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Determinants of Expected Returns at Public Defined-Benefit Pension Plans

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Estimated expected returns are important for pension plans, as they influence many plan characteristics including required asset levels, annual contributions, and the extent of plan under- or overfunding. Yet, there seems to be little prior literature on the factors influencing these estimated future returns. In an attempt to fill this gap, this paper presents the results of a panel analysis of data on the determinants of such returns used by US public defined-benefit (DB) pension plans for the period 2001–2011. As expected, we find that real return estimates by DB public pension funds are positively related to fund size, fund age, international asset diversification, state income, and corruption levels. However, more interestingly and importantly, we document that real return estimates by public US DB pension funds are positively related to cultural measures of individualism and masculinity, and negatively related to uncertainty avoidance. These results should be of much interest not only to scholars and pension beneficiaries, but also to fund managers, other capital market participants, and policymakers.

JEL Classifications: H3; H4; H6; I00; J3

Keywords: public pensions, defined benefit pensions, estimated returns, public policy, pension underfunding, finance and culture.

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1. Introduction

It has been commonly reported and acknowledged that US state defined benefit (DB) plans are and have been in difficulty because of their underfunding. Such underfunding, in part based on estimated future rates of return (ERRs) for pension plan assets, poses important fiscal challenges for states and municipalities especially at a time when many state budgets face fiscal shortfalls. Consequently, Corkery (2012) notes that most US states have made cuts to their public-employee pensions, with particular emphasis on reducing benefits for new hires. However, Corkery (2012), and many others also note that such cut-backs are likely not sufficient to restore stability to public pension plans. Novy-Marx and Rauh (2011a) find that even under the most optimistic scenarios, state pension plans will be far from fully funded and that unfunded liabilities of DB funds are an enormously important form of off-balance sheet debt of US states (see also Novy-Marx and Rauh (2011b)).

Bradford (2014) confirms these sobering findings in a detailed report by Moody's Investors Service. Moody's finds that between 2004 and 2012, unfunded liabilities for the largest DB plans tripled to an estimated $1.99 trillion growing at a compound annual growth rate of 17.7% for the period. Moody's suggests that the growth in these unfunded liabilities was due to many years of inadequate sponsor contributions compounded by shrinkages of asset bases during the 2007-08 global financial crises. Moody's also suggests that, under new regulations from the Government Accounting Standards Board (GASB), which emphasizes investment returns over annual contributions, the situation will continue to worsen. Additionally, Moody's also sees a resulting shift to riskier asset allocations. [1]

Estimated discount rates (such as ERRs) are important for pension funds as they determine the present values of future pension plan liabilities and the current assets needed to meet those obligations as well as the extent of under- or overfunding of a pension plan. For instance, asset values and obligations due in, for example, thirty years can be offset by a much smaller amount of assets if the ERRs are high.[2]

[1] Overall, as noted by Nobel-laureate Professor William F. Sharpe in a recent paper: "Are public pensions a problem? You bet. Is this a disaster? You bet." (Sharpe and Litterman (2014), page 18).

[2] This problem is not new or just limited to pension funds as financial accounting has long struggled with the determination of the present accounting value of future assets and liabilities. One review of these issues is Aggarwal and Gibson (1989).

Indeed, Hsu, Wu and Lin (2013) affirm that private firms adjust ERRs in order to change the actuarial values of pension assets and liabilities (also see Asthana (1999)).[3] Further, Fickett (2010) notes that politicians and public officials in charge of public DB funds will naturally also prefer higher discount rates, as the fund will then reflect greater solvency, reduce required pension contributions, and free tax-payer revenue for other purposes.[4] However, if actual returns fail expectations, the underfunding of pension plans will be exacerbated. Compounding this problem, pension underfunding might encourage plan administrators to take excessive risks in order to achieve higher expected returns.

The use of high expected returns is a serious problem.[5] For Example, Novy-Marx and Rauh (2009) note that the eight percent ERR used by many states is far too high[6] and argue that if future obligations are essentially certain then investment returns should also be certain and if a more appropriate low risk estimate like the return on Treasury bonds is used, the aggregate underfunding of public pension plans increases to $3 trillion rather than the $1 or so trillion widely reported.

State DB pension funds are of particular interest for a number of reasons. First, as discussed above, state DB pension plans are significantly underfunded exposing their sponsors to fiscal risk. Second, state pension plan investments are a large portion of institutional investments in the US and therefore of much interest to US money managers and other financial market participants. Third, unlike private pension funds state DB pension plans are likely to be influenced by the state political-economy and culture. Fourth, unlike defined contribution (DC) plans, DB plans pension risks (e.g., beneficiary longetivity and other actuarial risks) are almost wholly the sponsor's responsibility – exposing the sponsors to significant and as it turns out high levels of fiscal risk.

[3] Alderson and Seitz (2013) note the importance to shareholders of diversifying private pension-fund assets.

[4] Even small differences in estimated future returns can make large differences given the long compounding periods. Further, as noted by Phan and Hegde (2013), as compared to defined contribution (DC) plans, DB plans put more pressure on states to make mandatory contributions. So, this and other studies of DB-plan return estimates are particularly important.

[5] This contention is supported by others. For example, according to Nobel-laureate Professor William F. Sharpe, the discount rate on future pension liabilities promised in a DB fund should be based on "US Treasury securities that would provide cash flows to match those payments". Accordingly, in a 2012 rule that is currently in the process of implementation, the GASB recommends that a rate based on 20 year general obligation bonds rated at least AA (3.19% as of 12 December 2014) be used to value future pension obligations.

[6] According to Munnell, Aubry and Quinby (2011) the US Governmental Accounting Standards Board (GASB) recommends a discount rate based on the long-run yield on plan assets typically interpreted by most pension funds to use an expected rate of about eight percent. The mean nominal return estimate for our sample is 7.96%. The eight-percent rate was based on past return history even though the evidence is that the average of past returns is not the best estimator of future returns.

Most economists consider the United States to have integrated and efficient securities (e.g., equity and bond) markets, but estimates of future real returns used by various US state DB plans still vary greatly. There can be many factors other than the economic environment for expected return variations among state DB pension plans including variations in state culture and political-economy and fund characteristics including the nature and diversification of investments, and fund size and age.

In addition, given the growing interest in the effect of cultural differences on financial outcomes, and particularly on pension design (e.g., Aggarwal and Goodell (2013)), it is reasonable to assess the role of cultural factors in explaining state-by-state variation in estimates of future real returns used by US DB pension plans. The literature has noted the relative dearth of research at the intersection of finance and culture, but some scholarly papers have started to highlight the importance of considering culture in the context of economics and finance (e.g., Beugelsdijk and Maseland (2011).

Unfortunately, in spite of its importance, there has been virtually no prior literature regarding the determinants of state DB pension plan ERRs. In an attempt to fill this gap, we investigate cross-state cultural differences in the US as determinants of the public defined benefit plans return estimates while controlling for relevant other variables. By doing this we extend the literature in two directions: 1) the role of cultural differences across US states in determining financial outcomes; and 2) the role of culture in determining return estimates of US public pension funds. Specifically, this paper investigates the determinants of cross-fund differences in real ERRs of US public defined benefit pension systems with panel analysis for the period 2001–2011. We use real ERRs as inflation differences across our time period make it less confounding to use real rates.

We document that pension fund real ERRs are positively related to the level of corruption and income in the state, greater international diversification of fund assets, and higher fund size and age. More interestingly and importantly, we document that real ERRs for public pension funds in the US states are significantly positively related to the cultural dimensions of individualism and masculinity and significantly negatively related to uncertainty avoidance. These results are also economically important. This study makes an important contribution to our understanding of the determinants of estimates of

future real ERRs used by DB pension funds and the role of cultural differences across US states in influencing these financial outcomes.

