset classes, allocate to inappropriate mandates or investments, or accept too high fees charged by external investment experts. In the end, this may translate into insufficiently diversified portfolios and excessive investments in low-risk and high-liquid assets, leading to low equity and high cash. For example, Useem and Mitchell (2000) and Dobra and Lubich (2013) show that pension boards having independent performance evaluations to assess their competence is crucial and that such boards decide to invest more in equity.

[69] Predictions on the risk-taking behavior of pension boards with a high representation of beneficiaries, including mostly employees, are not clear. Harper (2008a) suggests that such boards are subject to lower potential conflicts of interests, take less risk, and invest less in equity. Pennacchi and Rastad (2011) find that instead they choose more equity and Useem and Mitchell (2000) show that board composition is an irrelevant question for the pension fund asset allocation.

4.3. Data and variables

4.3.1. The dataset of Swiss pension funds

In this study, we use the same dataset as in Chapter 3. Our dataset comprises a unique sample of 210 Swiss pension funds, out of the 2,073 registered in Switzerland at the end of 2012 [see OFS (2014)]. We manually gather data for all active pension funds registered in the cantons of Vaud, Valais, Neuchatel, and Jura, that report to the As-So (Autorité de Surveillance LPP et des fondations de Suisse Occidentale), a regional supervision authority. For the period 2010-2012, we collect individual variables directly from the paper files that these pension funds are obliged to send regularly to the authority. These include the audited annual reports under Swiss GAAP RPC 26, the foundation statutes (or laws for public pension funds), and the internal rules of organisation and investments. Our final sample contains a large panel dataset of 614 fund-year observations for many variables including pension fund, asset allocation, and pension governance information. All the variables used in this study are listed and defined in Appendix 4.1.

The advantages of our hand-collected dataset are threefold. First, common accounting standards ensure comparability across the various and different Swiss pension funds. Second, verification by a supervision authority and two independent specialists, namely an auditor and an expert in occupational pensions, confirm the reliability of the reported numbers. Third, the information is free of any subjectivity and positive selection bias compared to surveys data [see e.g., in Switzerland, Ammann and Zingg (2010); Ammann and Ehmann (2017)]. On the other hand, the collected information is constrained by the disclosure and transparency in Swiss pension fund files. This will necessarily influence the constructions of the measures and the interpretation of the results. In addition, the sample remains limited in time-series by only including three years as well as in cross-section by the number of pension funds. This will restrict further the empirical design and tests to be implemented.

Table 4.1 presents summary statistics of the pension fund variables and shows significant differences across the Swiss pension funds included in our sample. For example, their fund size varies from less than CHF 100,000 in assets (1 beneficiary) to almost CHF 8 billion (76,687 beneficiaries). Moreover, most pension funds are private entities (95%, vs. public) and offer defined-contributions plans (85%, vs. defined-benefits). Private pension funds are on average fully funded with an assets-weighted mean coverage ratio of 103.46%, while 11 public pension funds exhibit an average of 68.80% with respect to a different legal funding treatment. In addition, only few pension funds manage their administration and investments internally (21% and 25%, vs. external). The largest pension funds are also most likely to be public, multi-employer, autonomous, and manage their administration internally. Compared to the complete universe of pension funds in Switzerland [see OFS (2014)], our sample covers about 10% of all Swiss pension funds and

9% of their assets. It is also representative in terms of fund size, with an average pension fund managing CHF 314 million at the end of 2012 (vs. CHF 325 million, OFS (2014))[70].

[Table 4.1: Descriptive statistics of Swiss pension funds]

4.3.2. Measuring board effectiveness

In this study, we use the same measure of pension board effectiveness as in Chapter 3. In general, we aim to measure whether more effective pension boards influence the investment process and in particular, the extent to which their integrity, commitment, and competence can impact asset allocation decisions. For that purpose, we construct a general index of board effectiveness and additional sub-indices capturing its different dimensions.

We focus on desirable attributes that are considered best-practices and have received the most attention in the literature. The list of attributes is necessarily dependent on the Swiss institutional environment and has been restricted according to data availability and collectability in Swiss pension fund files. Therefore, this measure is directly applicable to Swiss pension funds and associated with the level of transparency and disclosed information in their reported files. In the end, we identify 24 quantifiable desirable governance attributes classified in each of the dimensions of board effectiveness[71]. For each attribute, we examine if the pension fund meets a threshold level of implementation. Then, we assign a value of one if the pension fund meets the threshold and complies with best-practices, and zero otherwise. When the information is missing in the files, we assign a value of zero, as if the best-practices criteria was not met. This procedure implies that governance and transparency matters cannot be clearly dissociated with this measure.

To aggregate the attributes, we follow a similar methodology as the widely-used corporate governance indices [see e.g., Gompers, Ishii, and Metrick (2003); Bebchuk, Cohen, and Ferrell (2009)] and previous integrated measures of pension fund governance [see e.g., in Switzerland, Ammann and Zingg (2010); Ammann and Ehmann (2017)]. As such, we aggregate all attributes into an additive equally-weighted index and scaled to one. For example, if a pension fund meets 18 attributes out of the 24, the index will have a value of 75% (that is 18/24). We label this general index “effectiveness”. A higher level is associated with a more effective pension board. To capture the different dimensions, we similarly build three indices representing the three key dimensions (namely “integrity”, “commitment”, and “competence”) as well as six indices of the potential solutions to strengthen them (namely “compliance”,

[70] For more detailed information about the dataset of Swiss pension funds, please refer to Chapter 3 of this thesis.
[71] Appendix 4.1 provides a detailed list of the attributes, their corresponding definitions, and classification.

"representativeness", "incentives", "organisation", "expertise", and "framework"). Each of the sub-indices includes the attributes classified in their respective dimension and solution.

We note that the approach of aggregating scores assigned to a number of attributes into an index is subject to several limitations that could lead to a misleading representation of pension board effectiveness. For instance, we are building additive indices assuming that all attributes matter equally and complement each other[72]. Unfortunately, there exists little guidance of how different attributes relate to each other. Although the indices we construct are imperfect instruments, they are easy to understand and provide a synthetic view of the multi-dimensional nature of governance considerations. In particular, they allow us to investigate empirically what matters exactly among the different dimensions of board effectiveness.

Table 4.2 describes in details the 24 governance attributes applicable to Swiss pension funds with their classification. It also gives the proportions of pension funds meeting each attribute and summary statistics of the governance indices. Overall, in our sample, we observe a wide dispersion in the governance and level of effectiveness of Swiss pension boards[73]. First, most pension funds comply with codes of best-practices preventing conflicts of interests through the Swiss legal and regulatory requirements (73%) or the ASIP charter and directive (21%). Second, representativeness of beneficiaries' interests is ensured with equal representation between the employees and employer (90%) and the fact that boards mostly do not include the internal manager (76%) and external trustees such as politicians (90%). However, an election procedure is only available in 42% of the cases and the chairman is rarely a representative of employees (17%) or infrequently alternate between the types of representatives (23%). Third, incentives for commitment may exist such as sufficient board tenure (94%) and board meeting frequency (80%) as well as women representatives on board (64%). However, most pension funds do not offer any kind of financial compensation (22%) or hire an internal manager to run the pension fund (66%). Fourth, a recommended organisation for making decisions with a small board (64%) and specialized committees (43%), with at least an investment committee (41%), is not the norm yet. Fifth, expertise in investments is mostly guaranteed by external investment experts (87%) as pension boards do not have an election procedure based on expertise (1%) or mention systematic training programs (56%). Sixth and last, most boards have in place a basic framework to take investment decisions, including an investment policy (94%) and investment

[72] We also adopt an alternative approach to the construction of equally-weighted indices by applying a principal component analysis [see e.g., Ammann, Oesch, and Schmid (2011); Boone, Field, Karpoff, and Raheja (2007); Larcker, Richardson, and Tuna (2007)]. However, we do not pursue this approach for the measure of board effectiveness as, despite different loadings, it would *not* significantly reduce the number of initial variables (10 principal components out of 24 attributes) while explaining most part of the variation in the dataset (65.83%).

[73] Although there is wide dispersion of the attributes across the Swiss pension funds, the time-variation remains low. Looking at indices will help to partly solve this issue inherent with the studies on governance questions, though the variation across time of the indices levels remains low as well.

objectives (81%) for their asset allocation. In contrast, they still seem to lack to define and use investment benchmarks (41%), an ALM study for the strategy (24%), and a risk policy (12%)[74].

[Table 4.2: Descriptive statistics of pension governance variables]

4.3.3. Measuring asset allocation

Based on our predictions, the existing literature, and the information in Swiss pension fund files, we focus on the following measures of asset allocation to conduct the empirical tests. After collecting and computing the different asset classes, we use the proportion allocated in "equity", "sponsor", and "cash"[75].

Asset allocation in "equity" represents a simple proxy for the risk-taking behavior of pension funds. "Equity" usually refers to investments in stocks but may also include real estate and alternatives as these investments can as well be defined as risky assets [see e.g., Andonov, Bauer, and Cremers (2013); Useem and Mitchell (2000)]. Given that real estate investments can also be considered as a safe asset [see e.g., Ammann and Ehmann (2017); Gerber and Weber (2007); Craft (2005)] through a stable and time-invariant income to the pension fund and more diversification to the portfolio, we decide not to include it. Thus, in this study, "equity" includes all stocks (both Swiss and foreign) and alternatives (including private equity, hedge funds, and commodities). As pension funds have generally a long-term horizon and that equity pays a positive expected risk premium in the long run, it seems appropriate to invest sufficiently in equities. This should have a positive impact on their long-term performance and sustainability, although we do not claim or assess directly this relation in this study.

Furthermore, we investigate the variable "sponsor", which mainly includes loans to the employer and employer's shares[76]. Given that employees already have exposure to the employer through their present revenues, a high ratio of sponsor allocation may be an indicative of an excessive risk concentration and lack of diversification. Finally, we take the proportion of "cash", including equivalents such as term deposits, to measure pension fund liquidity. Liquidity is necessary to meet short-term expected obligations such as pensioners' annuities as well as unexpected lump sum payments at retirement or vested benefits upon termination of employment. However, excessive cash holdings may translate into foregone

[74] For more detailed information about the measure of board effectiveness, please refer to Chapter 3 of this thesis.
[75] Note that the asset allocation of the different classes is computed in % over sum of asset classes instead of in % over total assets. In this way, the category "others" is ignored and spread proportionally to the other asset classes [see e.g., Pennacchi and Rastad (2011) for a similar computation]. Moreover, it ensures that the sum of each pension fund asset allocation is equal to one and that the other possible assets (example: receivables) as disclosed by pension funds have no influence. In this way, the analysis can focus on the investment strategy only, namely the different allocation to the asset classes, which is the interest of this study.
[76] The exact definition and computation of sponsor allocation is given in Appendix 4.1 and is dependent on the reporting system of the As-So, the supervision authority who shared their data with us.

investment returns and can be a symptom of poor governance as existing studies show in the context of corporations [see e.g., Pinkowitz, Stulz, and Williamson (2006); Dittmar and Mahrt-Smith (2007); Harford, Mansi, and Maxwell (2008); Frésard and Salva (2010)]. Although the reasons for holding liquidity in pension funds are different from those in corporations, high levels of cash may also be an indication of weak governance[77].

Table 4.3 describes all the asset allocation variables of the Swiss pension funds in our sample. On average, pension assets are invested as follows: 22% in Swiss bonds, 14% in foreign bonds, 15% in Swiss stocks, 14% in foreign stocks, 18% in real estate, and 5% in alternatives. Moreover, the allocation towards equity represents on average 34%. Surprisingly, about 13% of the investable assets are held under the form of cash (11% in 2010, 15% in 2011, and 13% in 2012). We also observe a high dispersion regarding pension fund asset allocation, although variables as alternatives and sponsor appear to be skewed to the left hand-side of the distribution by counting many zeros. Some pension funds have undiversified portfolios and a high exposure to particular asset classes. For example, one pension fund holds 80.21% in foreign bonds and another 99.87% in real estate. Regarding sponsor allocation, Swiss pension funds comply with the investment limit of 5% given by the Swiss law [see OPP2 art. 57-2] and, on average, invest only 1.41% in employer-related assets.

[Table 4.3: Descriptive statistics of asset allocation variables]

By construction, we compute proportions and the sum of each pension fund asset allocation is equal to one. Therefore, the different asset classes and measures of asset allocation under study are bounded in the unit interval [0;1] and have many values at the lower bound, zero included. Appendix 4.2 gives more details about the distribution of the three asset allocation measures. The histograms confirm fat tails near zero and in particular for sponsor and cash allocations. On top of their construction, some variables may also be constrained further towards zero by the legal investment limits set in Switzerland. This is for instance the case for sponsor allocation as highlighted previously [5%, see OPP2 art. 57-2]. Table 4.4 lists all the investment restrictions given by the Swiss law and in application to our asset allocation classification[78]. For equity allocation in particular, it also highlights a legal limit of 65% [50% for all stocks and 15% for alternatives, see OPP2 art. 55], while cash is legally unconstrained[79]. By looking at the statistics, it may

[77] The asset class "cash" is often omitted in the literature, although crucial for the operations and governance of pension funds. To our knowledge, only Dobra and Lubich (2013) and Ammann and Ehmann (2017) investigate the allocation in cash but they do not focus their analysis on that variable and their results are not conclusive.

[78] We only show the limits by asset classes (OPP2 art. 55 and OPP2 art. 57-2) and do not consider the following elements in the discussion: the compliance with authorized investments within the asset classes (OPP2 art. 53), the limits by a specific individual asset (OPP2 art. 54), and whether pension funds use OPP2 art. 50-4 to deviate from these limits by extending their investment possibilities.

[79] For equity allocation, note that the legal limit of 65% is much higher than the average of 34% in our sample.

appear that some Swiss pension funds included in the sample do not comply with the legal limits set for investments in Switzerland. In practice, a plausible explanation, and an element we cannot assess here, is the use of OPP2 art. 50-4 allowing pension funds to deviate from these limits by extending their investment possibilities. In the end, both the construction of the variables and investment restrictions induce non-linearity to be addressed in the empirical design.

[Table 4.4: Investment restrictions for asset allocation variables]

Finally, as shown in Table 4.5, the asset allocation variables are correlated. This can be explained by their construction and in particular as any decrease in the level of cash is necessarily translated in an increase in any other asset class. Particularly relevant for our study is the significant Pearson's correlation coefficient between cash and equity. This means that any uncover association with cash is related with equity and vice-versa. As sponsor allocation is constructed independently by looking at the proportion of employer's investments in all potential assets, it is not significantly correlated with cash or equity and is of less concern to interpret the results.

[Table 4.5: Pairwise correlation coefficients between asset allocation variables]

4.4. Empirical design

4.4.1. Model and estimation

In this Sub-section, we present the methodology to empirically test in a multivariate setting the relation between board effectiveness and its different dimensions with pension fund asset allocation, while controlling for several other factors. To do so, we estimate the following model of three regressions:

$$AA_{it} = a + T_t + b \times GI_{it} + c \times C_{it} + \varepsilon_{it}$$

With *i* referring to the pension fund; *t* to the fiscal year of the financial accounts; *T* to a time fixed-effect; *AA* to one of the three asset allocation measures ("equity", "sponsor", and "cash"); *GI* to one of the governance indices (general index, three dimension indices, and six solution indices); and *C* to a set of control variables.

Following our hypotheses, we expect betas to be positive for "equity" and negative for "sponsor" and "cash". In this panel setup, a time fixed-effect is added to the model to control for specific events over the sample period of 2010-2012 that could have affected the pension fund governance and financial

performance. Such events include in particular the structural reform of the Swiss occupational pension scheme and different economic and financial markets conditions across those three years[80]. Control variables correct for the heterogeneity across Swiss pension funds and include proxies for known determinants of pension fund asset allocation. There are described in details in the next Sub-section.

We proceed with the empirical analysis in three steps. First, we use the general index "effectiveness" to evaluate if governance matters for the allocations in equity, sponsor, and cash. Second, to further explore what matters exactly in board effectiveness, we disaggregate the general index into the three dimension indices and the six solution indices. Following the methodology of Bebchuk, Cohen, and Ferrell (2009)[81], all the governance indices from the same group are integrated into the same regression in order to control for the other governance attributes. In unreported results, we also regress each governance index alone into a single regression and find similar results in significance. Third, we present robustness tests including alternative specifications and restricted samples in order to understand better the limitations of our findings.

To estimate the model, we use two methods. First, as a base model, we estimate linear regressions with OLS, a constant, and cluster-robust standard errors by pension fund. Using cluster-robust standard errors helps us to mitigate serial correlation in a panel setup. This is especially relevant in our case because of a low time-variation of governance indices for a single pension fund. Moreover, we want to estimate simultaneous regressions with correlated error terms. Indeed, we have seen previously that the allocations in equity and cash are correlated. The seemingly unrelated regressions estimation (SURE) method using the two-steps procedure of feasible GLS can account for correlated error terms. And it is equivalent to estimating the regressions on equity and cash separately with OLS in our specification, i.e. with the same set of explanatory variables [see e.g., Kruskal (1968)].

Second, given that our endogenous variables are confined in the unit interval [0;1] and count many values at the lower bound, zero included, OLS estimation may miss some non-linearity in the data and raise inference issues. As shown previously, this is mainly the result from the variables construction (especially for cash) and investment restrictions given by the Swiss law (especially for sponsor). To overcome this econometric challenge and fit the model, we follow the fractional response model of Papke and

[80] We do not include a pension fund fixed-effect in the model specification because of a low time-variation of governance indices and a short time-series. Moreover, in this study, we are interested in the differences across pension funds and do not want to control for that but rather include a set of control variables.

[81] Bebchuk, Cohen, and Ferrell (2009) provide a cornerstone study on what matters for corporate governance among the entrenchment provisions studied by Gompers, Ishii, and Metrick (2003). We follow this idea here for pension fund governance but differ in the methodology applied to select what is relevant. Bebchuk, Cohen, and Ferrell (2009) highlight 6 provisions (among the 24) with significant shareholder opposition and support from interviews with M&A experts. They then confirm that these are the provisions that matter with extensive empirical tests. For this study, we adopt a purely empirical approach to highlight the most relevant dimensions and related governance attributes.

Wooldridge (1996, 2008) and Gallani, Krishnan, and Wooldridge (2016). This model provides a robust approach and allows for a more flexible functional form by estimating fractional logit regressions using quasi-maximum likelihood. Particularly for our case, it is designed to account for values of our measures of asset allocation close to and including zero. We alternatively employ this model with the same specification and standard errors' estimation as the base. For the presentation of the results, we report only average marginal effects to ease the interpretation of the coefficients estimates and the comparison with OLS.

4.4.2. Control variables

The set of pension fund controls included in the model is as follows. We include "total assets (ln)"[82] as a proxy for fund size and "foundation age" as a proxy for experience and learning. Large pension funds seem to take more risk and thus hold more equity [see e.g., Weller and Wenger (2009); Ammann and Ehmann (2017)]. Large pension funds might benefit from lower transaction costs and fees as well as have a stronger sponsoring employer who can afford additional contributions if needed [see Weller and Wenger (2009)]. They may also have more investment opportunities and advanced risk management structures [see Ammann and Ehmann (2017)]. A dummy "private" (vs. public) controls for the different agency and regulatory settings based on the legal form. Public pension funds tend to hold more real estate, sponsor, and domestic assets [see e.g., Ammann and Ehmann (2017)]. On the other hand, the legal form does not seem to be relevant for the equity allocation [see e.g., Gerber and Weber (2007)], although Weller and Wenger (2009) argue that public pension funds might actually take less risk due to more scrutinize by the authorities as well as different financial and investment constraints [see e.g., Mitchell and Hsin (1994)]. Further, a dummy "liquidation procedure", specific to the Swiss setting, controls for the adjustments on the asset allocation resulting from a foreseeable liquidation, such as artificially high levels of cash from the sales of assets.

To control for the capacity to take investment risk, we include two variables: "coverage ratio" and "beneficiaries ratio". First, the "coverage ratio" proxy for the financial health of pension funds with a high level being associated with a good funding in Switzerland [see OPP2 art. 44 and annex]. A good funding, with more reserves available to take risks, should lead to more risks taken, and thus more equity in the asset allocation [see e.g., Gerber and Weber (2007)]. At the opposite, pension funds with a low funding should lower their investment risk in order to limit the costs of financial distress [see for the risk management hypothesis e.g., Rauh (2009); An, Huang, and Zhang (2013); Weller and Wenger (2009);

[82] For a matter of scale, "total assets" is transformed by taking the natural logarithm.

Gerber and Weber (2007)][83]. Another strand of the literature though gives evidence that some types of pension funds, and particularly public ones, will increase their equity allocation as a way to gamble for resurrection and hide underfunding through an artificially higher technical rate to value pension liabilities [see for the risk shifting (or transfer) hypothesis e.g., Andonov, Bauer, and Cremers (2013); Mohan and Zhang (2014); Pennacchi and Rastad (2011)].

Following these studies, the technical rate may as well be a determinant of pension fund asset allocation. By setting a higher technical rate, pension funds automatically increase their expected rate of returns on pension assets and thus their investment risk. Though, this effect has been shown to be specific to the regulation for U.S. public pension funds [see e.g., Andonov, Bauer, and Cremers (2013); Cocco and Volpin (2007)] and we do not expect that it applies in Switzerland for two reasons. First, as for the U.K. setting [see Cocco and Volpin (2007)], the decision of the technical rate is in independent actuaries' hands rather than the employer or trustees. Second, Swiss pension funds have more discretion to set their technical rate as long as it does not exceed the national reference rate set by the Swiss Chamber of Pension Actuaries (CSEP/SKPE) in DTA 4 (2015). Further, for Swiss pension funds, we might rather expect a reverse causality: the technical rate might be set based on the current asset allocation of the pension fund. Indeed, following the DTA (2015), the CSEP/SKPE recommends that the technical rate should be chosen at a sensible margin below the expected rate of returns on pension assets. In the end, we decide not to include "technical rate" in the controls of the model but rather conduct an additional robustness test.

As a second way to control for the investment risk-taking capacity, we include the "beneficiaries ratio", computed as the number of employees over pensioners, to proxy for the liabilities side of pension funds. Pension funds with an older age structure and more benefits to be paid are expected to hold less equity [see e.g., Gerber and Weber (2007); Weller and Wenger (2009)]. They should take less risk when there are more mature, i.e. with more pensioners compared to still active and contributing employees (and thus a low "beneficiaries ratio"). They may also be constrained by urgent liquidity needs for their beneficiaries and as such hold more cash. Previous empirical studies support the structure of plan beneficiaries as an important determinant. Andonov, Bauer, and Cremers (2013) show that, except for U.S. public pension funds, a higher percentage of pensioners is related with less risk. Rauh (2009) show that there is a positive correlation between the risk-taking behavior of corporate pension plans and the share of employees. Despite less conclusive results, Mohan and Zhang (2014) also recognize a demographic effect and Ammann and Ehmann (2017) acknowledge that their opposite finding is counterintuitive.

[83] Additionally, Craft (2005) show with an asset-liability model that it is more optimal for underfunded (overfunded) pension funds to invest less (more) in real estate. According to the author, more real estate reduces portfolio risk. This might be explained by the diversification benefits because of a low correlation with the other asset classes.

Additionally, Pennacchi and Rastad (2011) and Mohan and Zhang (2014) give evidence that past investment returns relative to peers matter for the asset allocation of pension funds. Mainly, worst-performing pension funds will tend to take more risk in order to catch up. Limited by our dataset, we argue that "coverage ratio" could also control to some extent for past performance. Although not the ideal proxy, it is a key decisional indicator in Switzerland when it comes to take investment decisions based on previous results and peers. Finally, to control for the employer risk, or more precisely for when the employer has to bear the investment risk itself, we include the dummies "defined-benefits" (vs. defined-contributions), "multi-employer" (vs. single-employer), and "autonomous" (vs. reinsurance). In those situations, that particularly characterize the structure of Swiss pension funds and with minimum legal guarantees for Swiss plan beneficiaries, the diverging incentives of the employer may as well affect pension fund asset allocation.

We recognize that board decisions and its effectiveness are endogenous [as documented by e.g., Wintoki, Linck, and Netter (2012); Adams, Hermalin, and Weisbach (2010); Hermalin and Weisbach (2003); John and Senbet (1998)]. In particular, best-performing pension funds could have better levels of governance simply as they can afford costly governance attributes seen as best-practices. Also, it might be possible that this is poor performance that is triggering best-practices governance in the first place. By especially including a proxy for past performance (with the "coverage ratio") in our model, we can, slightly, mitigate this general endogeneity issue with boards [see e.g., Wintoki, Linck, and Netter (2012)].

4.4.3. Omitted variables

Despite this rich set of control variables included in the model, we cannot exclude that any relation we uncover could be correlated with other variables omitted in our model. As constrained by the collected information in our dataset, these include for instance employer-related variables as their default risk, better measures of past investment performance, and other variables influencing board's behavior as trustees' personality or personal risk aversion.

Furthermore, we can only partially control for the following two elements. First, for the liabilities side of pension funds and the structure of plan beneficiaries, we only include "beneficiaries ratio". However, it has been shown to be an important determinant of pension fund asset allocation in the literature. In particular, demographic parameters such as the age structure are as equally important for the risk-taking behavior of pension funds. Also, we cannot include any cash-flow variables, and in particular the different types of benefits to be paid to beneficiaries, while liquidity needs may as well explain asset allocation decisions and specially cash holdings. Second, to control for the legal investment limits set in Switzerland, we are only accounting for their consequences as a constraint on our asset allocation measures through the fractional response model. Especially for equity, we do not account for the possibility that Swiss pension

funds might decide to set their equity allocation close to the legal limit as a reference point. Finally, we cannot exclude that any other specificities related with the Swiss pension system may as well explain our results.

4.5. The results and additional tests

4.5.1. Main results

The estimated regressions of the general index "effectiveness" on the three asset allocation measures are shown in Table 4.6. According to the results, a high level of board effectiveness seems to be associated with less cash, while no direct relation with equity and sponsor allocations can be assessed[84]. Moreover, by disaggregating board effectiveness into its different dimensions, the results from Table 4.7 show that "competence" and "framework" are what seem to matter for cash allocation. These governance indices are also significantly related with more equity, and thus a higher risk-taking behavior, as well as beyond controls for known determinants of pension fund asset allocation. Accordingly, Swiss pension funds seem to hold less cash and take more risks when their board has the financial competence to base their decisions on an investment framework. As cash and equity allocations are correlated, this is actually the result of a single mechanism: such pension boards tend to decrease their level of cash in order to increase equity, translating in a higher risk-taking behavior. In unreported results, similar estimated regressions including all 24 governance attributes separately indicate that investment objectives for the strategic and tactical asset allocation is what seems to be the most relevant[85].

[Table 4.6: Does it matter?]

[Table 4.7: What matters exactly?]

Remarkably, the other dimensions of board effectiveness do not seem to be as relevant for the asset allocation of Swiss pension funds. Only "representativeness" and "incentives" are slightly significantly related with, respectively, sponsor and cash allocations. For board integrity, it could be that our measure may not be able to capture the influence of politicians, with only one attribute ("no external trustees") accounting partially for this point. With respect to its importance in the literature, the issue of boards lacking integrity could also be more sensitive in public pension funds which only represent a small part of our sample.

[84] Note that our general index of board effectiveness becomes significantly related with more equity in two other model specifications though: (1) when standard errors are not clustered by pension fund but only adjusted following the Huber-White estimation and (2) when the model is estimated with GLS and pension fund random effects.
[85] The results from this test have to be taken with caution as the estimation suffers from a multicollinearity issue when estimating with each governance attribute separately rather than in the aggregate through the governance indices.

Furthermore, two reasons can explain why we do not find any relation with sponsor allocation and obtain a low adjusted R-squared of 6.06%. First, by only including employer's loans and shares, the measurement of the variable "sponsor" cannot really capture the overall and more complex employer's influence. Second, the specific investment restriction of 5% given by the Swiss law [see OPP2 art. 57-2] may actually limit the scope of discretion of pension boards. By looking at the regressions estimated with fractional logit, we observe that "framework" becomes statistically significant and negatively related, supporting further our hypotheses. Except for that point, the results given by this alternative estimation method are virtually the same that with OLS estimation.