2. Theory and practice of pension plan ERRs

Retirement decision-making is one of the most complex problems in finance. Theories of savings behavior (like the life-cycle or permanent income models) are embedded with rationality assumptions that are difficult and unlikely to hold in practice. For example, a major assumption is that pension savers accumulate and then spend assets to maximize some lifetime utility function (possibly including bequests), a utility function that spans many decades. A second related assumption is that such savers have the cognitive and financial ability to solve the resulting multi-decade optimization problem. Another implicit assumption is that these pension savers also have sufficient willpower and continuing discipline to execute this optimal plan. These assumptions are suspect among economists and others especially as humans have bounded rationality, are subject to behavioral and cultural biases, and utility functions that change steadily and sometimes unexpectedly over the decades time horizons involved in pension planning. Thus, most people cope by adopting simple heuristics or rules of thumb even though psychology shows that such heuristics, though often useful and even accurate, can lead to systematic biases (Benartzi and Thaler, 2007). In a DB pension system most of this decision-making complexity and risks are transferred to the plan sponsor. Thus, pension plan sponsors face a complex decision-making environment and have to use many simplifying assumptions and imperfect estimates of many future variables.

It is not surprising then, that pension plan sponsors are uncertain about ERRs, especially as they face many influences in determining ERRs for pension assets. Managerial and regulatory environments are important influences and such estimates are also likely to be influenced by behavioral deviations from

rationality and by culture-driven mental frames of sponsor managers and state public officials and politicians. Thus, for public DB pension plans the institutional and political economy environments are likely to be important. It should be noted here that while the following general introductory section helps frame the economic importance of the various influences on ERRs, only some of these factors are likely to be empirically important for us since we examine pension plans in various states in a single country (the US) with much national legal and institutional uniformity across the various states.

2.1 Managerial and regulatory pension environments and ERRs

Pension Plan Regulation: Contracts between retirees and employees (as potential retirees) and pension plan sponsors cover fairly long time horizons and much can change or go wrong during these long periods. In the interests of public policy and retiree protection, the Pension Benefit Guaranty Corporation (PBGC) provides insurance in the event of the failure of private pension plans. DB pension plans also enjoy favorable tax treatment. The special tax status of corporate pension plans includes deductibility of pension contributions and tax exemption on investment earnings generated from pension funds helping motivate employers to sponsor such plans. As in other areas of financial regulation, the PBGC insurance creates moral hazard for plan sponsors which is then in turn is constrained by regulation.

Sharpe (1976) and Treynor (1977) contend that the put option based on the Pension Benefit Guaranty Corporation (PBGC) insurance for DB pension plans can be maximized for shareholder wealth maximization by maintaining a minimum level of pension funding and investing in a maximum level of risky assets (the ‘‘mini–max’’ strategy).[7] Further, pension beneficiaries have debt-like claims on a firm’s pension assets. Consequently, corporate managers and owners have strong risk shifting incentives (that increase with financial distress) and tend to underfund DB pension plans (Anantharaman and Lee (2014)). Such underfunding motivates sponsor managers to use higher ERRs.

The principle law regulating DB pension plans is the Employee Retirement Income Security Act (ERISA) of 1974 which requires sponsors make pension contributions, invest in appropriate assets, and

[7] In some relatively rare circumstances it may be useful to deviate from this strategy as Black (1980) and (Tepper (1981)) contend that when tax arbitrage is important, sponsors may contribute the maximum level of pension funding and invest in a minimum level of risky assets.

provide adequate funding levels to meet pension obligations. It mandates that pension funds be managed solely in the interests of its participants and not in the interests of the sponsors. The Pension Protection Act of 2006, the major reform of US pension regulations since the 1974 ERISA, requires stricter pension funding rules, liability discount rates, and reporting and information disclosure.[8]

Pension Funding and Corporate Capital Structure: Pension plans are often important relative to sponsor's balanced sheets - sponsors' leverage ratios are about 35% higher after incorporating pension assets and liabilities into the corporate capital structure (Shivdasani and Stefanescu (2010)). Even though a DB pension plan is legally considered a separate entity, but from an economic perspective pension benefits are an integral part of a firm's financial liabilities (Treynor (1977)). Further, sponsors use their financial resources to fulfill DB pension obligations so that pension liabilities and assets should be assessed as a part of the sponsor's consolidated balance sheet with any difference between pension assets and liabilities treated as a part of shareholders' equity (Bulow and Scholes (1983); Bicksler and Chen (1985)). Thus, plan sponsor balance sheets and market risk can be impacted by the size of pension plan assets. Such impact can be particularly severe for plan sponsors with pension assets that are large relative to their market capitalization.[9] In order to reduce these impacts of pension assets, plan sponsors will be tempted to increase ERRs to reduce the relative size of pension under-funding.

Pension Plan Accounting: Pension sponsors have to make a number of assumptions in reporting on pension plans, including estimated future salary increases and employee turnover, the estimated future rates of return on pension plan assets, and the discount rate used to estimate present value of future pension liabilities. Sponsors report on their income statements the net pension costs which are calculated by subtracting expected plan asset returns from the sum of service cost, interest cost, and other pension

[8] Labor unions can be important for pension funding levels but the overall effects seem ambiguous. Union workers receive higher salaries and retirement benefits resulting in higher pension obligations (Cooper and Ross (2001)). However, Mitchell and Smith (1994) report that higher unionization leads to lower levels of pension funding.

[9] Merton (2006) illustrates this using pre-bankruptcy GM with $93 billion in pension assets in January 2006, an amount seven times its market equity value of $13 billion. GM invested 65%, or about $60 billion, of its pension funds in the equity market. This meant that even a low market volatility, of say 10%, would mean a $6 billion swing in pension assets - equivalent to half of GM's equity market value.

plan costs. Sponsors use higher rates to reduce pension liabilities and required assets to achieve the resulting higher earnings (An, Huang and Zhang (2013), Bergstresser, Desai and Rauh (2006)).

The Statement of Financial Accounting Standard (SFAS) 87 requires pension plan sponsors to base the discount rate on US 30-year Treasury bond yields, but SFAS 158 (effective for the fiscal year ending after December 15, 2006) requires sponsors to base the discount rate on the yield of high quality (A or better rated) corporate bonds. However, as in other areas of financial accounting, to reduce pension costs some pension plan sponsors often use any flexibility in these accounting standards to pick ERRs that are higher then those intended by the accounting standards (Picconi (2006)).

Pension Plan Funding and Operating Profits Correlations: Because of similar reactions to macroeconomic factors, a pension plan sponsor may face a positive correlation between its operating income and pension plan asset returns (Broeders, 2010). Such a positive correlation will reduce a sponsor's ability to make pension contributions exactly when higher contributions are needed - as pension plans generate low returns simultaneously with a sponsor's poor operating performance.[10] In such cases, managers are more likely to use higher ERRs for their pension assets.

As this brief discussion indicates, among other factors, pension plan ERRs can be expected to reflect regulatory induced moral hazard, accounting actuarial uncertainty, economically motivated risk-shifting, and correlation risk between operating and pension asset returns. However, as we focus on state averages for pension plans, we need not include some of these variables in our empirical estimates as they are likely to be constant across states; e.g., the federal regulatory and accounting environments are very similar across the US, and pension plan size, extent of over- or under-funding, and unionization are reflected at state aggregate levels. Nevertheless, in practice there may be several reasons for deviations from rational and economic estimates for ERRs. Thus, additional factors based on state differences in behavioral, cultural, and institutional influences on ERRs are examined next as they may lead to deviations from the economic analysis of ERRs presented above.

[10] To avoid risks due to this common co-movement, pension investment strategy should be structured such that changes in pension assets are less positively correlated with a sponsor's core business operations, but are highly correlated with projected pension liabilities (Maginn, Tuttle, McLeavey and Pinto (2007)).

2.2 ERRs and behavioral deviations from rational expectations

As Tobin (1958) explains, according to modern portfolio theory (MPT) investors are concerned only about the standard deviation and means of returns so that all investors would hold the same portfolio of risky assets with risk levels set by the portfolio weighting of the risk-free asset. Based on this idealized view, there are few reasons that would explain differences in pension portfolios. However, in practice the effects of behavioral factors and limited rationality must also be considered in addition to the fact that different people and entities form expectations differently. Further, unlike many other investors, pension plans have longer-term investment horizons. These practical considerations are likely to result in idiosyncratic asset allocations and differences in expected returns.