Our findings show that a clear and detailed framework to take investment decisions seems to be crucial for pension board effectiveness in order to allocate and manage the pension assets towards plan beneficiaries' best interests. In particular, a guide stating the investment policy and providing the tools to actually take and implement judicious asset allocation decisions is key [see also e.g., Carmichael and Palacios (2004); Koedijk, Slager, and Bauer (2010)]. However, we need to acknowledge three limitations to this interpretation of the results. First, the uncover associations could still be related with omitted variables such as the ones expressed previously. The significance of the constant given by OLS for the three estimated regressions particularly suggests that a lot remains unexplained with our model. As an example, that could be sensitive to our results, liquidity needs may as well explain cash levels. Second, our measure of pension board effectiveness cannot clearly dissociate governance and transparency matters. Therefore, we cannot exclude that this is the transparency of having set clearly and disclosed in details an investment framework that explains the results and not the board decision of having in fact established it to guide the investment process. Third and last, we empirically show that more competent pension boards with an investment framework are associated with a higher risk-taking behavior. However, we do not evaluate why more risk should be better for plan beneficiaries by looking at, for instance, its impact on pension fund performance, funding, and sustainability. This investigation goes beyond the scope of this study.

The relevance of an investment framework is an important finding for the Swiss pension fund industry. In a militia system based primarily on the representation of all participants, this suggests that the professionalization of the trustees responsible for the investment of pension assets is as equally important. In the end, both representation and competence should be key ingredients of a strong board [see e.g., Clark (2007); Besley and Prat (2003)]. This suggestion of financial professionalism for pension boards is in line with previous studies [see e.g., the Myners Report (2001); Ammann and Zingg (2010); Ammann and Ehmann (2017); Mitchell and Hsin (1994); Harper (2008b)] [86]. In particular for Switzerland, Ammann and

[86] This conclusion also reaches one of Andonov, Hochberg, and Rauh (2016) who show that elected beneficiaries in public pension boards are associated with a lower level of financial experience and that their "confusion" might lead to poor choices affecting pension fund performance.

Zingg (2010) and Ammann and Ehmann (2017) also highlight the relevant importance of a designed framework including elements of target setting, investment strategy, and risk management for the governance of Swiss pension funds and their investment performance.

4.5.2. Robustness tests

In this Sub-section, we conduct additional robustness tests on equity and cash allocations in order to validate our findings. Most of them support the relevance of board competence with an investment framework for the risk-taking behavior of Swiss pension funds, while some highlight specific cases when it does not seem to hold. Using a similar methodology, the results of these tests are presented in Tables 4.8 and 4.9 for, respectively, equity and cash. We do not report the results on the allocation in sponsor as the coefficient estimates of the governance indices generally lack significance. For each group (general index, three dimension indices, or six solution indices), we report only the results related with the governance indices. The regressions are solely estimated with OLS as we have seen previously that applying a fractional response model provides similar results in significance. After recalling the base result *(1)*, each robustness test *(2-14)* is developed in details below.

[Table 4.8: Robustness tests on equity allocation]

[Table 4.9: Robustness tests on cash allocation]

(2-3) Alternative proxies to control for determinants of pension fund asset allocation are used in the model. For the fund size, we use "total beneficiaries (ln)"[87] instead of "total assets (ln)". The results remain unchanged. For the liabilities side of pension funds, we use "capital ratio", computed as capital of employees over capital of pensioners, instead of "beneficiaries ratio"[88]. This variable expresses the same ratio of plan beneficiaries but in monetary terms. The results are also similar except that the direct relation between the general index "effectiveness" and cash allocation disappears. This feature will appear in other tests, suggesting further that these are "competence" and "framework" that really matter and not the level of board effectiveness in the aggregate.

(4) Due to our sample specificities, we include an additional control in the model to account for possible location differences across the cantons in Switzerland. We add "canton urban" (or equivalently a dummy for the canton of VD vs. NE, VS, and JU) to control for those potential location differences as well as

[87] For a matter of scale, "total beneficiaries" is transformed by taking the natural logarithm.
[88] For the linear estimation, note that one pension fund containing only one pensioner among its beneficiaries and thus an excessively high "capital ratio" is omitted.

a relatively facilitated access to financial services, as this could have an influence on the investment process and decisions. The results are the same.

(5) Following previous literature, we also add in the model the variable "technical rate" as an additional control and determinant of investment risk. Although we did not expect this point to be crucial in Switzerland (see Sub-section 4.4.2), it appears to be an empirically sensitive one. Indeed, the technical rate seems to as well be significantly related with the variations in the asset allocation of Swiss pension funds and captures the significance of all governance indices. Therefore, our findings do not hold in this specific case. As one explanation, it could be the result of the recommendation of the DTA (2015) by the CSEP/SKPE to set the technical rate based on the expected rate of return.

(6-7) To estimate our model, we also restrict our sample from Swiss pension funds with particular settings which may influence their asset allocation. For reasons developed previously in the study, we exclude either public pension funds or funds planning a liquidation procedure. In both cases, the results remain unchanged.

(8-9) Fund size seems to be an important determinant of the governance of pension funds (see Chapter 3 of this thesis). For that reason, and a high dispersion in size for Swiss pension funds, we re-estimate the model separately for two sub-samples split by the median of "total assets". The results do not hold when estimating on a sub-sample of the largest pension funds. For small pension funds, there are of less significance for equity and of larger magnitude for cash. However, the conclusions from these tests have to be taken with caution due to the small size of the sub-samples.

(10) As comparison, we alternatively compute the measures of asset allocation in % over total assets instead of in % over sum of asset classes and we re-estimate the model. Although the results are virtually the same for equity allocation, this alternative computation appears to be a sensitive point for measuring the proportion of cash in Swiss pension funds. It seems to be another limitation to our findings.

(11-12) Methodologically, we also estimate the model with a 1-year (2-year) lag between the governance indices (as well as the set of pension fund controls) and the asset allocation variables in order to mitigate concerns of reverse causality. Indeed, it could be that this is a poor allocation of the assets that is triggering investments in best-practices governance attributes such as the development of an investment framework, strengthening board competence. Further, it might be possible that higher risk-taking pension funds are the ones that put in place the governance structures allowing them to better manage risks. This 1-year (2-year) lag could also control for the time needed for pension boards to actually implement asset

allocation decisions in practice. Our results are qualitatively similar in both cases[89]. This lessens to some extent the concern of reverse causality although we do not claim any causality for our results in this study.

(13-14) The organisation of the management of the investments and administration, whether internal or external, could as well influence the asset allocation by Swiss pension boards. For that reason, we include either "internal invest" or "internal admin" as additional structural controls. In both cases, the results are the same.

4.5.3. Discussion on cash levels

Our results related specifically with cash allocation deserve more discussion. Generally, Swiss pension funds seem to have high levels of cash. At the end of 2012, CHF 52 billion are kept in cash by all pension funds in Switzerland [see OFS (2014)]. On average, this represents about 8% of their assets under management[90]. In international comparison, pension funds in the U.S., U.K., Canada, and Japan usually have no more than 3% allocated to cash [see e.g., Towers Watson (2014)]. One of the most professionalized system, the Netherlands, even hold 0%[91].

As for the management of any portfolio, as soon as the investment performance is benchmarked with an index, the level of cash should be zero. Any cash flow received in excess of liquidity needs should be reinvested automatically according to the investment benchmark. Thus, high cash holdings do not make sense from a theoretical perspective and especially that, on average, Swiss pension funds appear to receive more cash than what they have to pay. Indeed, over the years, the assets under management have kept growing and the received contributions exceeded the benefits to be paid [see OFS (2016)]. And this pattern is projected to continue in the future [see e.g., the reports of the SwissBanking (2017) or the Federal Council (2013)]. Furthermore, the average level of cash remained high and constant over time as well as different economic cycles and financial markets conditions [see OFS (2016)]. High levels of cash in Switzerland seem to be a persistent phenomenon across different periods.

[89] Lagging the independent variables does not affect our findings although by doing so we lose about one third (two third) of our sample. This can also be explained by the low time-variation of governance indices.
[90] The 8% contrasts with the 13% as disclosed in Table 4.3 for our sample and can be explained by measurement differences. When applying a similar computation, i.e. over total assets instead of over sum of asset classes, we find the same equally-weighted mean of about 8%.
[91] Compared to the Swiss occupational pension system, the regulatory setting of the Netherlands generally does not allow withdrawals that can generate large unexpected liquidity needs such as lump sum payments at retirement or free pass transfers of vested benefits. This could explain in part the 0% held in cash by Dutch pension funds.

In comparison with modern corporations, there is also no particular motive for Swiss pension funds to hold a lot of cash[92]. First, it could be for specific investment opportunities such as large infrastructure projects. However, pension funds might as well sell other liquid assets in due time and such investments are rare in Switzerland. Second, it could be a strategic decision to survive in the case of high competition [see e.g., Frésard (2010)]. Yet, this hypothesis does not really apply to Swiss pension funds as they are linked to the employer and as such do not face any competition. Employees cannot choose their pension fund in Switzerland.

So, what can explain these high levels of cash particularly in Switzerland? Why Swiss pension funds seem to allocate so much in cash? In this study, we empirically show that cash holdings are related to the governance of pension funds, beyond other determinants. In particular, high levels of cash seem to be associated with weak governance through the lack of an investment framework. Accordingly, such pension funds might not know how to manage their cash, where to invest the cash they regularly receive, invest it too slowly, and accumulate it. This is especially critical if they do not have preliminary established an investment benchmark or lack the investment tools to compute their optimal level of cash[93].

We need to acknowledge that two other reasons may as well explain this finding. First, the sample period of 2010-2012 under study is characterized by a specific environment of low yields on bonds and thus can also explain high cash levels in Switzerland. Therefore, there is the need to conduct similar empirical tests on another period and a longer time-series in order to generalize our finding. Second, as expressed along this study, liquidity needs may be an alternative explanation that we cannot control in our model[94]. Swiss pension funds may simply hold a lot of cash because they actually need it. Although liquidity needs can be anticipated and planned in advance such as the benefits to be paid under the form of annuities to pensioners, some can be large and unexpected. In the Swiss regulatory setting, two important ones include (1) the lump sum payments at retirement cashing out the entire (or partial) pension savings of employees and (2) the free pass transfers of vested benefits upon termination of employment. In these two cases, despite some anticipation, Swiss pension funds face an important liquidity risk. Hence, more empirical work is needed to dissociate governance and liquidity matters behind the relations we uncovered. And although providing a deeper analysis on the drivers of pension fund liquidity is beyond the scope of this study,

[92] We look at the corporate cash literature for explanations as the literature on pension fund cash management is very scarce. To our knowledge, there are only a few studies investigating the cash allocation of pension funds [see Dobra and Lubich (2013); Ammann and Ehmann (2017)].

[93] This last idea is reinforced by the fact that the Swiss GAAP RPC 26 to present the financial statements of Swiss pension funds do not require any cash-flow statement.

[94] The most important cash-flow variables faced by Swiss pension funds and not included in our model are as follows: contributions (+), benefits (-), investment incomes (+), operating costs (-), as well as free pass transfers (+/-) resulting from the LFLP (Law on Free Pass in Occupational Old-age, Survivors, and Disability Pension Plans).

further research is also needed to understand the cash management of Swiss pension funds, their liquidity needs, and optimal level of cash.

As an end point, and beyond its limitations, we highlight through this study for the first time the high levels of cash of Swiss pension funds. Eventually, holding too much cash translates into foregone returns from any investment of the pension assets. It is particularly costly in today's Swiss environment where cash is rewarded with negative interest rates, affecting ultimately the sustainability of Swiss pension funds. Contrary to the general aging of the population, this is not an exogenous issue. The boards of Swiss pension funds can actually take action and influence cash levels. Some major Swiss pension funds have already taken measures against the negative interest rates in Switzerland [see the annual survey of Swisscanto (2016)]. Although 30% admitted to have done nothing, 46% separated their cash in several banks and/or 39% reduced their cash exposure in their strategic and tactical asset allocation.

4.6. Conclusion

Various governance considerations may impact the asset allocation of pension funds, and ultimately the welfare of plan beneficiaries. In this chapter, we use a unique dataset of Swiss pension funds to empirically evaluate the relation between pension board effectiveness and its different dimensions with measures of asset allocation. We show that competent pension boards with a clear and detailed framework to take investment decisions seems to be what matters. In particular, such pension boards appear to be associated with more equity and less cash, translating in a higher investment risk-taking behavior. We also highlight the seemingly high levels of cash in Swiss pension funds and relate it with the lack of an investment framework. These results hold beyond known determinants of pension fund asset allocation while we cannot control and exclude liquidity needs reasons for our findings.

Following this study, four avenues are particularly open for further research. First, additional empirical work should investigate and evaluate whether more risk is better for plan beneficiaries by, for instance, enhancing pension fund performance, funding, and sustainability. Second, endogeneity tests should be conducted to mitigate further the concerns of reverse causality. An exogenous shock such as the introduction of negative interest rates by the Swiss National Bank in January 2015 may provide a good experiment to validate the results and claim causality. Indeed, after this unexpected event, we would expect that better-governed Swiss pension funds to be the ones who have decided to reduce their cash exposure. Third, more empirical tests are also needed to assess to what extent our results are related with liquidity matters. For that purpose, there is the necessity to understand better how Swiss pension funds manage their cash and how they determine their liquidity needs and optimal level of cash. Fourth and last, other datasets should be used in order to generalize our findings and expand them in another time period and outside Switzerland.

Appendix 4.1: Variables of the study

This table presents all the variables used in this study, including the pension fund variables (Panel A), asset allocation variables (Panel B), and pension governance variables (Panel C), with their respective definitions and computations. More information about the data collection process of these variables is available upon request.