Another major issue in estimating future returns is the relationship between ex-ante and ex post measures of returns. How do inferred expected values for future returns compare with ex post values in practice? This issue is covered by the theoretically elegant but empirically questionable Rational Expectations Hypothesis (REH). The notion that realized returns are biased and noisy measures of expected returns is supported extensively in the literature (e.g., Elton (1999), Fama and French (2002)). These papers posit that "information surprises" do not offset each other over time or across firms, leading to differences in ex post and ex ante returns. The literature has many examples highlighting the fact that even well-formed and motivated predictors fail to reflect all available information (for example Aggarwal, Mohanty and Song (1995)). As noted by Davidson (1982), "REH theorists assume information exists and is available for processing by all decision makers. This information, consisting primarily of quantitative time-series data, it is assumed, is a finite realization of a stochastic process; from this data the probability distribution of actual outcomes today and for all future dates can be estimated." Further, Dimson, Marsh and Staunton (2007) note that to label excess returns as "risk premia" is likely misleading as excess returns can vary greatly from year to year and can even be negative.

The long time horizons of pension funds are important. Campbell and Viceira (1992) note that for many years empirical research on long-term allocation practices has lagged far behind theoretical MPT-based research on asset allocation and dispute the traditional MPT-based conclusions that the individually

varying asset-allocation (the interior-decorator approach – Bernstein, 1992) is entirely without rational merit. Further, they argue that a long investment horizon may indeed justify greater risk taking suggesting that specific forms of labor income can rationally lead to bespoke asset allocation. They also note that cash may be risky in the long run as it must be reinvested at unknown future interest rates. These conclusions are supplemented by other research, such as Fama and Schwert (1977), that wealth levels influences portfolio choice.

Consequently, in the large and expanding financial-planning industry (Canner, Mankiw and Weil (1997)), notions about portfolio allocation have long differed based on individual characteristics such as wealth levels, investment horizons, and risk appetites. Then, there is the so-called asset-allocation puzzle (Canner et al. (1997)) in which more conservative investors are encouraged to hold more bonds despite financial economic theory suggesting the same ratio of bonds to stocks (but varying cash and leverage levels) for all investors. Further, there is the widely practiced rule of thumb that equity allocation in an individual portfolio should be 100 minus the investor's age. Similarly, pension funds may also differ in terms of their asset allocation decisions especially as they have long-term investment horizons. These consequential differing asset allocations are one reason why there may be differing estimates of future expected returns for various pension funds.

2.3 Culture and pension ERRs

A major influence on future expected return estimates likely is culture. Culture represents the shared beliefs, values, and ideals of a society. Culture influences return estimates directly through the propensity to tolerate risk and through its influence on transactions costs. Culture also influences future return estimates indirectly through its interaction with institutional environments (especially as current institutions can be considered as having evolved through path-dependent interactions between culture and historical conditions and events).

Given that all optimal contracts are incomplete (Hart 2001) and so allow for a range of responses and actions, costs of monitoring and enforcing these incomplete contracts depend not only on the legal environment but also on a number of non-legal behavioral factors. Further, so do agency costs (defined by

Jensen and Meckling (1976)), including contracting costs, transaction costs, moral hazard costs, and information costs. In fact, as our discussion below shows, all of these agency costs and costs of managing these imperfect contracts depend on the level of information asymmetry between the contracting parties. In such an imperfect environment, the responses and actions of contracting parties will depend on factors such as the ethical, social, and cultural environments as well as on institutional features like regulatory, disclosure and legal frameworks.

According to North (1990), the costliness of information needed for the assessment and enforcement of contracts and the resulting exchanges creates "transaction costs." Transaction costs involve costs of defining property rights and costs of enforcing contracts—including costs of information identification and collection. In addition, "transformation costs" are the costs associated with the efficiency of factor and product markets and of using technology and are also reflected in transactions costs (TCs). TCs also depend critically on the willingness to engage in opportunistic self-serving behavior by the contracting parties. Such ability and willingness depends not only on the legal, ethical, and institutional environments, but also on other informal conventions reflected in social and cultural values that differ across borders.

TCs are important in a number of financial and business decisions. For example, TCs can set firm boundaries as they determine which transactions are best internalized and which are better as external market exchanges. TCs can also influence the efficacy of various investments (such as debt versus equity) based on the information asymmetry and potential for opportunistic behavior involved in each case. Thus, TCs can influence asset allocation and pension plan ERRs.

The central role of culture in determining contract and agency costs is further clarified by Hofstede (1980) who notes that, "*Culture is the collective programming of the mind distinguishing the members of one group or category of people from others.*" Culture has also been proposed as an important factor in understanding ethical decision making (Vitell, Nwachukwu and Barnes (1993). Unethical behavior lowers trust, forming a tax on all transactions. Vitell et al. (1993); and Volkema

(2004) have identified certain cultural dimensions as positively associated with ethical discernment, while identifying other cultural dimensions as negatively associated with ethical behavior.

Thus, given that cultural measures influence mental frameworks, ethical values, the predilection for risk tolerance, and the tendency to engage in self-serving opportunistic behavior, it is clear that culture plays an important role in determining costs in business exchanges. Additionally, apart from the influence of culture via transactions costs, culture also affects financial outcomes by reflecting and shaping commonly acknowledged individual behavioral biases that have been empirically demonstrated (Hirshleifer (2001)).

Culture has been shown to influence earnings management (Desender, Castro and Escamilla de Leon (2011)). Previous research has also shown that culture can influence levels of Corruption (e.g., Sanyal (2005); Park (2003); Davis and Ruhe (2003); Weaver (2001); Getz and Volkema (2001); Seleim and Bontis (2009); Aggarwal, Goodell and Goodell (2014)**)**. Culture also influences legal systems (Licht, Goldschmidt and Schwartz (2005)). Hofstede (1991) as summarized by Mostert (2003) suggests culture is also a significant determinant of societies' willingness for public participation. Ioannou and Serafeim (2012) find that politics and culture are the most important drivers of corporate social responsibility.

A widely used set of four dimensions to measure culture are attributed to Hofstede (1991): *individualism* or the tendency to believe in and take individual responsibility, *masculinity* or the extent to which male and female roles are clearly differentiated, *uncertainty avoidance* or the inability to be comfortable with ambiguity, and *power distance* or the importance of hierarchy. These dimensions of culture are widely accepted and have been used in over five hundred social science and business scholarly studies (Kirkman, Lowe, and Gibson, 2006). These cultural dimensions have been shown to influence many financial decisions.

For example, culture-associated relative propensity for risk taking has been found to influence portfolio allocation. Biais, Hilton, Mazurier and Pouget (2005) find an association of individualism with greater overconfidence bias. Markus and Kitayama (1998) document that there is a tendency to promote

self-esteem in more individualistic cultures, leading to more pervasive self-attribution bias. Several other studies also show that self-attribution bias is significantly higher in high individualism cultures as compared to low individualism cultures (Fry and Ghosh (1980); Nurmi (1992)). Rieger, Wang and Hens (2011) document that country-level factors determine the degree of loss aversion (as defined by Kahneman (1979)).

In addition, Zheng, El Ghoul, Guedhami and Kwok (2012) find that use of shorter-term debt is positively associated with masculinity, uncertainty avoidance, power distance and negatively associated with individualism. Aggarwal and Goodell (2011) find that equity premia around the world are determined by national cultural dimensions. Chui, Titman and Wei (2010) find that individualism is positively associated with volume and volatility and profits from momentum strategies as more individualistic countries are more attuned to risk taking.

It is important to note here that cultural differences are not just cross-national, they also occur any time you cross other political, linguistic, religious, or behavioral borders. For example, at a sub-national level, scholars have started focusing on the role of cross-US state and cross-US county cultural differences. For instance Baxamusa and Jalal (2014) examine the impact of religion with regard to the demographics of US counties on respectively located US firms. Similarly, Ucar (2014) examines the effect of religion on dividend payout differences across US counties. However, while these papers deal with the general influence of culture on various financial decisions and outcomes, none of these papers assess the influence of culture on pension plan expected returns.