Panel A: Pension fund variables

Fund variables	**Definitions:**
Total assets (in mio CHF)	Total assets of the pension fund, with the assets/liabilities from collective insurance contracts (in million CHF)
Total beneficiaries	Number of total beneficiaries, computed as active employees plus passive pensioners
Foundation age	Age of the pension fund, computed from the foundation year
Coverage ratio (in %)	Coverage ratio or technical funding ratio of the pension fund, defined as the pension assets available over the committed pension liabilities (OPP2 art. 44 and annex) (in %)
Beneficiaries ratio	Ratio of active over passive beneficiaries, computed as active employees over passive pensioners (and is equal to active employees if passive pensioners is zero)
Capital ratio	Ratio of active over passive capital, computed as capital of employees (in million CHF) over capital of pensioners (in million CHF) (and is equal to capital of employees if capital of pensioners is zero)
Technical rate (in %)	Applied technical interest rate for valuation of pension liabilities (in %)
Canton urban (dummy)	Canton of location of the pension fund is VD with facilitated access to financial services vs. NE/VS/JU
Liquidation procedure (dummy)	Liquidation procedure of the pension fund is in progress or expected in a foreseeable future
Structure characteristics	**Definitions:**
Legal form – PRIVATE	Legal form of the pension fund is PRIVATE (cooperative society or foundation) vs. PUBLIC (public institution)
Plan type – DEFINED-BENEFITS	Plan type of the pension plans is DEFINED-BENEFITS vs. DEFINED-CONTRIBUTIONS (defined-contributions or hybrid)
Administrative form – MULTI-EMPLOYER	Administrative form of the pension fund is MULTI-EMPLOYER (collective or common) vs. SINGLE-EMPLOYER
Hedging type – AUTONOMOUS	Hedging type of the risks is AUTONOMOUS vs. REINSURANCE (partial or total)
Management administration – INTERNAL ADMIN.	Management of the administration part of the pension fund is INTERNAL ADMIN. vs. EXTERNAL ADMIN. as mentioned in fillings
Management investments – INTERNAL INVEST.	Management of the investments part of the pension fund is INTERNAL INVEST. vs. EXTERNAL INVEST. as mentioned in fillings

Panel B: Asset allocation variables

Asset classes and allocation	**Computed in % over sum of asset classes:**
(1) Cash	Cash and equivalents (CHF and foreign currencies)
(2) Swiss bonds	Swiss bonds
(3) Foreign bonds	Foreign bonds (CHF and foreign currencies)
(4) Swiss stocks	Swiss stocks
(5) Foreign stocks	Foreign stocks
(6) Real estate	Real estate including direct and indirect investments
(7) Alternatives	Alternatives including private equity, hedge funds, and commodities

Equity allocation (4+5+7)	Equity allocation including Swiss stocks, foreign stocks, and alternatives
Sponsor allocation	Total investments towards the employer without guarantee, including current account (employer contributions on hold), employer loans (cash and mortgages), and employer shares (bonds and stocks), but excluding real estate and mutual funds (computed in % over total assets)

Panel C: Pension governance variables

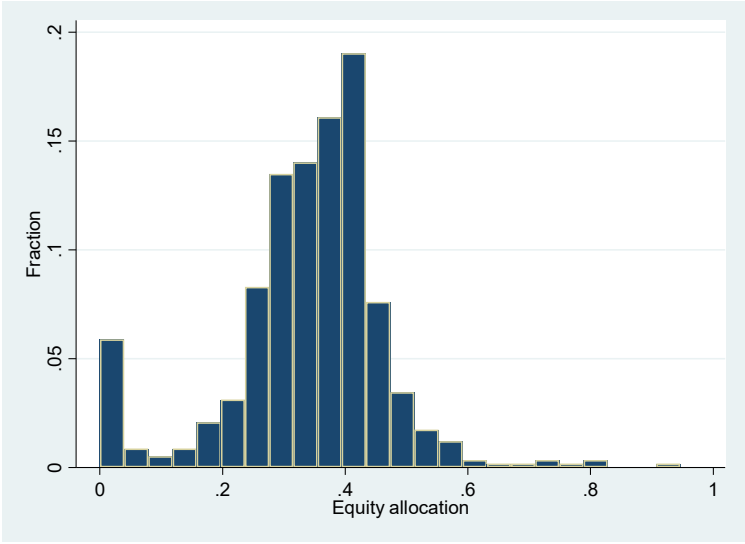
Governance indices	**Computed as sum of governance attributes scaled to 1:**
EFFECTIVENESS	General index, including the 24 governance attributes (1-24)
INTEGRITY	Dimension index, including 8 governance attributes (1-8)
COMMITMENT	Dimension index, including 8 governance attributes (9-16)
COMPETENCE	Dimension index, including 8 governance attributes (17-24)
Compliance	Solution index, including 2 governance attributes (1-2)
Representativeness	Solution index, including 6 governance attributes (3-8)
Incentives	Solution index, including 5 governance attributes (9-13)
Organisation	Solution index, including 3 governance attributes (14-16)
Expertise	Solution index, including 3 governance attributes (17-19)
Framework	Solution index, including 5 governance attributes (20-24)

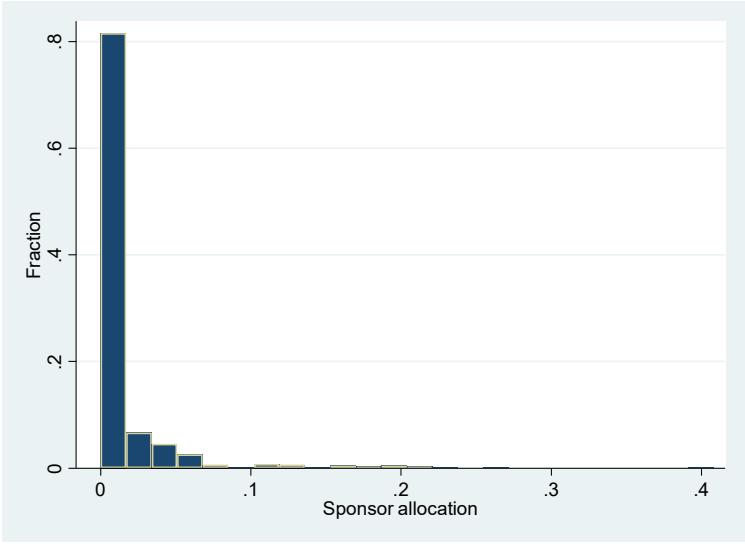
Governance attributes	**Equal to 1 if following conditions apply:**
(1) own code of best-practices	The pension fund has its own code of conduct, ethic, and disclosure practices built on the legal and regulatory requirements of LPP art. 51b, LPP art. 51c, OPP2 art. 48f-l
(2) ASIP charter and directive	The pension fund follows the prevalent ASIP charter and directive (based on duties, material benefits, and conflicts of interests)
(3) election procedure available	The board is constituted according to an election procedure for the selection and nomination of its trustees (LPP art. 51)
(4) equal representation	The number of trustees representing the employer equals the ones of the employees (and/or pensioners) (LPP art. 51-1)
(5) chairman employees representative	The chairman is a representative of the employees
(6) chairmanship alternation	The chairmanship is lead alternately by a representative of the employees and the employer (as recommended in LPP art. 51-3)
(7) manager not a trustee	The internal manager is not a trustee (or the attribute is equal to one if existence of a manager is equal to zero)
(8) no external trustees	The percentage of trustees in the board representing industry professionals, the state for public pension funds, or the founding sponsoring company for multi-employer pension funds is zero (as discussed in OPP2 art. 48h)
(9) compensation for attending	The trustees are compensated with at least an indemnity for attending board meetings as mentioned in fillings (LPP art. 51a-4)
(10) existence of a manager	An internal manager is available for the administration and/or investments of the pension fund
(11) women representatives	The percentage of women in the board is greater than zero
(12) board tenure at least three years	The minimum board tenure is three years
(13) board meets at least once per year	The minimum number of board meetings per year is one (to validate the annual financial statements)
(14) small number of trustees	The number of trustees is below or equal to six (with a lower bound of four following OPP2 art. 33)
(15) existence of committees	The number of committees to support the board of trustees is greater than one (as recommended in LPP art. 51a-3)
(16) existence of an investment committee	A separated investment committee exists
(17) election procedure based on expertise	The board election procedure is based on the expertise and competence of the candidates and trustees
(18) training of the trustees	A basic and continuous training is offered by the pension fund to the trustees as mentioned in fillings (LPP art. 51a-2-i)

(19) investment experts available	External investments experts are available to the pension fund (managers, consultants, specialists)
(20) investment policy available	An investment policy is mentioned in the financial statements (or there is a reference to the rules of investments) (LPP art. 51a-2-m and based on LPP art. 71-1)
(21) investment objectives defined	Investment objectives related to the strategic and tactical asset allocation are defined
(22) investment benchmarks defined	Investment benchmarks for each asset class or a global reference index for the portfolio are defined
(23) risk policy available	A risk policy is mentioned in the financial statements (or in the rules of investments)
(24) ALM study for the strategy	An ALM study to control the matching of the assets with the liabilities is used as basis for the investment policy (LPP art. 51a-2-n)

Appendix 4.2: Distribution of the main asset allocation variables

These figures present the histograms of the measures of asset allocation under study on the full sample (2012-2010).





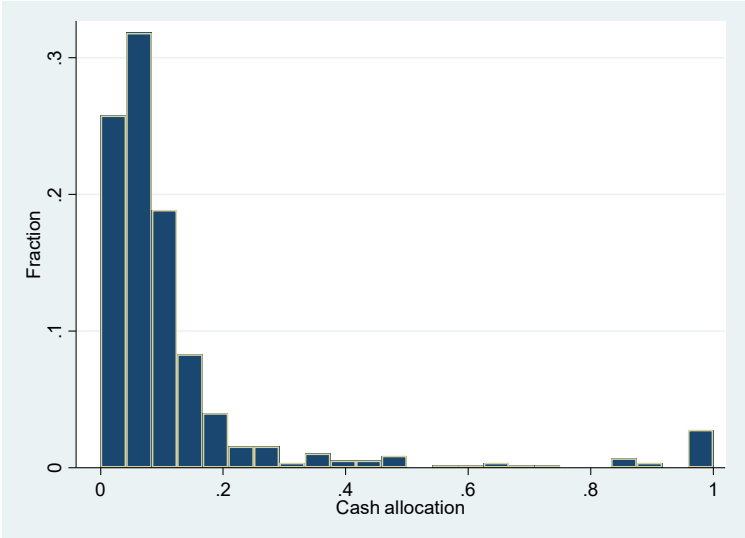


Table 4.1.

Descriptive statistics of Swiss pension funds.

This table presents summary statistics of the fund variables and structure characteristics for the full sample (2012-2010). The proportions of the structure characteristics are computed over non-missing values and over the number of pension funds. Means are also computed by weighting over total assets. Summary statistics for the coverage ratio are given separately for private pension funds and for public ones due to different legal funding treatment. Information on whether public pension funds follow a total or partial funding regime is not available. The variables are detailed in Appendix 4.1.

	Full sample (2012-2010)						
	Obs.	Sd	Min	Median	Mean	Mean (assets-weighted)	Max
Total assets (in mio CHF)	614	802.0612	0.09	43.27	281.52	2562.89	7846.39
Total beneficiaries	614	7394.4505	1	287	2455	16887	76687
Foundation age	614	20.8564	0	38	39	53	114
Coverage ratio (in %)							
Private	*570*	*18.6643*	*67.70*	*103.55*	*106.00*	*103.46*	*278.44*
Public	*32*	*17.3135*	*55.20*	*66.47*	*74.93*	*68.80*	*102.58*
Beneficiaries ratio	614	14.4496	0.00	4.38	8.93	4.90	196.00
Capital ratio	614	245.3639	0.00	1.90	25.17	12.58	5428.49
Technical rate (in %)	543	0.3811	2.00	3.50	3.60	3.66	4.50
Canton urban (dummy)	614	0.4818			63.52%	66.85%	
Liquidation procedure (dummy)	614	0.2661			7.65%	0.46%	
Legal form – PRIVATE	614	0.2224			94.79%	63.97%	
Plan type – DEFINED-BENEFITS	605	0.3594			15.21%	28.68%	
Administrative form – MULTI-EMPLOYER	614	0.4018			20.20%	38.64%	
Hedging type – AUTONOMOUS	614	0.3456			13.84%	59.31%	
Management administration – INTERNAL ADMIN.	614	0.4111			21.50%	55.72%	
Management investments – INTERNAL INVEST.	605	0.4341			25.12%	26.47%	

Table 4.2.

Descriptive statistics of pension governance variables.

This table presents summary statistics of the governance indices and attributes for the full sample (2012-2010). Note that by construction all the variables have a number of observations of 614. For the governance attributes, means are equivalent to proportions when computed over non-missing observations. The variables are detailed in Appendix 4.1.

	Full sample (2012-2010)	
	Sd	Mean
EFFECTIVENESS	**0.1197**	**54%**
INTEGRITY	**0.1569**	**54%**
Compliance	*0.2906*	*47%*
(1) own code of best-practices	0.4437	73%
(2) ASIP charter and directive	0.4089	21%
Representativeness	*0.1753*	*56%*
(3) election procedure available	0.4932	42%
(4) equal representation	0.3058	90%
(5) chairman employees representative	0.3796	17%
(6) chairmanship alternation	0.4220	23%
(7) manager not a trustee	0.4290	76%
(8) no external trustees	0.2972	90%
COMMITMENT	**0.1656**	**59%**
Incentives	*0.1891*	*65%*
(9) compensation for attending	0.4145	22%
(10) existence of a manager	0.4753	66%
(11) women representatives	0.4799	64%
(12) board tenure at least three years	0.2382	94%
(13) board meets at least once per year	0.3993	80%
Organisation	*0.2790*	*49%*
(14) small number of trustees	0.4794	64%
(15) existence of committees	0.4957	43%
(16) existence of an investment committee	0.4917	41%
COMPETENCE	**0.1767**	**50%**
Expertise	*0.2101*	*48%*
(17) election procedure based on expertise	0.0984	1%
(18) training of the trustees	0.4970	56%
(19) investment experts available	0.3315	87%
Framework	*0.2284*	*50%*
(20) investment policy available	0.2320	94%
(21) investment objectives defined	0.3918	81%
(22) investment benchmarks defined	0.4923	41%
(23) risk policy available	0.3258	12%
(24) ALM study for the strategy	0.4251	24%

Table 4.3.

Descriptive statistics of asset allocation variables.

This table presents summary statistics of the asset classes and allocation for the full sample (2012-2010) and the mean each year. The allocations are computed in % over sum of asset classes, except for sponsor allocation which is computed in % over total assets. The variables are detailed in Appendix 4.1.

	Full sample (2012-2010)								
	Obs.	Sd	Min	Median	Mean	Max	Mean (2012)	Mean (2011)	Mean (2010)
(1) Cash	578	0.1927	0.00%	7.21%	12.86%	100.00%	12.90%	14.97%	10.70%
(2) Swiss bonds	578	0.1339	0.00%	20.94%	21.66%	89.49%	20.17%	21.75%	22.96%
(3) Foreign bonds	578	0.0920	0.00%	12.75%	13.92%	80.21%	13.90%	13.83%	14.01%
(4) Swiss stocks	578	0.0756	0.00%	14.81%	14.89%	52.46%	15.22%	13.90%	15.60%
(5) Foreign stocks	578	0.0733	0.00%	14.81%	14.41%	47.45%	14.77%	13.45%	15.05%
(6) Real estate	578	0.1401	0.00%	14.65%	17.53%	99.87%	18.11%	17.52%	17.01%
(7) Alternatives	578	0.0588	0.00%	3.08%	4.73%	37.11%	4.93%	4.58%	4.68%
Equity allocation (4+5+7)	578	0.1304	0.00%	36.00%	34.03%	94.61%	34.92%	31.93%	35.32%
Sponsor allocation	614	0.0366	0.00%	0.11%	1.41%	40.78%	1.55%	1.35%	1.35%

Table 4.4.