2.4 Institutions and pension ERRs

Culture also influences pension plan future return estimates indirectly through its interaction with institutional environments that include the legal, regulatory, and disclosure environments. Culture is likely the fundamental driving source especially as institutions reflect “rules, beliefs, norms, and organizations that together generate regular social behavior” (current institutions can be considered as having evolved through path-dependent interactions between culture and historical conditions and events (Greif, 2006)). Institutions affect responses and actions of economic entities in incomplete contracts and,

for example, have been shown to affect corruption (Judge, McNatt and Xu (2011)), disclosure-related regulatory requirements (Licht, Goldschmidt and Schwartz (2007)), the ethical environment (Vitell et al. (1993)), both the de-jure and de-facto legal systems (Eggleston, Posner and Zeckhauser (2000), Milhaupt and Pistor (2008))[11], and social trust (Beugelsdijk and Maseland (2011), Doney, Cannon and Mullen (1998), Fukuyama (1995)). This means that institutions influence many aspects of pension funds.

For example, scholars have noted that pension plan features differ over political jurisdictions (Beshears, Choi, Laibson and Madrian (2010)3). Schieber (2011) finds varying levels of political-economy factors, such as the nature of social and political structures, determine many pension variables. Pennacchi and Rastad (2011) find that higher discount rates for pension liabilities are positively associated with higher portfolio risk. The institutional environment is clearly likely to influence pension plan manager discretion in estimating future expected returns.

The large and expanding financial planning industry presents much evidence of the influence of agency costs on pension planning and pension plan management. Because of non-zero agency costs, pension fund management may also be shaped by political or non-pecuniary motivations. Bagchi (2014), for instance, suggests that political competition rather than political orientation influences pension funding and assumptions regarding pension returns. While it is possible that public pension policy reflects the democratic will of the people (see Aggarwal and Goodell (2013)), given agency costs it is probable that pension fund managers may be only partially responsive to the will of the people.[12] While Eaton et al. (2014) find institutional ownership lowers underfunding for private pension funds, the role of economically driven outside monitoring is diminished in public pension funds as the controlling entities of DB plans are politically driven public institutions. The nature of the cultural-institutional environment is most likely to influence managerial discretion in estimating ERRs for public DB plans.

2.5 Cultural dimensions and hypotheses for expected pension plan returns

[11] Aghion, Algan, Caluc and Shleifer (2010) find a strong correlation between mistrust and regulation levels, suggesting that social capital and regulation are substitutes.

[12] Eaton, Nofsinger and Varma (2014) find that institutional ownership is negatively associated with pension underfunding and opportunistic increases in the expected rate of return assumption especially when there is underfunding.

As the prior section indicates, ERRs for US state public pension funds seem to depend not only on behavioral issues such as bounded rationality, but also on agency costs and cultural and institutional environments. In this paper, we note the range of future return estimates among various states' DB pension plans and ask what factors, including "soft" cultural factors at the sub-national level across US states, affect pension plan ERRs. The next section presents some relevant theoretical frameworks based on prior literature and the resulting hypotheses regarding the influence of cultural dimensions on ERRs.[13] Our data covers a large period so we examine real ERRs to eliminate any confounding effects of inflation variation and, consequently our hypotheses are framed with regard to real ERRs.

2.5.1 Cultural dimensions and Superior Access and Superior Information frameworks

Hochberg and Rauh (2013) offer several theories that may be relevant for explaining cross-border differences in the ERRs of US state public pension funds. Their contentions are supported by (Garcia and Norli (2012)) who find that firms that are less geographically diversified and have large proportions of in-state investments have higher rates of return. While Hochberg and Rauh (2012) originally present these theories with regard to the asset allocation behavior of pension funds, we believe that these sets of assumptions regarding the behavior of pension fund managers also has applicability to how managers form ERRs.

The *Superior Access* framework suggests that public pension funds enjoy superior access to particular investments that are part of local networks. Thus, local public pension funds have a broader set of investment opportunities within their state than out-of-state investors and can obtain allocations in the best local funds and investments. Similarly, the *Superior Information* framework in which public pension funds have superior information about home-state investments also because of local networks or connections. We consider that just like superior access, better information should also rationally lead to higher return estimates. Further, we note

[13] We use the Hofstede cultural dimensions as an organizing theory for framing and understanding our empirical estimates of state DB pension plan differences in ERRs. The Hofstede cultural framework and related cultural dimensions have been used in many hundred scholarly business studies (Kirkman, Lowe and Gibson (2006)).

here that superior access to information is consistent with greater societal hierarchy, higher societal power distance, and higher income inequality (Hofstede (2001)). Thus, we have the following hypothesis regarding the influence of the Superior Information and Superior Access frameworks reflecting the affects of societal power distance on the estimated real ERRs.

H1: Real ERRs of US state pension funds are positively related to the cultural dimension of power distance

2.5.2 Cultural dimensions and the Superior Confidence framework

Individualism compared to its opposite, Collectivism, is the degree to which individuals are not integrated into groups. In individualist societies people are generally expected to look after themselves. In contrast, in collectivist societies, people are integrated into strong and cohesive groups. Such groups could include extended families which while demanding unquestioning loyalty also provide emotional and economic support. In collectivist societies organization of behavior around collective societal goals would take precedent over the needs, inclinations, and instincts of individuals.

Many of the theoretical arguments for the investigation of individualism in finance have rested on using the association of individualism with either overconfidence or increased appetite for risk. The Chui et al. (2010) study of individualism and momentum effects associates individualism with enhanced risk taking and greater market momentum effects. Markus and Kitayama (1991) suggest that positive self-thinking and higher self-confidence is inherent in individualistic cultures.[14] The Shao, Kwok and Zhang (2013) study of corporate investments also associates individualism with greater risk appetite in explaining its results. Nguyen and Truong (2013) find an association of financial outcomes with individualism and again explain their results via the notion that more individualistic societies have a higher risk appetite. Ferris, Jayaraman and Sabherwal (2013) also connect individualism with overconfidence in explaining their positive association of individualism and CEO acquisition offers.

[14] These qualities could be due to child rearing practices in individualistic cultures where children are encouraged to be stars (Heine, Lehman, Markus and Kitayama (1999).

Based on prior literature, we associate individualism with increased confidence and risk-taking. Confidence associated with individualism also raises social trust as individuals feel more confident that uncertainties are likely to be resolved. Consequently, in our *Superior Confidence* framework, higher confidence levels increase return expectations for pension funds. Thus, we have the following hypothesis regarding pension plan estimates of future returns based on the *Superior Confidence* framework.

H2: Real ERRs of US state pension funds are negatively related to Collectivism.

2.5.3 Cultural dimensions and the Indifference framework

We next consider the influence of the cultural dimension of masculinity associated with increased competitiveness on pension plan return estimates. Also, in a masculine cultural environment the need for means of economic support through social or government channels has been shown to be held in less repute. Hempel (1998) suggests that in societies high in masculinity, income from one's job is closely related to self-identity; while income from unemployment insurance is stigmatized. While Hempel (1998) emphasizes a distinction with employment and unemployment insurance, we consider that pension income, especially the pension income of others, will also be less valued in more masculine societies.

Hofstede (2001) associates masculinity with enhanced differentiation of gender roles. Zheng et al. (2012) note that Powell and Ansic (1997) and others find that in financial decision-making females exhibit less risk-seeking behavior than males. Zheng et al. (2012) also find a positive association of masculinity with a greater preference for shorter term debt. They explain this particular result in part by associating masculinity with greater risk-taking.

We consider an *Indifference* theoretical framework in which greater competitiveness increases the return expectation of pension funds because there will be less societal concern for any undermining of fund viability that might result from an inflated ERR. Based on the *Superior Confidence* and *Indifference* frameworks we expect real ERRs of US state pension funds will be positively related to masculinity. Thus, we form the following hypothesis regarding pension plan estimates of future real returns.