Investment restrictions for asset allocation variables.

This table lists the asset allocation variables and their corresponding legal limits in Switzerland. Only the limits by asset classes (OPP2 art. 55 and OPP2 art. 57-2), when applicable to our classification, are shown in this table. Note that OPP2 art. 57-2 includes only employer's investments without guarantee as defined in our variable of sponsor allocation. The following elements are not under consideration: the compliance with authorized investments within the asset classes (OPP2 art. 53), the limits by a specific individual asset (OPP2 art. 54), and whether pension funds use OPP2 art. 50-4 to deviate from these limits by extending their investment possibilities. The time entry of application as reported is 2009 for OPP2 art. 55 and 2004 for OPP2 art. 57-2. This table also recalls the mean and max of the asset allocation variables for the full sample (2012-2010).

			Full sample (2012-2010)	
	Legal limits	Corresponding requirements	Mean	Max
(1) Cash			12.86%	100.00%
(2) Swiss bonds			21.66%	89.49%
(3) Foreign bonds			13.92%	80.21%
(4) Swiss stocks	} 50%	} OPP2 art. 55-b	14.89%	52.46%
(5) Foreign stocks			14.41%	47.45%
(6) Real estate	30%	OPP2 art. 55-c	17.53%	99.87%
(7) Alternatives	15%	OPP2 art. 55-d	4.73%	37.11%
Equity allocation (4+5+7)	65%	By computation	34.03%	94.61%
Sponsor allocation	5%	OPP2 art. 57-2	1.41%	40.78%

Table 4.5.

Pairwise correlation coefficients between asset allocation variables.

This table presents the pairwise Pearson's correlation coefficients between the asset allocation variables to be used in the empirical analysis on the full sample (2012-2010). The statistical significance at 1% of the correlation coefficients is highlighted with (*).

	-1-	-2-	-3-	-4-	-5-	-6-	-7-	-8-	-9-
-1- Cash	1								
-2- Swiss bonds	-0.349*	1							
-3- Foreign bonds	-0.355*	-0.163*	1						
-4- Swiss stocks	-0.386*	-0.021	0.081	1					
-5- Foreign stocks	-0.525*	0.072	0.247*	0.253*	1				
-6- Real estate	-0.262*	-0.360*	-0.150*	-0.121*	-0.207*	1			
-7- Alternatives	-0.152*	-0.084	-0.083	-0.130*	0.092	-0.055	1		
-8- Equity allocation (4+5+7)	-0.587*	-0.009	0.148*	0.664*	0.751*	-0.211*	0.427*	1	
-9- Sponsor allocation	0.067	-0.141*	-0.066	0.101	-0.117*	0.119*	-0.066	-0.037	1

Table 4.6.

Does it matter?

This table presents the results from the estimated regressions with the general index "effectiveness" and the set of control variables on the measures of asset allocation under study ("equity", "sponsor", and "cash"). For a matter of scale, "total assets" is transformed by taking the natural logarithm. Each regression is estimated with a time fixed-effect, cluster-robust standard errors by pension fund, and with two methods: (1) OLS with a constant seen as the base model and (2) Fractional logit using quasi-maximum likelihood (fractional response model). (1) For OLS, the coefficient estimates and the cluster-robust standard errors are presented as well as the adjusted R-squared and the statistical value from the F-test. (2) For fractional logit, the average marginal effects and the cluster-robust standard errors are given to facilitate the comparison with OLS coefficient estimates. The value of the log pseudo-likelihood and the statistical value from the Wald-test are also presented. For both methods of estimation, the number of observations is reported and the null hypothesis to be tested is that all coefficient estimates are equal to zero.

*Statistical significance: * p<0.05, ** p<0.01, *** p<0.001*

	(1) Base: OLS			**(2) Fractional Logit**		
	Equity	Sponsor	Cash	Equity	Sponsor	Cash
EFFECTIVENESS	0.0995	-0.0145	-0.1858*	0.0988	-0.0109	-0.1936*
	0.079	*0.015*	*0.094*	*0.079*	*0.015*	*0.091*
Total assets (ln)	0.0148	-0.0009	-0.0284*	0.0149	-0.0014	-0.0267**
	0.008	*0.002*	*0.011*	*0.008*	*0.002*	*0.008*
Foundation age	-0.0006	-0.0001	0.0000	-0.0006	-0.0001	-0.0002
	0.000	*0.000*	*0.001*	*0.000*	*0.000*	*0.001*
PRIVATE	-0.0133	-0.0381*	0.0243	-0.0135	-0.0332**	0.0322
	0.046	*0.017*	*0.041*	*0.047*	*0.011*	*0.042*
Liquidation procedure	-0.0545	0.0150	0.1255*	-0.0611	0.0098	0.0638
	0.029	*0.017*	*0.059*	*0.032*	*0.009*	*0.035*
Coverage ratio	0.0002	0.0000	-0.0010*	0.0002	0.0000	-0.0010*
	0.001	*0.000*	*0.000*	*0.001*	*0.000*	*0.000*
Beneficiaries ratio	-0.0004	0.0000	0.0010	-0.0005	0.0000	0.0003
	0.000	*0.000*	*0.001*	*0.001*	*0.000*	*0.001*
DEFINED-BENEFITS	-0.0089	-0.0070	0.0172	-0.0092	-0.0089	0.0134
	0.021	*0.005*	*0.026*	*0.021*	*0.005*	*0.022*
MULTI-EMPLOYER	-0.0607*	-0.0135*	0.0867	-0.0616*	-0.0182*	0.0771
	0.025	*0.006*	*0.047*	*0.025*	*0.007*	*0.040*
AUTONOMOUS	0.0232	0.0073	-0.0020	0.0219	0.0076	-0.0168
	0.023	*0.006*	*0.021*	*0.022*	*0.005*	*0.021*
constant	0.2727**	0.0642**	0.3593***			
	0.097	*0.023*	*0.086*			
Time FE	YES	YES	YES	YES	YES	YES
# Obs.	569	599	569	569	599	569
Adj. R-squared	11.14%	6.06%	20.27%			
F-test	5.10	1.65	3.36			
Log pseudo-likelihood				-362.58	-40.82	-193.48
Wald-test				54.61	35.65	67.81

Table 4.7.

What matters exactly?

This table presents the results from the estimated regressions with the three dimension indices (Panel A) and the six solution indices (Panel B) as well as the set of control variables on the measures of asset allocation under study ("equity", "sponsor", and "cash"). For the estimation, all the governance indices from the same group are integrated into the same regression. Only the results related with the governance indices are reported in this table. For a matter of scale, "total assets" is transformed by taking the natural logarithm. Each regression is estimated with a time fixed-effect, cluster-robust standard errors by pension fund, and with two methods: (1) OLS with a constant seen as the base model and (2) Fractional logit using quasi-maximum likelihood (fractional response model). (1) For OLS, the coefficient estimates and the cluster-robust standard errors are presented as well as the adjusted R-squared and the statistical value from the F-test. (2) For fractional logit, the average marginal effects and the cluster-robust standard errors are given to facilitate the comparison with OLS coefficient estimates. The value of the log pseudo-likelihood and the statistical value from the Wald-test are also presented. For both methods of estimation, the number of observations is reported and the null hypothesis to be tested is that all coefficient estimates are equal to zero.

*Statistical significance: * p<0.05, ** p<0.01, *** p<0.001*

	(1) Base: OLS			**(2) Fractional Logit**		
	Equity	Sponsor	Cash	Equity	Sponsor	Cash
Panel A: Three dimension indices						
INTEGRITY	-0.0379	-0.0131	0.0086	-0.0393	-0.0158	0.0122
	0.054	*0.010*	*0.078*	*0.053*	*0.011*	*0.065*
COMMITMENT	-0.0401	0.0173	0.1049	-0.0441	0.0198	0.0635
	0.044	*0.012*	*0.057*	*0.044*	*0.012*	*0.046*
COMPETENCE	0.1789*	-0.0198	-0.3076**	0.1836**	-0.0172	-0.2743**
	0.069	*0.014*	*0.109*	*0.070*	*0.014*	*0.089*
# Obs.	569	599	569	569	599	569
Adj. R-squared	14.34%	7.07%	25.34%			
F-test	5.01	1.54	3.35			
Log pseudo-likelihood				-361.83	-40.42	-189.63
Wald-test				59.95	46.99	89.22
Panel B: Six solution indices						
Compliance	-0.0195	0.0105	-0.0486	-0.0186	0.0089	-0.0516
	0.031	*0.007*	*0.035*	*0.030*	*0.007*	*0.034*
Representativeness	-0.0237	-0.0238*	0.0689	-0.0260	-0.0247*	0.0658
	0.049	*0.011*	*0.077*	*0.049*	*0.011*	*0.056*
Incentives	-0.0604	0.0109	0.1471*	-0.0643	0.0163	0.1080*
	0.048	*0.011*	*0.063*	*0.047*	*0.012*	*0.050*
Organisation	0.0086	0.0065	-0.0145	0.0079	0.0062	-0.0204
	0.027	*0.005*	*0.024*	*0.027*	*0.005*	*0.021*
Expertise	0.018	0.0097	-0.071	0.0203	0.0151	-0.0543
	0.040	*0.014*	*0.058*	*0.040*	*0.015*	*0.044*
Framework	0.1440**	-0.0286	-0.1956**	0.1461**	-0.0276*	-0.1664***
	0.051	*0.016*	*0.065*	*0.051*	*0.013*	*0.051*
# Obs.	569	599	569	569	599	569
Adj. R-squared	15.17%	9.37%	27.10%			
F-test	4.44	1.25	2.83			
Log pseudo-likelihood				-361.56	-39.63	-187.97
Wald-test				64.58	64.42	89.90

Table 4.8.

Robustness tests on equity allocation.

This table presents the results of the robustness tests on equity allocation from the estimated regressions with the general index "effectiveness", the three dimension indices (ICC), and the six solution indices (CRIOEF), as well as the set of control variables for each group. For the estimation, all the governance indices from the same group are integrated into the same regression. Only the results related with the governance indices are reported in this table. For a matter of scale, "total assets" and "total beneficiaries" are transformed by taking the natural logarithm. Each regression is estimated with OLS, a constant, a time fixed-effect, and cluster-robust standard errors by pension fund. For each estimated regression, the coefficient estimates of the governance indices and the cluster-robust standard errors are presented. The first test recalls the base result (1) and all the tests (2-14) are developed in details in the body of the chapter. For each test, the number of observations (N) is also reported for indication. For test (3), for the linear estimation, note that one pension fund containing only one pensioner among its beneficiaries and thus an excessively high "capital ratio" is omitted. For tests (8-9), the split between large and small pension funds is done based on the median of "total assets". For test (10), equity is computed in % over total assets instead of in % over sum of asset classes as used in the base regressions.

*Statistical significance: * p<0.05, ** p<0.01, *** p<0.001*

OLS: Equity	EFFECTIVENESS	INTEGRITY	COMMITMENT	COMPETENCE	Compliance	Representativeness	Incentives	Organisation	Expertise	Framework
(1) Base result	0.0995	-0.0379	-0.0401	0.1789*	-0.0195	-0.0237	-0.0604	0.0086	0.0180	0.1440**
(N=569)	*0.079*	*0.054*	*0.044*	*0.069*	*0.031*	*0.049*	*0.048*	*0.027*	*0.040*	*0.051*
(2) Total beneficiaries instead of total assets	0.1345	-0.0318	-0.0352	0.1983**	-0.0185	-0.0201	-0.0604	0.0126	0.0268	0.1545**
(N =569)	*0.077*	*0.054*	*0.045*	*0.068*	*0.031*	*0.049*	*0.049*	*0.028*	*0.041*	*0.050*
(3) Capital ratio instead of beneficiaries ratio	0.0970	-0.0325	-0.0359	0.1669*	-0.0201	-0.0189	-0.0602	0.0123	0.0080	0.1396**
(N =567)	*0.079*	*0.054*	*0.044*	*0.069*	*0.031*	*0.049*	*0.048*	*0.028*	*0.040*	*0.051*
(4) Canton urban as additional control	0.1095	-0.0336	-0.0378	0.1826**	-0.0121	-0.0257	-0.0606	0.0104	0.0170	0.1455**
(N =569)	*0.079*	*0.054*	*0.043*	*0.069*	*0.031*	*0.049*	*0.047*	*0.026*	*0.039*	*0.052*
(5) Technical rate as additional control	0.0002	-0.0492	-0.0182	0.0696	-0.0162	-0.0350	-0.0504	0.0172	-0.0174	0.0700
(N =510)	*0.062*	*0.050*	*0.041*	*0.066*	*0.029*	*0.045*	*0.042*	*0.029*	*0.036*	*0.050*
(6) Without public pension funds	0.0777	-0.0513	-0.0534	0.1834*	-0.0109	-0.0439	-0.0734	0.0045	0.0131	0.1472**
(N =540)	*0.088*	*0.056*	*0.046*	*0.072*	*0.033*	*0.050*	*0.050*	*0.029*	*0.041*	*0.053*
(7) Without funds in liquidation procedure	0.1054	-0.0424	-0.0366	0.1862*	-0.0307	-0.0169	-0.0528	0.0076	0.0327	0.1466**
(N =526)	*0.084*	*0.056*	*0.047*	*0.072*	*0.031*	*0.050*	*0.049*	*0.029*	*0.040*	*0.055*
(8) Large pension funds (total assets)	0.0692	0.0703	-0.1268*	0.1699	-0.0105	0.0775	-0.0956	-0.0360	0.0056	0.1426*
(N =299)	*0.084*	*0.079*	*0.058*	*0.093*	*0.035*	*0.063*	*0.054*	*0.039*	*0.046*	*0.071*

(9) Small pension funds (total assets)	0.1587	-0.1178	0.0471	0.2110*	-0.0136	-0.1171*	-0.0190	0.0641	0.0505	0.1458*
(N =270)	*0.140*	*0.064*	*0.094*	*0.099*	*0.070*	*0.059*	*0.087*	*0.046*	*0.063*	*0.065*
(10) Asset allocation over total assets	0.1100	-0.0453	-0.0505	0.2076**	-0.0302	-0.0221	-0.0646	0.0043	0.0394	0.1590**
(N =569)	*0.080*	*0.052*	*0.043*	*0.064*	*0.029*	*0.047*	*0.043*	*0.026*	*0.038*	*0.048*
(11) 1-year lag estimation	0.1312	-0.0198	-0.0305	0.1819*	-0.0041	-0.0180	-0.0519	0.0095	-0.0009	0.1544**
(N =376)	*0.086*	*0.054*	*0.049*	*0.071*	*0.031*	*0.048*	*0.051*	*0.029*	*0.044*	*0.053*
(12) 2-year lag estimation	0.0871	-0.0720	-0.0416	0.1988*	-0.0283	-0.0412	-0.0430	-0.0030	0.0024	0.1778**
(N =181)	*0.088*	*0.055*	*0.056*	*0.078*	*0.035*	*0.052*	*0.055*	*0.035*	*0.053*	*0.060*
(13) Internal invest as additional control	0.0780	-0.0465	-0.0479	0.1767*	-0.0264	-0.0229	-0.0642	0.0044	0.0050	0.1469**
(N =560)	*0.074*	*0.053*	*0.042*	*0.070*	*0.029*	*0.048*	*0.046*	*0.027*	*0.037*	*0.052*
(14) Internal admin as additional control	0.1267	-0.0374	-0.0202	0.1790*	-0.0208	-0.0212	-0.0454	0.0138	0.0175	0.1451**
(N =569)	*0.082*	*0.055*	*0.048*	*0.070*	*0.031*	*0.049*	*0.049*	*0.028*	*0.040*	*0.052*

Table 4.9.

Robustness tests on cash allocation.

This table presents the results of the robustness tests on cash allocation from the estimated regressions with the general index "effectiveness", the three dimension indices (ICC), and the six solution indices (CRIOEF), as well as the set of control variables for each group. For the estimation, all the governance indices from the same group are integrated into the same regression. Only the results related with the governance indices are reported in this table. For a matter of scale, "total assets" and "total beneficiaries" are transformed by taking the natural logarithm. Each regression is estimated with OLS, a constant, a time fixed-effect, and cluster-robust standard errors by pension fund. For each estimated regression, the coefficient estimates of the governance indices and the cluster-robust standard errors are presented. The first test recalls the base result (1) and all the tests (2-14) are developed in details in the body of the chapter. For each test, the number of observations (N) is also reported for indication. For test (3), for the linear estimation, note that one pension fund containing only one pensioner among its beneficiaries and thus an excessively high "capital ratio" is omitted. For tests (8-9), the split between large and small pension funds is done based on the median of "total assets". For test (10), cash is computed in % over total assets instead of in % over sum of asset classes as used in the base regressions.

*Statistical significance: * p<0.05, ** p<0.01, *** p<0.001*

OLS: Cash	EFFECTIVENESS	INTEGRITY	COMMITMENT	COMPETENCE	Compliance	Representativeness	Incentives	Organisation	Expertise	Framework
(1) Base result	-0.1858*	0.0086	0.1049	-0.3076**	-0.0486	0.0689	0.1471*	-0.0145	-0.0710	-0.1956**
(N=569)	*0.094*	*0.078*	*0.057*	*0.109*	*0.035*	*0.077*	*0.063*	*0.024*	*0.058*	*0.065*
(2) Total beneficiaries instead of total assets	-0.2479**	-0.0020	0.0966	-0.3428**	-0.0502	0.0631	0.1484*	-0.0219	-0.0869	-0.2139**
(N =569)	*0.089*	*0.078*	*0.058*	*0.114*	*0.036*	*0.078*	*0.066*	*0.025*	*0.059*	*0.066*
(3) Capital ratio instead of beneficiaries ratio	-0.1853	-0.0043	0.0995	-0.2896**	-0.0478	0.0551	0.1413*	-0.0153	-0.0600	-0.1868**
(N =567)	*0.095*	*0.078*	*0.059*	*0.110*	*0.035*	*0.078*	*0.063*	*0.024*	*0.063*	*0.065*
(4) Canton urban as additional control	-0.1762	0.0124	0.1069	-0.3045**	-0.0473	0.0686	0.1470*	-0.0142	-0.0712	-0.1953**
(N =569)	*0.094*	*0.078*	*0.058*	*0.107*	*0.035*	*0.077*	*0.063*	*0.024*	*0.058*	*0.065*
(5) Technical rate as additional control	-0.0321	-0.0048	0.0396	-0.0766	-0.0241	0.0189	0.0602	-0.0061	0.0248	-0.0695
(N =510)	*0.058*	*0.052*	*0.046*	*0.058*	*0.027*	*0.056*	*0.052*	*0.017*	*0.034*	*0.039*
(6) Without public pension funds	-0.1895	0.0143	0.1198	-0.3318**	-0.0702	0.0886	0.1660*	-0.0098	-0.0743	-0.2107**
(N =540)	*0.100*	*0.080*	*0.062*	*0.112*	*0.039*	*0.079*	*0.067*	*0.025*	*0.060*	*0.066*
(7) Without funds in liquidation procedure	-0.1706	0.0190	0.0904	-0.2864*	-0.0343	0.0632	0.1195	-0.0087	-0.0894	-0.1715*
(N =526)	*0.087*	*0.078*	*0.056*	*0.113*	*0.032*	*0.076*	*0.061*	*0.024*	*0.057*	*0.068*
(8) Large pension funds (total assets)	-0.0847	0.0115	0.0045	-0.1070	-0.0428	0.0533	0.0349	-0.0096	-0.0051	-0.0695
(N =299)	*0.064*	*0.048*	*0.053*	*0.083*	*0.028*	*0.035*	*0.055*	*0.020*	*0.031*	*0.055*

(9) Small pension funds (total assets)	-0.3616	0.0693	0.1046	-0.4593**	0.0134	0.0864	0.1645	-0.0583	-0.0695	-0.3612**
(N =270)	*0.185*	*0.128*	*0.089*	*0.170*	*0.074*	*0.124*	*0.105*	*0.056*	*0.108*	*0.107*
(10) Asset allocation over total assets	-0.0813	-0.1076*	0.0695	-0.0549	-0.0246	-0.0796	0.0634	0.0125	0.0001	-0.0469
(N =569)	*0.059*	*0.054*	*0.048*	*0.048*	*0.024*	*0.046*	*0.047*	*0.018*	*0.034*	*0.036*
(11) 1-year lag estimation	-0.2397*	-0.0411	0.1072	-0.3144**	-0.0786	0.0482	0.1630*	-0.0176	-0.0677	-0.1934**
(N =376)	*0.118*	*0.077*	*0.073*	*0.118*	*0.042*	*0.070*	*0.072*	*0.029*	*0.065*	*0.071*
(12) 2-year lag estimation	-0.1637	0.0517	0.1052	-0.3248**	-0.0459	0.0993	0.1278	0.0033	-0.0690	-0.2030**
(N =181)	*0.115*	*0.085*	*0.087*	*0.124*	*0.055*	*0.083*	*0.080*	*0.034*	*0.079*	*0.077*
(13) Internal invest as additional control	-0.1559	0.0108	0.1144*	-0.2924*	-0.0434	0.0647	0.1580*	-0.0143	-0.0516	-0.1914**
(N =560)	*0.091*	*0.080*	*0.057*	*0.114*	*0.034*	*0.078*	*0.065*	*0.023*	*0.062*	*0.066*
(14) Internal admin as additional control	-0.2235*	0.0081	0.0830	-0.3077**	-0.0474	0.0666	0.1333*	-0.0193	-0.0705	-0.1966**
(N =569)	*0.098*	*0.079*	*0.059*	*0.110*	*0.035*	*0.079*	*0.067*	*0.023*	*0.059*	*0.065*

Academic references

Adams, R., Ferreira, D., 2009. Women in the boardroom and their impact on governance and performance. *Journal of Financial Economics* 94, 291-309.

Adams, R., Hermalin, B., Weisbach, M., 2010. The role of boards of directors in corporate governance: A conceptual framework and survey. *Journal of Economic Literature* 48, 58-107.

Adams, J., Mansi, S., Nishikawa, T., 2010. Internal governance mechanisms and operational performance: Evidence from index mutual funds. *The Review of Financial Studies* 23, 1261-1286.

Agrawal, A., Knoeber, C., 2001. Do some outside directors play a political role? *Journal of Law and Economics* 44, 179-198.

Albrecht, W., Hingorani, V., 2004. Effects of governance practices and investment strategies on state and local government pension fund financial performance. *International Journal of Public Administration* 27, 673-700.

Albrecht, W., Shamsub, H., Giannatasio, N., 2007. Public pension fund governance practices and financial performance. *J. of Public Budgeting, Accounting & Financial Management* 19, 246-268.

Ambachtsheer, K., 1994. The economics of pension fund management. *Financial Analysts Journal* Nov-Dec, 21-31.

Ambachtsheer, K., Capelle, R., Lum, H., 2008. The pension governance deficit: Still with us. *Rotman International Journal of Pension Management* 1, 14-21.

Ambachtsheer, K., Capelle, R., Scheibelhut, T., 1998. Improving pension fund performance. *Financial Analysts Journal* 11/12, 15-21.

Ambachtsheer, K., McLaughlin, J., 2015. How effective is pension fund governance today? And do pension funds invest for the long-term? Findings from a new survey. Working Paper, KPA Advisory Services LTD.

Ammann, M., Ehmann, C., 2017. Is governance related to investment performance and asset allocation? Empirical evidence from Swiss pension funds. *Swiss Journal of Economics and Statistics* 153, 293-339.

Ammann, M., Oesch, D., Schmid, M., 2011. Corporate governance and firm value: International evidence. *Journal of Empirical Finance* 18, 36-55.

Ammann, M., Zingg, A., 2010. Performance and governance of Swiss pension funds. *Journal of Pension Economics and Finance* 9, 95-128.

An, H., Huang, Z., Zhang, T., 2013. What determines corporate pension fund risk-taking strategy? *Journal of Banking and Finance* 37, 597-613.

Andonov, A., Bauer, R., Cremers, M., 2012. Can large pension funds beat the market? Asset allocation, market timing, security selection, and the limits of liquidity. Working Paper, Maastricht University and University of Notre Dame.

Andonov, A., Bauer, R., Cremers, M., 2013. Pension fund asset allocation and liability discount rates: Camouflage and reckless risk taking by U.S. public plans? Working Paper, Maastricht University and University of Notre Dame.

Andonov, A., Hochberg, Y., Rauh, J., 2016. Political representation and governance: Evidence from the investment decisions of public pension funds. Working Paper, Erasmus University, Rice University, and Stanford University.

Atanasova, C., Chemla, G., 2014. Familiarity breeds alternative investment: Evidence from corporate defined-benefit pension plans. Working Paper, Simon Fraser University and Imperial College Business School.

Bauer, R., Lum, H., Frehen, R., Otten, R., 2008. The performance of US pension funds: New insights into the agency costs debate. Working Paper, Rotman International Centre for Pension Management.

Beatty, A., 1994. An empirical analysis of the corporate control, tax and incentive motivations for adopting leveraged employee stock ownership plans. *Managerial and Decision Economics* 15, 299-315.

Bebchuk, L., Cohen, A., 2005. The costs of entrenched boards. *Journal of Financial Economics* 78, 409-433.

Bebchuk, L., Cohen, A., Ferrell, A., 2009. What matters in corporate governance? *The Review of Financial Studies* 22, 783-827.

Bebchuk, L., Weisbach, M., 2010. The state of corporate governance research. *The Review of Financial Studies* 23, 939-961.

Becht, M., Bolton, P., Röell, A., 2005. Corporate governance and control. Working Paper, European Corporate Governance Institute.

Benartzi, S., 2001. Excessive extrapolation and the allocation of 401(k) accounts to company stock. *The Journal of Finance* 56, 1747-1764.

Benartzi, S., Thaler, R., 2001. Naive diversification strategies in defined contribution saving plans. *The American Economic Review* 91, 79-98.

Benartzi, S., Thaler, R., Utkus, S., Sunstein, C., 2007. The law and economics of company stock in 401(k) plans. *Journal of Law and Economics* 50, 45-79.

Bergstresser, D., Desai, M., Rauh, J., 2006. Earnings manipulation, pension assumptions and managerial investment decisions. *The Quarterly Journal of Economics*, February, 157-195.

Berle, A., Means, G., 1932. The Modern Corporation and Private Property. Ed: Macmillan Publishing Co., New York.

Bertrand, M., Mullainathan, S., 2003. Enjoying the quiet life? Corporate governance and managerial preferences. *Journal of Political Economy* 111, 1043-1075.

Besley, T., Prat, A., 2003. Pension fund governance and the choice between defined benefit and defined contribution plans. Working Paper, London School of Economics.

Bhagat, S., Black, B., 1999. The uncertain relationship between board composition and firm performance. *The Business Lawyer* 54, 921-963.

Bhagat, S., Black, B., 2002. The non-correlation between board independence and long-term firm performance. *The Journal of Corporation Law* 27, 231-273.

Bhagat, S., Bolton, B., Romano, R., 2008. The promise and peril of corporate governance indices. *Columbia Law Review* 108, 1803-1882.

Bikker, J., 2017. Is there an optimal pension fund size? A scale-economy analysis of administrative costs. *The Journal of Risk and Insurance* 84, 739-769.

Bikker, J., De Dreu, J., 2009. Operating costs of pension funds: The impact of scale, governance, and plan design. *Journal of Pension Economics and Finance* 8, 63-89.

Bikker, J., Steenbeek, O., Torracchi, F., 2012. The impact of scale, complexity, and service quality on the administrative costs of pension funds: A cross-country comparison. *The Journal of Risk and Insurance* 79, 477-514.

Bird, R., Gray, J., 2013. Principles, principals and agents. Working Paper, University of Technology Sydney.

Blake, D., Lehmann, B., Timmermann, A., 1999. Asset allocation dynamics and pension fund performance. *Journal of Business* 72, 429-461.