H3: Real ERRs of US state pension funds are positively related to masculinity.

2.5.4 Culture and the Risk Avoidance framework

We next consider the "Risk Avoidance" framework for explaining cross-border differences in the real ERRs of pension plans. There may be cultural distances between the locale of an investor and the location of an investment (Aggarwal, Kearney and Lucey (2012)). Indeed, as suggested by Epstein and Miao (2003), extended uncertainty or extended uncertainty avoidance (perhaps due to foreignness or unfamiliarity) with regard to "distant" investments can lead investors to assume an almost Knightian uncertainty regarding their returns. Uncertainty and risk avoidance would seem to be important negative influences on state pension fund ERRs. Because of risk avoidance, an inclination to adopt higher real ERRs will be dampened by greater uncertainty avoidance. This is in keeping with the notion that higher returns are less certain. It also consistent with Hempel (1998) who suggests that higher uncertainty avoidance is associated with more diligent and prudent managing of income-protection vehicles. Thus, we have the following hypothesis.

H4: Real ERRs of US state pension funds are negatively related to uncertainty avoidance

3. Methodology

Our models and their empirical estimates are based on the following equation:

$$y_{it} = \alpha_i + \sum \beta_1 * \mathrm{X}_{1it} + \sum \beta_2 * \mathrm{X}_{2it} + \sum \beta_3 * \mathrm{X}_{3it} + \sum \beta_4 * \mathrm{X}_{4it} + e_{it} \quad (1)$$

In this equation, y are the pension plan estimated real ERRs, while X_1 represents a set of variables reflecting fund characteristics, X_2 are the four Hofstede cultural variables, X_3 are variables representing state demographics, and X_4 are variables representing state political characteristics.

3.1 Dependent variable

The dependent variable for our panel analysis is the expected real rate of return (ERR) of pension plan fund assets (Real ERR). Focusing on the real return ensures that the noise, possibly confounding, associated with year to year changes in inflation is eliminated. We estimate this variable using data for respective funds estimates of next period's return and next period's inflation, reported annually by Boston College's Center for Retirement Research. We form REAL_ Real ERR according to Equation 2:

$$\text{REAL\_RETURN} = \frac{\left(1 + \text{Expected Nominal Return}\right)}{\left(1 + \text{Expected Inflation}\right)} - 1 \qquad 2)$$

The state-level averages for this dependent variable for 2001–2011 are reported in Table 1. These real ERRs for US state DB pension plans vary widely, with the Rhode Island pension plans having a particularly high mean real return estimate (5.05%),[15] while Maine has the lowest mean return estimate (2.93%). The equal weighted average across US states is a real ERR of 4.2%. It is interesting to note here that Ramaswamy (2012) estimates the average real return on the US 10-year note for 1970–2010 as 2.90%. So it seems that based on this measure, on average US state DB funds have estimated real returns that are about a third (31%) higher than historical real risk-free returns.

(Please insert Table 1 about here)

3.2 Variables measuring state-level cultural dimensions

This section supplements and summarizes earlier discussions in this paper and in the literature of why the following variables were considered to be the best available state-level representatives for each of the Hofstede cultural dimensions, individualism (opposite of Collectivism), power distance, masculinity, and uncertainty avoidance. These selected state variables would have to meet appropriate quality and availability criteria. Recent data regarding such variables would have to be available from reliable resources for each of the fifty US states for a reasonable and sufficient period of time, such as the time frame of this study. As the discussion below shows, the state-level variables selected for this study meet these criteria of reliable sources and availability over our time period.

3.2.1 Collectivism

A primary cultural variable of interest in this study is a cross-state estimate of individualism. Fortunately, state-level Collectivism (the opposite of individualism) is available (and taken) from Vandello and Cohen (1999). Vandello and Cohen (1999) base their index on eight items representing collectivist versus individualist tendencies. Convergence validity of the index was established by showing

[15] Interestingly, large unfunded state pension obligations were an important determining factor in the last Rhode Island governor's election.

that Collectivism at the state level predicted variation in individual attitudes in an national survey. We include this variable (Collectivism) in order to assess if real-return estimates are partially determined by the cultural dimension of Collectivism.

3.2.2 Power distance

Unlike the cross-state index of Collectivism of Vandello and Cohen (1999) , to our knowledge there seems to be no corresponding index directly measuring power distance in US states. Hofstede (2001) indicates a positive correlation between the Gini coefficient and the culture dimension of power distance. Additionally, greater power distance is associated with being less pro social. And so there will be less support for redistribution measures (Aggarwal and Goodell (2013)). Franke, Hofstede and Bond (1991) note that power distance is an implicit endorsement of inequality. Further, Corneo and Gruner (2002) documents that a concern for status is negatively related to a preference for income redistribution. Consequently, we include as an independent variable the state-level measure of the Gini coefficient of income inequality to represent Power Distance. The income Gini indices for US states are taken from the 2010 American Community Survey of the 2010 US Census.

3.3.3 Masculinity

Hofstede (2001) associates the cultural dimension of masculinity positively with greater differentiation of gender roles. Higher masculinity and greater differentiation of gender roles is highly associated with higher gender based pay differences. Our use of the gender pay gap as a measure for differentiation of gender roles is also consistent with the gender pay gap stemming from a crowding effect as the two genders fit into differing occupational assignments (see for instance, Solberg and Laughlin (1995)). There seems to be no direct index corresponding to masculinity for US states, but fortunately data on gender pay gaps are available for US states. We select the Males/Females pay ratio as the measure of the Hofstede cultural dimension of masculinity. This variable is constructed as 1 minus ratio of women's pay to men's pay with data taken from the 2012 American Community Survey as reported by "The Geography of the Males/Females Ratio Pay Gap: Women's Earnings by State" by Meghan Casserly (www.forbes.com; 9/19/2013). The use of this gender pay gap ratio as a measure for the Hofstede

dimension of masculinity is consistent with social embeddedness impacting economic outcomes (Granovetter (2005).

3.2.4 Uncertainty avoidance

Unlike the cross-state index of Collectivism of Vandello and Cohen (1999), to our knowledge there again seems to be no corresponding index of uncertainty avoidance for US states. However, fortunately there is extensive prior research on various factors related to uncertainty avoidance. For example, the liability of foreignness in International business notes that the Internalization of firms usually starts in foreign markets that are close to the respective domestic market in terms of psychic distance. Foreign markets more easily comprehended and accessible by home country persons will be favored initially. Such companies then will gradually enter other markets that are further away in psychic distance terms (Johanson and Vahlne (1977); Johanson and Vahlne (2009); Hymer (1976)). The liability of foreignness notion emerged to explain why a foreign investor needed to have a firm-specific advantage to more than offset this liability (Hymer (1976); Zaheer (1995); Johanson and Vahlne (2009)). The larger this psychic distance the larger is the liability of foreignness. It is interesting to note here that the notion of liability of foreignness directly links the perception of foreignness to a feeling of uncertainty.

Interestingly, prior literature has noted that greater familiarity with strangers mitigates the aversion to ambiguity. Seminal studies such as Berger and Calabrese (1975), Gudykunst, Ting-Toomey and Nishida (1996), and Gudykunst (2005) have also shown that uncertainty avoidance in interpersonal relationships is catalyzed by one party being a stranger or foreign in background. The likelihood of such interactions is related to the percentage of foreign born in the surrounding population. Further, it seems that a greater percentage of foreign-born residents will likely be the result of a more welcoming attitude on the part of native-born residents that reflects less discomfort with uncertainty. Thus, for these reasons a larger percentage of foreign born is likely to reflect lower uncertainty avoidance in a population.

These effects can be self-reinforcing. For instance, the town of Lakewood, Ohio, has a particularly high level of émigrés from Albania. More émigrés from Albania might be more likely to come to Lakewood because of the high number of residents from Albania already in place. Thus, as the

discussion above indicates, cross-state differences in uncertainty avoidance can best be represented by the percentage of the population that is foreign-born. This variable is taken from the U.S. Census Bureau, American Community Survey, 2010.