Bodie, Z., Marcus, A., Merton, R., 1988. Defined benefit versus defined contribution pension plans: What are the real trade-offs? In: Bodie, Z., Shoven, J., Wise, D. (Ed.), Pensions in the U.S. Economy, Chapter 5. University of Chicago Press.

Bolla, L., Wittig, H., Kohler, A., 2016. The liability market value as benchmark in pension fund performance measurement. *Journal of Pension Economics and Finance* 15, 90-111.

Bonini, S., Deng, J., Ferrari, M., John, K., 2017. On long-tenured independent directors. Working Paper, New York University.

Boone, A., Field, L., Karpoff, J., Raheja, C., 2007. The determinants of corporate board size and composition: An empirical analysis. *Journal of Financial Economics* 85, 66-101.

Bouvatier, V., Rigot, S., 2013. Pension funds' allocations to hedge funds: An empirical analysis of US and Canadian defined benefit plans. *Applied Economics* 45, 3701-3710.

Bradley, D., Pantzalis, C., Yuan, X., 2016. The influence of political bias in state pension funds. *Journal of Financial Economics* 119, 69-91.

Brinson, G., Hood, R., Beebower, G., 1986. Determinants of portfolio performance. *Financial Analysts Journal* 07/08, 39-44.

Brinson, G., Singer, B., Beebower, G., 1991. Determinants of portfolio performance II: An update. *Financial Analysts Journal* 05/06, 40-48.

Brown, J., Liang, N., Weisbenner, S., 2007. Individual account investment options and portfolio choice: Behavioral lessons from 401(k) plans. *Journal of Public Economics* 91, 1992-2013.

Bubb, R., Corrigan, P., Warren, P., 2015. A behavioral contract theory perspective on retirement savings. Working Paper, New York University School of Law.

Bütler, M., 2014. Insights from Switzerland's pension system. Working Paper, Pension Research Council, University of Pennsylvania.

Bütler, M., Ruesch, M., 2007. Annuities in Switzerland. Working Paper, The World Bank.

Carmichael, J., Palacios, R., 2004. A framework for public pension fund management. In: Musalem, A., Palacios, R. (Ed.), Public Pension Fund Management: Governance, Accountability, and Investment Policies, Chapter 1. The World Bank.

Chau, S., 2011. An anatomy of corporate governance. *The IUP Journal of Corporate Governance* 10, 7-21.

Chhaochharia, V., Laeven, L., 2009. Corporate governance norms and practices. *J. Finan. Intermediation* 18, 405-431.

Choi, J., 2015. Contributions to defined contribution pension plans. Working Paper, NBER No. 21467.

Choi, J., Laibson, D., Madrian, B., Metrick, A., 2002. Defined contribution pensions: Plan rules, participant choices, and the path of least resistance. *Tax Policy and the Economy* 16, 67-113.

Choi, J., Laibson, D., Madrian, B., Metrick, A., 2003. Employees' investment decisions about company stock. Working Paper, Harvard University and University of Pennsylvania.

Choudhury, B., 2014. New rationales for women on boards. *Oxford Journal of Legal Studies* (2014), 1-32.

Clark, G., 2004. Pension fund governance: Expertise and organizational form. *Journal of Pension Economics and Finance* 3, 233-253.

Clark, G., 2007. Expertise and representation in financial institutions: UK legislation on pension fund governance and US regulation of the mutual fund industry. *Twenty-First Century Society: Journal of the Academy of Social Sciences* 2, 1-24.

Clark, G., Caerlewy-Smith, E., Marshall, J., 2006. Pension fund trustee competence: Decision making in problems relevant to investment practice. *Journal of Pension Economics and Finance* 5, 91-110.

Clark, G., Caerlewy-Smith, E., Marshall, J., 2007. The consistency of UK pension fund trustee decision-making. *Journal of Pension Economics and Finance* 6, 67-86.

Clark, G., Urwin, R., 2008. Best-practice pension fund governance. *Journal of Asset Management* 9, 2-21.

Clark, G., Urwin, R., 2010. DC pension fund best-practice design and governance. Working Paper, Oxford University and Monash University.

Cocco, J., Volpin, P., 2007. Corporate governance of pension plans: The U.K. evidence. *Financial Analysts Journal* 63, 70-83.

Comment, R., Schwert, W., 1995. Poison or placebo? Evidence on the deterrence and wealth effects of modern antitakeover measures. *Journal of Financial Economics* 39, 3-43.

Connelly, T., Limpaphayom, P., 2004. Board characteristics and firm performance: Evidence from the life insurance industry in Thailand. *Chulalongkorn Journal of Economics* 16, 101-124.

Cosandey, J., 2013. Un deuxième pilier vacillant : Pour des ajustements décentralisés du taux de conversion. Avenir Suisse, Points de vue.

Cotellon-Rigot, S., 2012. Stratégies et gouvernance des fonds de pension. PhD Thesis. *Vie & sciences de l'entreprise* 190, 16-29.

Craft, T., 2005. How funding ratios affect pension plan portfolio allocations. *Journal of Real Estate Portfolio Management* 11, 29-35.

Davis, G., Useem, M., 2001. Top management, company directors and corporate control. In: Handbook of Strategy and Management, Chapter 11, 233-259.

De Andres, P., Vallelado, E., 2008. Corporate governance in banking: The role of the board of directors. *Journal of Banking and Finance* 32, 2570-2580.

Defond, M., Hann, R., Hu, X., 2005. Does the market value financial expertise on audit committees of boards of directors? *Journal of Accounting Research* 43, 153-193.

Del Guercio, D., Dann, L., Partch, M., 2003. Governance and boards of directors in closed-end investment companies. *Journal of Financial Economics* 69, 111-152.

Del Guercio, D., Hawkins, J., 1999. The motivation and impact of pension fund activism. *Journal of Financial Economics* 52, 293-340.

Del Guercio, D., Tkac, P., 2002. The determinants of the flow of funds of managed portfolios: Mutual funds vs. pension funds. *Journal of Financial and Quantitative Analysis* 37, 523-557.

Denis, D., 2001. Twenty-five years of corporate governance research… and counting. *Review of Financial Economics* 10, 191-212.

Denis, D., McConnell, J., 2003. International corporate governance. Working Paper, European Corporate Governance Institute.

Dittmar, A., Mahrt-Smith, J., 2007. Corporate governance and the value of cash holdings. *Journal of Financial Economics* 83, 599-634.

Dobra, M., Lubich, B., 2013. Public pension governance and asset allocation. *The Business and Economics Research Journal* 6, 83-101.

Doidge, C., Karolyi, A., Stulz, R., 2007. Why do countries matter so much for corporate governance? *Journal of Financial Economics* 86, 1-39.

Dvorak, T., 2015. Do 401k plan advisors take their own advice? *Journal of Pension Economics and Finance* 14, 55-75.

Dyck, A., Pomorski, L., 2011. Is bigger better? Size and performance in pension plan management. Working Paper, University of Toronto, Rotman School of Management.

Eaton, T., Nofsinger, J., 2004. The effect of financial constraints and political pressure on the management of public pension plans. *Journal of Accounting and Public Policy* 23, 161-189.

Eisenhardt, K., 1989. Agency theory: An assessment and review. *The Academy of Management Review* 14, 57-74.

Elder, E., Wagner, G., 2015. Political effects on pension underfunding. *Economics & Politics* 27, 1-27.

Elton, E., Gruber, M., Blake, C., 2006. The adequacy of investment choices offered by 401(k) plans. *Journal of Public Economics* 90, 1299-1314.

Even, W., Macpherson, D., 2004. Company stock in pension funds. *National Tax Journal* 57, 299-313.

Even, W., Macpherson, D., 2008. Pension investments in employer stock. *Journal of Pension Economics and Finance* 7, 67-93.

Faccio, M., Lasfer, A., 2000. Institutional shareholders and corporate governance: The case of UK pension funds. Working Paper, University of Milano and London City University Business School.

Faleye, O., 2007. Classified boards, firm value, and managerial entrenchment. *Journal of Financial Economics* 83, 501-529.

Fama, E., 1980. Agency problems and the theory of the firm. *Journal of Political Economy* 88, 288-307.

Fama, E., Jensen, M., 1983. Separation of ownership and control. *Journal of Law and Economics* 26, 301-325.

Farrell, J., Shoag, D., 2016. Asset management in public DB and non-DB pension plans. *Journal of Pension Economics and Finance* 15, 379-406.

Ferreira, D., Kirchmaier, T., Metzger, D., 2011. Boards of banks. Working Paper, London School of Economics.

Fich, E., 2005. Are some outside directors better than others? Evidence from director appointments by Fortune 1000 firms. *Journal of Business* 78, 1943-1971.

Fich, E., Shivdasani, A., 2006. Are busy boards effective monitors? *The Journal of Finance* 61, 689-724.

Franzoni, F., 2009. Underinvestment vs. overinvestment: Evidence from price reactions to pension contributions. *Journal of Financial Economics* 92, 491-518.

Frésard, L., 2010. Financial strength and product market behavior: The real effects of corporate cash holdings. *The Journal of Finance* 65, 1097-1122.

Frésard, L., Salva, C., 2010. The value of excess cash and corporate governance: Evidence from US cross-listings. *Journal of Financial Economics* 98, 359-384.

Gallani, S., Krishnan, R., Wooldridge, J., 2016. Applications of fractional response model to the study of bounded dependent variables in accounting research. Working Paper, Harvard Business School and Michigan State University.

Gerber, D., Weber, R., 2007. Aging, asset allocation, and costs: Evidence for the pension fund industry in Switzerland. Working Paper, International Monetary Fund.

Gerrans, P., Clark, G., 2013. Pension plan participant choice: Evidence on defined benefit and defined contribution preferences. *Journal of Pension Economics and Finance* 12, 351-378.

Gillan, S., 2006. Recent developments in corporate governance: An overview. *Journal of Corporate Finance* 12, 381-402.

Gompers, P., Ishii, J., Metrick, A., 2003. Corporate governance and equity prices. *The Quarterly Journal of Economics* 118, 107-155.

Gray, S., Nowland, J., 2014. Professional expertise and board diversity. Working Paper, University of Queensland and City University of Hong Kong.

Guan, Y., Lui, D., 2016. The effect of regulations on pension risk shifting: Evidence from the US and Europe. *Journal of Business Finance & Accounting* 43, 765-799.

Güner, B., Malmendier, U., Tate, G., 2008. Financial expertise of directors. *Journal of Financial Economics* 88, 323-354.

Harford, J., Mansi, S., Maxwell, W., 2008. Corporate governance and firm cash holdings in the US. *Journal of Financial Economics* 87, 535-555.

Harper, J., 2008a. Board of trustee composition and investment performance of US public pension plans. Working Paper, Rotman International Centre for Pension Management.

Harper, J., 2008b. Public sector pension governance in the United States: Up to the task? *Rotman International Journal of Pension Management* 1, 22-28.

Harris, M., Raviv, A., 2008. A theory of board control and size. *The Review of Financial Studies* 21, 1797-1832.

Hermalin, B., Weisbach, M., 2003. Boards of directors as an endogenously determined institution: A survey of the economic literature. *Economic Policy Review* 9, 7-26.

Hess, D., 2005. Protecting and politicizing public pension fund assets: Empirical evidence on the effects of governance structures and practices. Working Paper, University of California.

Hess, D., Impavido, G., 2004. Governance of public pension funds: Lessons from corporate governance and international evidence. In: Musalem, A., Palacios, R. (Ed.), Public Pension Fund Management: Governance, Accountability, and Investment Policies, Chapter 2. The World Bank.

Hood, R., 2005. Determinants of portfolio performance: 20 years later. *Financial Analysts Journal* 09/10, 6-8.

Hornung, D., Beer-Toth, K., Bernhard, T., Gardiol, L., Röthlisberger, T., 2011. Verwaltungskosten der 2. Säule in Vorsorgeeinrichtungen und Unternehmen. Publication by OFAS & SECO.

Huberman, G., Jiang, W., 2006. Offering versus choice in 401(k) plans: Equity exposure and number of funds. *The Journal of Finance* 61, 763-801.

Ibbotson, R., Kaplan, P., 2000. Does asset allocation policy explain 40, 90, or 100 percent of performance? *Financial Analysts Journal* Jan/Feb, 26-33.

Impavido, G., 2002. On the governance of public pension fund management. Working Paper, The World Bank.

Jackowicz, K., Kowalewski, O., 2012. Crisis, internal governance mechanisms and pension fund performance: Evidence from Poland. *Emerging Markets Review* 13, 493-515.

Jensen, M., Meckling, W., 1976. Theory of the firm: Managerial behavior, agency costs and ownership structure. *Journal of Financial Economics* 3, 305-360.

John, K., Senbet, L., 1998. Corporate governance and board effectiveness. *Journal of Banking and Finance* 22, 371-403.

Kisser, M., Kiff, J., Soto, M., 2015. Do pension plans manipulate pension liabilities? Working Paper, NETSPAR Academic Series.

Koedijk, K., Slager, A., Bauer, R., 2010. Investment beliefs that matter: New insights into the value drivers of pension funds. Working Paper, Rotman International Centre for Pension Management.

Kowalewski, O., 2012. Corporate governance and pension fund performance. *Contemporary Economics* 6, 14-44.

Kruskal, W., 1968. When are Gauss-Markov and least squares estimators identical? A coordinate-free approach. *The Annals of Mathematical Statistics* 39, 70-75.

Lakonishok, J., Shleifer, A., Vishny, R., 1992. The structure and performance of the money management industry. *Brookings Papers: Microeconomics* 1992, 339-391.

Larcker, D., Ormazabal, G., Taylor, D., 2011. The market reaction to corporate governance regulation. *Journal of Financial Economics* 101, 431-448.

Larcker, D., Richardson, S., Tuna, I., 2007. Corporate governance, accounting outcomes, and organizational performance. *The Accounting Review* 82, 963-1008.

Lee, Y.-T., Liu, Y.-J., Zhu, N., 2007. The cost of owning employer stock: Lessons from Taiwan. Working Paper, Center for Retirement Research at Boston College.

Lehn, K., Patro, S., Zhao, M., 2009. Determinants of the size and composition of US corporate boards: 1935-2000. *Financial Management* Winter, 747-780.

Lipton, M., Lorsch, J., 1992. A modest proposal for improved corporate governance. *The Business Lawyer* 48, 59-77.

Lusardi, A., Mitchell, O., 2011. Financial literacy around the world: An overview. *Journal of Pension Economics and Finance* 10, 497-508.

Lusardi, A., Mitchell, O., 2014. The economic importance of financial literacy: Theory and evidence. *Journal of Economic Literature* 52, 5-44.

Madrian, B., Shea, D., 2001. The power of suggestion: Inertia in 401(k) participation and savings behavior. *The Quarterly Journal of Economics* 116, 1149-1187.

Markowitz, H., 1952. Portfolio selection. *The Journal of Finance* 7, 77-91.

Mayers, D., Shivdasani, A., Smith, C., 1997. Board composition and corporate control: Evidence from the insurance industry. *Journal of Business* 70, 33-62.

McCarthy, D., Miles, D., 2013. Optimal portfolio allocation for corporate pension funds. *European Financial Management* 19, 599-629.

Mettler, U., Schwendener, A., 2011. Frais de gestion de la fortune dans le 2e pilier. Publication by OFAS.

Meulbroek, L., 2005. Company stock in pension plans: How costly is it? *Journal of Law and Economics* 48, 443-474.

Mitchell, O., Hsin, P., 1994. Public pension governance and performance. Working Paper, NBER No. 4632.

Mitchell, O., Utkus, S., 2003. Lessons from behavioral finance for retirement plan design. Working Paper, Pension Research Council.

Mitchell, O., Utkus, S., 2004. The role of company stock in defined contribution plans. In: The Pension Challenge: Risk transfers and retirement income security, Chapter 3, 33-70.

Mohan, N., Zhang, T., 2014. An analysis of risk-taking behavior for public defined benefit pension plans. *Journal of Banking and Finance* 40, 403-419.

Netter, J., Poulsen, A., Stegemoller, M., 2009. The rise of corporate governance in corporate control research. *Journal of Corporate Finance* 15, 1-9.

Newell, G., Kreuze, J., Hurtt, D., 2002. Corporate pension plans: How consistent are the assumptions in determining pension funding status? *Mid-American Journal of Business* 17, 23-30.

Njuguna, A., 2010. Strategies to improve pension fund efficiency in Kenya. PhD Thesis, Nelson Mandela Metropolitan University.

Njuguna, A., 2011. Determinants of pension governance: A survey of pension plans in Kenya. *International Journal of Business and Management* 6, 101-111.

Papke, L., Wooldridge, K., 1996. Econometric methods for fractional response variables with an application to 401(K) plan participation rates. *Journal of Applied Econometrics* 11, 619-632.

Papke, L., Wooldridge, J., 2008. Panel data methods for fractional response variables with an application to test pass rates. *Journal of Econometrics* 145, 121-133.

Park, Y., 2014. Risk-taking behavior of public pension plans before and after the financial crisis of 2008. *The Journal of Applied Business Research* 30, 557-566.

Pennacchi, G., Rastad, M., 2011. Portfolio allocation for public pension funds. *Journal of Pension Economics and Finance* 10, 221-245.

Pinkowitz, L., Stulz, R., Williamson, R., 2006. Does the contribution of corporate cash holdings and dividends to firm value depend on governance? A cross-country analysis. *The Journal of Finance* 61, 2725-2751.

Plantinga, A., 2005. Performance measurement for pension funds. Working Paper, University of Groningen.

Plantinga, A., Huijgen, C., 2000. Performance measurement and insurance liabilities. Working Paper, University of Groningen.

Poterba, J., 2003. Employer stock and 401(k) plans. *The American Economic Review* 93, 398-404.

Poterba, J., 2004. Portfolio risk and self-directed retirement saving programmes. *The Economic Journal* 114, C26-C51.

Poterba, J., Rauh, J., Venti, S., Wise, D., 2007. Defined contribution plans, defined benefit plans, and the accumulation of retirement wealth. *Journal of Public Economics* 91, 2062-2086.

Queisser, M., Vittas, D., 2000. The Swiss multi-pillar pension system: Triumph of common sense? Working Paper, The World Bank.

Ramaswamy, K., 2004. Company stock and pension plan diversification. In: The Pension Challenge: Risk transfers and retirement income security, Chapter 4, 71-88.

Rauh, J., 2006a. Own company stock in defined contribution pension plans: A takeover defense? *Journal of Financial Economics* 81, 379-410.

Rauh, J., 2006b. Investment and financing constraints: Evidence from the funding of corporate pension plans. *The Journal of Finance* 61, 33-71.

Rauh, J., 2009. Risk shifting versus risk management: Investment policy in corporate pension plans. *The Review of Financial Studies* 22, 2687-2733.

Rocha, R., Vittas, D., Rudolph, H., 2010. The payout phase of pension systems: A comparison of five countries. Working Paper, The World Bank.

Romano, R., 1993. Public pension fund activism in corporate governance reconsidered. *Yale Law School*, Faculty Scholarship Series, 795-853.

Romano, R., 1995. The politics of public pension funds. *The Public Interest* Spring, 42-53.

Romano, R., 2001. Less is more: Making institutional investor activism a valuable mechanism of corporate governance. *Yale Law School*, Faculty Scholarship Series, 175-251.

Schneider, M., Damanpour, F., 2002. Public choice economics and public pension plan funding: An empirical test. *Administration & Society* 34, 57-86.

Shleifer, A., Vishny, R., 1997. A survey of corporate governance. *The Journal of Finance* 52, 737-783.

Sialm, C., Starks, L., Zhang, H., 2015. Defined contribution pension plans: Sticky or discerning money? *The Journal of Finance* 70, 805-838.

Smith, A., 1776. The Wealth of Nations. Ed, 1937: Modern Library, New York.

Souto, P., Musalem, A., 2012. Assessing the governance and transparency of national public pension funds. *Review of European Studies* 4, 148-167.

Stewart, F., Yermo, J., 2008. Pension fund governance: Challenges and potential solutions. Working Paper, OECD Working Papers on Insurance and Private Pensions No. 18.

Tan, M., Cam, M.-A., 2013. Explaining pension fund product and governance disclosure in Australia. *Australasian Accounting, Business and Finance Journal* 7, 49-68.

Tan, M., Cam, M.-A., 2015. Does governance structure influence pension fund fees and costs? An examination of Australian not-for-profit superannuation funds. Working Paper, RMIT University (Australia).

Tang, N., Mitchell, O., Mottola, G., Utkus, S., 2010. The efficiency of sponsor and participant portfolio choices in 401(k) plans. *Journal of Public Economics* 94, 1073-1085.

Tufano, P., Sevick, M., 1997. Board structure and fee-setting in the U.S. mutual fund industry. *Journal of Financial Economics* 46, 321-355.

Useem, M., Mitchell, O., 2000. Holders of the purse strings: Governance and performance of public retirement systems. *Social Science Quarterly* 81, 489-506.

Vafeas, N., 1999. Board meeting frequency and firm performance. *Journal of Financial Economics* 53, 113-142.

Vafeas, N., Vlittis, A., 2016. The association between board composition and corporate pension policies. *The Financial Review* 51, 481-506.

Von Arx, U., Schäfer, A., 2007. The influence of pension funds on corporate governance. Working Paper, University of Zürich.

Wagner, A., 2011. Board independence and competence. *Journal of Financial Intermediation* 20, 71-93.

Webb, D., 2007. Sponsoring company finance, investment and pension plan funding. *The Economic Journal* 117, 738-760.

Weller, C., Wenger, J., 2009. Prudent investors: The asset allocation of public pension plans. *Journal of Pension Economics and Finance* 8, 501-525.

Whitehouse, E., 2006. New indicators of 30 OECD countries' pension systems. *Journal of Pension Economics and Finance* 5, 275-298.

Wintoki, B., Linck, J., Netter, J., 2012. Endogeneity and the dynamics of internal corporate governance. Working Paper, University of Kansas and University of Georgia.

Woidtke, T., 2002. Agents watching agents?: Evidence from pension fund ownership and firm value. *Journal of Financial Economics* 63, 99-131.

Yang, T., Mitchell, O., 2005. Public pension governance, funding, and performance: A longitudinal appraisal. Working Paper, Pension Research Council.

Yermack, D., 1996. Higher market valuation of companies with a small board of directors. *Journal of Financial Economics* 40, 185-211.

Professional references

Allianz, 2014. Pension Sustainability Index.

Australian Centre for Financial Studies, Mercer, 2014. Melbourne Mercer Global Pension Index.

ASIP (Association Suisse des Institutions de Prévoyance), 2011. Charte de l'ASIP et Directive.

CFA (Chartered Financial Analyst), 2008. Code of Conduct for Members of a Pension Scheme Governing Body. CFA Institute, Centre for Financial Market Integrity.

CHS/OAK (High Supervision Commission), 2013. D-02 – Indication des frais de gestion de la fortune.

Clapman Report, 2007. Committee on fund governance: best practice principles. Stanford Law School, The Stanford Institutional Investors' Forum.

CSEP/SKPE (Swiss Chamber of Pension Actuaries), 2015. DTA 4 – Taux d'intérêt technique.

Federal Council, 2013. Rapport du Conseil fédéral : Vue d'ensemble des perspectives de financement des assurances sociales jusqu'en 2035.

IOPS (International Organisation of Pension Supervisors), 2008. Guidelines for the Supervisory Assessment of Pension Funds.

IOPS (International Organisation of Pension Supervisors), 2010. Principles of Private Pension Supervision.

Ireland Pensions Board, 2012. Trustee Handbook.

LFLP (Law on Free Pass in Occupational Old-age, Survivors, and Disability Pension Plans), 2012. Loi fédérale sur le libre passage dans la prévoyance professionnelle vieillesse, survivants et invalidité du 17 décembre 1993. Etat le 1er janvier 2012.

LPP (Law on Occupational Old-age, Survivors, and Disability Pension Plans), 2017. Loi fédérale sur la prévoyance professionnelle vieillesse, survivants et invalidité du 25 juin 1982. Etat le 1er janvier 2017.

Myners Report, 2001. Institutional investment in the United Kingdom: A review. HM Treasury.

OECD (Organisation for Economic Co-operation and Development), 2016. Core Principles of Private Pension Regulation.

OECD (Organisation for Economic Co-operation and Development), 2009. Guidelines for Pension Fund Governance.

OECD (Organisation for Economic Co-operation and Development), 2006. Guidelines on Pension Fund Asset Management.

OECD (Organisation for Economic Co-operation and Development), 2009. Pension country profile: Switzerland. In: OECD Private Pensions Outlook 2008.

OECD (Organisation for Economic Co-operation and Development), 2016. Pension Markets in Focus.

OECD (Organisation for Economic Co-operation and Development), IOPS (International Organisation of pension supervisors), 2011. Good Practices for Pension Funds Risk Management Systems.

OFAS (Office Fédéral des Assurances Sociales), 2017. Chiffres repères dans la prévoyance professionnelle.

OFAS (Office Fédéral des Assurances Sociales), 2017. Prévoyance vieillesse 2020 : Le projet adopté.

OFS (Office Fédéral de la Statistique), 2016. Indicateurs du marché du travail 2016.

OFS (Office Fédéral de la Statistique), 2014. La prévoyance professionnelle en Suisse : Statistique des caisses de pensions 2012.

OFS (Office Fédéral de la Statistique), 2015. La prévoyance professionnelle en Suisse : Principaux résultats de la statistique des caisses de pensions 2007-2013.

OFS (Office Fédéral de la Statistique), 2016. La prévoyance professionnelle en Suisse : Principaux résultats de la statistique des caisses de pensions 2008-2014.

OFS (Office Fédéral de la Statistique), 2016. La prévoyance professionnelle en Suisse : Statistique des caisses de pensions 2014.

OPP1 (Ordinance on Supervision of Occupational Pension Funds), 2012. Ordonnance sur la surveillance dans la prévoyance professionnelle des 10 et 22 juin 2011. Etat le 1er janvier 2012.

OPP2 (Ordinance on Occupational Old-age, Survivors, and Disability Pension Plans), 2013. Ordonnance sur la prévoyance professionnelle vieillesse, survivants et invalidité du 18 avril 1984. Etat le 1er janvier 2013.

ORAb, 2014. Ordonnance contre les rémunérations abusives dans les sociétés anonymes cotées en bourse du 20 novembre 2013. Etat le 1er janvier 2014.

PPCmetrics, 2016. 2ème pilier 2016 : Analyse des rapports annuels des caisses de pensions.

Swiss GAAP RPC 26, 2013. Présentation des comptes des institutions de prévoyance. Etat le 1er janvier 2014.

SwissBanking, 2017. Le troisième cotisant en matière de prévoyance professionnelle : Suggestions d'optimisation.

Swisscanto, 2014. Les caisses de pension suisses 2014.

Swisscanto, 2016. Etude sur les caisses de pension en Suisse en 2016.

Swisscanto, 2017. Etude sur les caisses de pension en Suisse en 2017.

Towers Watson, 2014. Global Pension Finance Watch.

Towers Watson, 2014. Global Pension Assets Study.

U.K. Pensions Regulator, 2009. Code No. 7 – Trustee Knowledge and Understanding (TKU).

Willis Towers Watson, 2016. Global Pension Assets Study.

Newspaper articles

Arcinfo, 11.02.2013. “La recapitalisation de Prévoyance.ne coûtera 30 millions par an à l’Etat”.

European Pensions, 16.07.2014. “Netherlands focus: Under pressure”.

Investment & Pensions Europe, 01.12.2012. “Switzerland: How to avoid Gloor 2.0”.

Investment & Pensions Europe, 18.08.2014. “Finnish government submits bill on pension fund transparency, governance”.

Investment & Pensions Europe, 09.12.2015. “Finnish foundation law set to strengthen governance”.

Investment & Pensions Europe, May 2017. “Pensions in Switzerland: Make or break”.

L’Extension, 19.01.2013. “Caisses de pension publiques : Genève lanterne rouge”.

Le Temps, 03.05.2012. “Genève réforme ses caisses de pension sous tension”.

Le Temps, 21.09.2016. “Selon le pape de la prévoyance, la Suisse doit réduire à 20 le nombre de caisses de pension”.

Le Temps, 17.11.2016. “Les experts prévoient une forte baisse du nombre de caisses de pension”.

Le Temps, 14.08.2017. “Les caisses de pension suisses sous-performent et sont mal dirigées”.

Pensions & Investments, 10.06.2013. “Paying for performance”.

The New York Times, 20.03.2015. “A scary movie: Filling your 401(k) with company stock”.

Top1000funds.com, 16.06.2010. “Korrupter boss arrested at Swiss BVK fund”.

Tribune de Genève, 04.10.2012. “Le gouvernement sèchement remis à l’ordre”.