3.2.5 Overview of state-level measures for cultural dimensions

In this paper we present a framework for analyzing the US state level influence of culture on financial outcomes, in this case on the real ERRs of US state-level DB public pension funds. We have mapped carefully selected measures of state characteristics to the four cultural dimensions originally proposed by Hofstede (1980), i.e., 1) Individualism (versus Collectivism); 2) Power Distance; 3) Uncertainty Avoidance; and 4) Masculinity. We use the collectivistic index of Vandello and Cohen (1999) as a measure of cross-state levels of individualism/Collectivism; the Gini Coefficient as a measure of cross-state levels of power distance, the Gender Pay Gap as a measure of cross-state levels of Masculinity, and the percentage of foreign born in the population as a measure of cross-state levels of Uncertainty Avoidance. A matrix representing these variables along with corresponding hypotheses, are presented in Table 2.

(Please insert Table 2 about here)

3.4 Fund-level independent variables

As discussed in the previous sections, we include a number of fund-level control variables taken from the Boston College Center for Retirement Research. We include a measure of the ratio of pension plan equity to debt investments (Equity/Debt). We include this variable in order to account for the risk of equity generally being seen as greater than that of bonds, with a concomitant higher level of expected return. Intnl Diversification is formed as the ratio of International equity to domestic equity in the fund asset allocation (such allocation influences expected future returns). To account for scale and learning effects we also include measures of fund size and age, taking the natural log of these variables (Fund Age and Fund Size). To account for differences in time horizons, liability term structures, funding periods, and other characteristics, Plan Type is a general indicator that is assigned "1" if a "General Employees Plan"

; “2” if a “Teachers Plan”; and “3” if a “Police and Fire Plan” (among other factors, this variable also reflects differences in regulatory and political influences).

3.5 State demographic, economic, and political variables

Based on the literature discussed earlier, we include a set of state-level independent variables to account for differences in asset allocation risk-taking, bounded rationality, and other factors related to demographics and educational and income levels. We include the percent of the state with a high-school diplomas taken from the 2010 U.S. Census (Educ Level), the 2010 natural log of the ratio of state GDP per capita taken from the U.S. Bureau of Economic Analysis (GDP/Capita), the median state age and the male/female ratio from 2010 U.S. Census (Median Age and Male/Female Ratio).

We also include several variables that account for cross-state differences in the political environment. For example, to account for the possibility of public pension ERRs being influenced by state-wide culture of governance, we also include a cross-state measure of Corruption from Glaeser and Saks (2004) (Corruption). Similarly, RtToWrk Law is a dummy variable that is assigned “1” if a state does not have a right-to-work law and “0” otherwise. This data is from National Right to Work Legal Defense Foundation**.** Prtsn Voting is a measure of Republican versus Democrat state-wide environment from the *Cook Partisan Voting Index*. A higher positive number would be associated with a more Republican state; while a higher negative number is associated with a more democrat political environment. Pol Competition is formed as the absolute value of Prtsn Voting and so a lower number (closer to zero) represents an even balance of Republican versus Democrat and so greater ongoing political competition. Descriptive statistics and sources for all of the independent variables used in our panel analysis are reported in Table 3.

(Please insert Table 3 about here)

4. Estimation results

We present our preliminary analysis in the four graphs of Figure 1. These bi-variate analyses of the relationships between the real expected future returns across states and the four Hofstede cultural dimensions discussed above, Collectivism, power distance, masculinity, and uncertainty avoidance. As the four graphs show, there seems to be clear positive relationships between each of the four cultural dimensions and the real expected future returns across states (at this point the results for Collectivism seems only weakly positive while those for masculinity seem particularly strong).

While these bi-variate graphs are very illustrative and provide initial evidence supporting our contentions, they also motivate us to examine these issues further. We cannot be sure that these positive relationships will survive a more comprehensive multi-variate analysis that accounts for the affects of other relevant independent variables. Consequently, we next present the results of our more comprehensive multivariate statistical analysis.

(Please insert figure 1 about here)

The main results of our panel-data regressions are reported in Tables 4 and 5. Based on the results of the Breusch Pagan Lagrange Multiplier tests that yield 'p values' close to zero, we report random-effects estimates. We do not consider reporting fixed effects estimates as we include variables in our models (most notably the measures of culture across US states) that do not vary or vary only lightly within our period of study. According to Guiso, Sapienza and Zingales (2006), cultural values remain largely unchanged over time. Variance inflation factors (VIF) are under 10 for all independent variables for all models so that any multicollinearity is unlikely to be problem. Further, the intercept is not significant in any model in either table so model mis-specification is also unlikely to be a problem.

4.1 Results of panel regressions

Model 1 of Table 4 includes as independent variables the fund-level control variables: Plan Type, Equity/Debt, Fund Age, Fund Size, and Intnl Diversification. The results of this model indicate that only Fund Age and Fund Size are highly positively significant. Model 2 of Table 4 adds to the variables of Model 1 the four variables for cultural differences: Collectivism; Uncertainty Avoidance; Power Distance; and Masculinity. The estimate for this model indicates that Collectivism is negatively

significant at 10% while Power Distance is not significant. Masculinity and Neg Uncertainty Avoidance are positively significant at 1%. Fund Age and Fund Size remain positively significant. Also, Intnl Diversification is now positively significant at 10%.

Model 3 of Table 4 further adds the state independent variables, Corruption and GDP/Capita. This estimate shows that Corruption is positively significant at the 1% level. Other variables have the same signs and significance as in previous models as Fund Age and Fund Size are positively significant, Collectivism is negatively significant at 10%, and Masculinity and Neg Uncertainty Avoidance are positively significant while Fund Age, Fund Size, and Intnl Diversification remain positively significant as before.

Model 4 of Table 4 adds the demographic state variables the Male/Female Ratio, Median Age, and Educ Level to the previous set of independent variables. The Male/Female Ratio is significant at 10% while the other two variables are not significant. Other variables have the same signs and significance as in previous models, with Corruption positively significant. Collectivism is negatively significant at 10%. Masculinity and Neg Uncertainty Avoidance are positively significant; Fund Age, Fund Size, and Intnl Diversification remain positively significant.

(Please insert Table 4 about here)

4.2 Economic importance of the results

Regarding our control variables, pension plan real ERRs are positively associated with Intnl Invests diversification of fund assets and with levels or Corruption. Real ERRs are also positively associated with the size and age of a fund. Examining the variables across the models of Table 4, these results are robust as there are few differences in the signs and significances of these variables across the various models.

Overall, the models of Table 4 report Collectivism as negatively significant and Uncertainty Avoidance and Masculinity as positively significant. Following our theoretical frameworks, these results suggest that real ERRs of state pension funds are negatively associated with and Uncertainty Avoidance and Collectivism (positive with individualism) and positively associated with masculinity. Consequently

these results offer support for the *Superior Confidence*, the *Risk Avoidance*, and the *Indifference* frameworks. As Power Distance is not significant our results for this variable offer no support for the *Superior Access* and the *Superior Information* frameworks. However, we do find cross-state differences in Corruption to be significant. This result for Corruption is evidence of the adoption of improperly higher real ERRs for political or other non-pecuniary reasons and is consistent with our *Indifference* framework.

The results presented here are not only significant, but are also economically important. For example, the coefficient on Corruption on average is 0.08 and its standard deviation is 1.9 means that a one standard deviation change in Corruption is associated with a fairly large 15 basis point change in Real ERR. Similarly a one sigma change in Uncertainty Avoidance and Collectivism lead respectively to 27 and –10 basis point changes in Real ERR. Further, one sigma changes in Fund Size, Fund Age and Intnl Diversification lead respectively to 21, 12 and 3 basis-point changes in Real ERR. Finally, a one sigma change in Masculinity leads only to a 14 one hundredths of a basis-point change in Real ERR.

Thus, a one standard deviation change in the foreign born population (representing uncertainty avoidance) in a state leads to a 27 basis point change in the estimated return used by state DB pension plans. Similarly, other variables with major economic impacts on estimated future returns (in descending order) are Fund Size (21 basis points), Corruption (15 basis points), Fund Age (12 basis points), and Individuality (10 basis points). These are all fairly large impacts given that the average expected real return for our sample is 420 basis points (these impacts are approximately 2.5% to 6.5% of 420 basis points). In addition, given the exponential growth of compounded values and due to the long time horizons of pension fund investments, these differences in estimated future returns can lead to large differences present values and the assessed over- or under-funding of a pension plan.

With regard to our cultural variables, the overall results of Table 4 suggest that real ERRs of state pension funds are strongly affected by cultural differences. ERRs are significantly negatively associated with Collectivism (positive with individualism) while they are positively associated with percentage of the population that is foreign born (Neg uncertainty avoidance) and positively associated with the gender

pay gap (masculinity). In other words, estimated real ERRs are significantly positively associated with Individualism and Masculinity and negatively associated with Uncertainty Avoidance.

4.3 Further robustness tests

Table 5 reports results of models that correct for endogeneity in the percentage of foreign born and adds independent variables beyond those used in Table 4. Models 1 and 2 of Table 5 add two different measures of the state-level political environment to the set of independent variables used in Table 4. RtToWrk Law included in Model 1, is a dummy variable that is assigned "1" if the respective state does not have a right-to-work law and "0" otherwise. Prtsn Voting, included in Model 2, is a measure of Republican versus Democrat political support. Kelley (2014), Bagchi (2014), and others have shown the influence of politics and special interest groups on pension funding and pension real ERRs.

(Please insert Table 5 about here)

The results of Table 5, Models 1 and 2 are in agreement with the results of Table 4, Model 4: Again, Collectivism is negatively significant, while Neg Uncertainty Avoidance, Masculinity, and Corruption are positively significant. These results confirm that real return estimates are positively associated with Individualism, Masculinity and Corruption and negatively associated with Uncertainty Avoidance. Additionally, fund variables such as Fund Size, Age, and International Diversification are also positively significant. The political variables RtToWrk Law and Prtsn Voting are not significant in these models, suggesting that differences in pension real ERRs are not driven by these political concerns (at least in the presence of the other variables in these models and a 0.66 correlation between the two variables).

In Model 3 of Table 5 we adjust Neg Uncertainty Avoidance (represented by percent foreign born) to control for possible endogeneity. This concern stems from considering the possible association of immigration/foreign born on wealth and income distribution.[16] There is a high level of correlation between Neg Uncertainty Avoidance and GDP/Capita, Power Distance, and Masculinity. In order to focus more clearly on the association of Real ERR with Uncertainty Avoidance we remove the influence of

[16] There is a large literature on this topic. See, for example, Aggarwal, Holly, and Wadhwa, 2014.

wealth, wealth inequality, and Males/Females Ratio related wealth differences from the percent foreign born by regressing our measure of Neg Uncertainty Avoidance on GDP/Capita, Power Distance, and Masculinity according to Equation 3. Then we substitute the residuals from Equation 3 for the independent variable Neg Uncertainty Avoidance. This new variable is now referred to in the text as RESID_Neg Uncertainty Avoidance. This procedure effectively orthogonalizes Uncertainty Avoidance against GDP/Capita, Power Distance, and Masculinity.

$$\text{FOREIGN\_BORN} = \alpha + \beta_1 \text{GENDER\_PAY\_GAP} + \beta_2 \text{GINI} + \beta_3 \text{LNGDPCAP} + \varepsilon \qquad 3)$$

Models 3 and 4 in Table 5 results are that RESID_Neg Uncertainty Avoidance is positively significant. Collectivism is again negatively significant, while Masculinity and Corruption are again highly positively significant. Additionally, fund and state variables fund size, age, Intnl diversification, are again positively significant while the Male/Female Ratio is negatively significant. GDP/Capita is now positively significant at 5%. Model 4 of Table 5 considers the effects of the level of political competition rather than the nature of political orientation. As noted above, Bagchi (2014) evidences that greater political competition induces deterioration in fulfilling the duty of care with regard to public pension funds, leading to higher estimated returns and concomitantly lower levels of funding. We include Pol Competition as an independent variable, but it turns out not significant.

In addition, while not reported here for brevity, we retest the influence of political competitiveness removing our four culture variables (Masculinity, Power Distance, Uncertainty Avoidance, and Collectivism) and our variable for cross-state differences in Corruption (Corruption) from the estimation model. Political competitiveness is now positively significant at 10%. In other words, we find that, when not controlling for both Corruption and culture, political competitiveness is positively significant. Again while not reported here for brevity, we also re-tested our comprehensive models with the addition of independent variables for state budget shortfalls and US market excess returns both with concurrent year and one-year lags. These variables were not significant and did not change our other

results. Similarly, the results reported in this paper do not change much when state clustered standard errors are used (the only change is that the significance of Collectivism drops a bit below the 10% level).

4.4. Discussion

In this section we discuss the overall interpretation of our various estimates of the determinants of the real ERRs used by public DB pension plans. First, we discuss what the results mean for our theoretical frameworks. Second, we discuss the importance of our results for our model and hypotheses.

4.4.2 Support for our theoretical frameworks

Examining the results in both Tables 4 and 5, our results clearly support the *Indifference* framework. We find Masculinity to be significantly positive in every model in which it is present. This suggests that greater masculinity (and competitiveness) in society is associated with higher pension real ERRs. As noted above, Hempel (1998) suggests that in societies high in masculinity, income from one's job is closely related to self-identity; while income from social insurance bears a stigma.

The positive significance of Neg Uncertainty Avoidance is consistent with the *Risk Avoidance* framework. The percent foreign born, as a state measure for less uncertainty avoidance, is associated with higher pension ERRs. This is consistent with societies with more uncertainty avoidance being more prudent asset managers and conservative in assigning pension real ERRs. The negative significance of Collectivism is consistent with the *Superior Confidence* framework. More individualistic and more confident societies adopt higher ERRs. We also find Corruption to be positively significant. Consistent with the *Superior Access* framework, Corruption implies special relationships which afford access to higher-yielding assets. Overall we find that cultural differences are very important in determining pension real ERRs. More confident societies that are more competitive, more corrupt, and less cautious set higher real ERRs for their public pension funds.

The insignificance of pension plan Equity/Debt Invests suggests that the real ERRs of funds do not seem to be driven by the relative proportion of equity to bonds in their respective portfolios – at least in the presence of the other variables in the estimation equation. We might expect higher real ERRs to be

positively associated with greater relative use of equity over bonds, as equity is generally seen as a riskier investment than debt. However, our results do not support this conclusion. On the other hand, consistent with fund managers viewing International assets as riskier, we generally find that higher real ERRs are associated with greater International asset diversification.

4.4.2 Support for our model and hypotheses

We find no support for *H1* that greater power distance raises real ERRs as Power Distance is not significant in any of the models. Collectivism is negatively significant at 10% in all models in which it is present in both Tables 4 and 5 (this supports H2) indicating that highly individualistic states use higher pension ERRs. Masculinity is positively significant in all models in which it is present (this supports H3) indicating that states with high masculine cultures use higher ERRs. Uncertainty Avoidance (or RESID_Uncertainty Avoidance) is positively significant at 1% or 5% in all models in which it is present (supporting H4) indicating that states with high uncertainty avoidance cultures use higher ERRs. Overall, these results support hypotheses 2, 3, and 4, documenting that cultural variables are important determinants of ERRs used by public DB pension funds.

Fund Size, Fund Age and Intnl Diversification are all positively significant in all models in both Tables where they are present indicating that, as expected, larger and older funds and funds with greater international investments use higher real ERRs. Corruption is positively significant in all models in both tables where it is present. Real pension ERRs are positively associated with higher levels of Corruption is consistent with Bagchi (2014) and others who suggest ERRs are often adopted for political and other non-pecuniary reasons.[17]

Unlike Bagchi (2014), we do not find political variables to have significant explanatory power for determining pension ERRs, perhaps because we are controlling for differences in culture across states. Interestingly, we obtain results that are consistent with Bagchi (2014) if we omit cultural dimensions and differences in Corruption from the models. Thus, it seems that our results are consistent with cultural

[17] Allowing such non-pecuniary factors to influence pension ERRs would of course be contrary to the role of fund managers as agents of the employee beneficiaries.

dimensions being fundamental activators of attitudes toward pension responsibility than are political factors.

Overall, three of the four cultural dimensions are important. Estimated real ERRs are significantly positively associated with Individualism and Masculinity and negatively associated with Uncertainty Avoidance. Further, fund characteristics such as fund size and age, and international diversification along with state characteristics such as corruption levels, GDP/Capita, and the Male/Female ratio are also important determinants of estimated real ERRs for DB pension funds.

5. Conclusions

Public pension funds in the US are generally underfunded, are a financial threat for their sponsors, and are otherwise a challenge to the fiscal health and stability of their sponsoring states. Estimates of future expected returns used by pension funds are very important as they influence discount rates used in the estimates of pension plan over- or under-funding. However, there is little prior literature on the determinants of the future returns estimates used by defined benefit plans across the US. In an attempt to fill this important gap in the literature, this paper investigates the determinants of cross-fund differences in the real return estimates used by public defined benefit (DB) pension plans using panel analysis of data for the period 2001–2011.

We document that real return estimates used by public DB pension plans are positively related to the state culture measures of individualism and masculinity and negatively related to uncertainty avoidance. We also find that real return estimates are positively related to higher International Diversification, larger Fund Size, and higher Fund Age; as well as state Corruption levels and GDP/Capita, and negatively related to state Male/Female population ratios. These findings suggest that real return estimates used by US state public pension funds are consistent with a state culture of greater risk taking, enhanced confidence, more comfort with ambiguity, but also with more Corruption and lower regard for those less successful. These are novel, interesting, and important results and this study makes

an important contribution to our understanding of the determinants of the estimated future returns used by pension funds and the role of cultural differences across US states in influencing financial outcomes.

Policy-makers will find these results interesting and useful in developing appropriate public policies to protect pension plan participants and the pension burdens on the plan sponsors' tax-payers, capital market participants, and investors would be interested in these results as pension plans are some of the largest institutional investors, and money managers will find these results useful in assessing and developing funding strategies based on state and municipal securities. These results may also be useful in designing and managing national and private pension funds. Thus, the novel and interesting findings presented here should be of much interest to policy-makers, capital market participants, investors, managers, and scholars.

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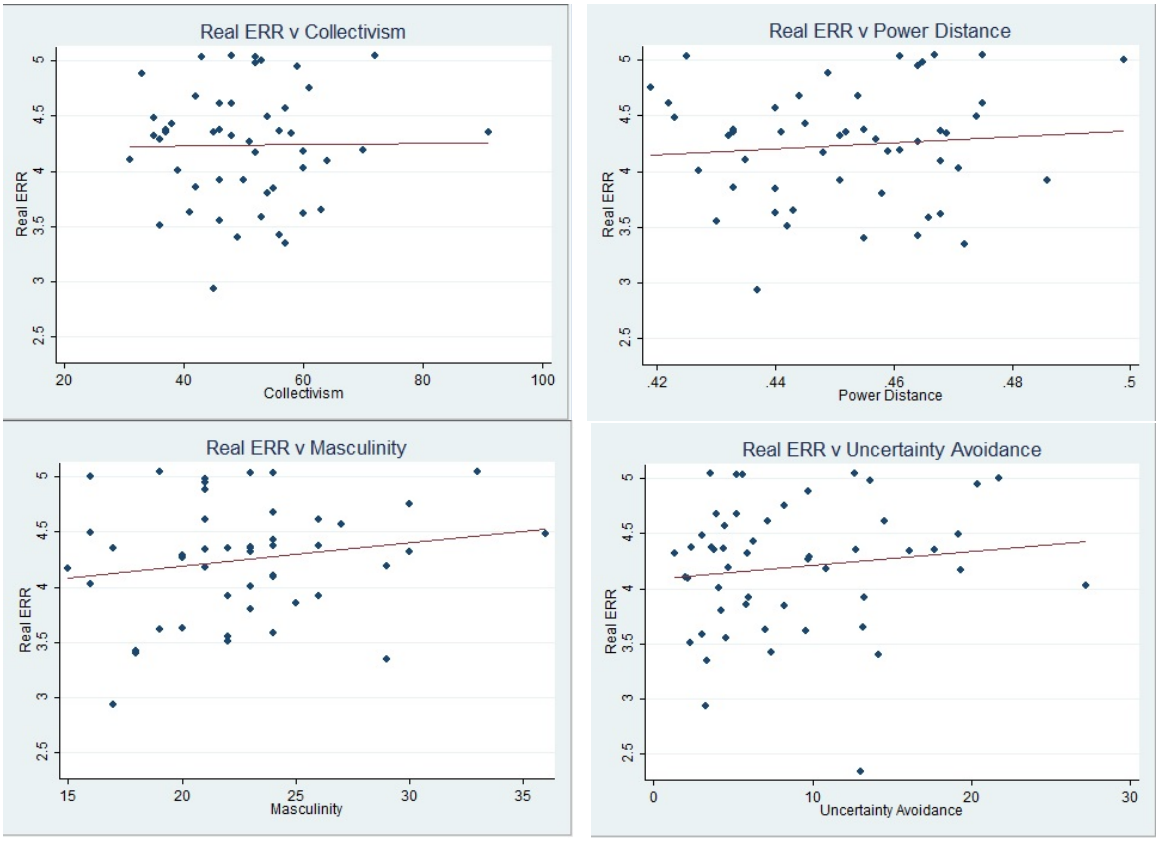
Figure 1:
Estimated Real State Pension Returns and the Four Hofstede (2001) Cultural Dimensions



Source: Author calculations based on data from Hofstede (2001) and the Center for Retirement Research at Boston College.

Table 1

State Averages of Estimated Real Rates of Returns of US Defined Benefit Plans

This table lists the means for US states for 2001–2011 for our dependent variable, real future return estimate on pension assets (Real ERRs). Annual data from the Center for Retirement Research at Boston College adjusted for inflation rates.

Country	Mean	Country	Mean
Rhode Island	5.05	West Virginia	4.32
Louisiana	5.04	Colorado	4.29
Pennsylvania	5.03	New Mexico	4.26
New Hampshire	5.03	South Carolina	4.19
New York	5.00	Virginia	4.18
Illinois	4.98	Nevada	4.17
New Jersey	4.95	Montana	4.10
Oregon	4.88	Mississippi	4.10
Utah	4.76	California	4.03
Vermont	4.68	Iowa	4.00
Oklahoma	4.68	Connecticut	3.92
Alaska	4.62	Michigan	3.91
Massachusetts	4.61	Idaho	3.85
Indiana	4.57	Delaware	3.84
Florida	4.49	Arkansas	3.80
Wyoming	4.49	Maryland	3.65
Kansas	4.42	Minnesota	3.62
Missouri	4.37	Georgia	3.62
North Dakota	4.37	Kentucky	3.58
Tennessee	4.37	Wisconsin	3.56
Ohio	4.35	South Dakota	3.51
Hawaii	4.35	North Carolina	3.42
Washington	4.35	Arizona	3.40
Texas	4.34	Alabama	3.35
Nebraska	4.32	Maine	2.93

Table 2

Cultural Proxies, Hypotheses, and Empirical Findings of the Influence of Culture Estimated Real Returns Used by Public Pension Plans Across US States

Hofstede cultural dimension	Corresponding measure used in this paper	Predicted finding	Empirical result	Theory Framework
Individualism	Collectivism index of Vandello and Cohen (1999)	Higher real return estimates with individualism (less with Collectivism)	Collectivism is negatively significant and therefore supports H1	Confidence Framework: individualism associated with greater optimism about future returns and confidence in allocation choices
Power Distance	Power Distance coefficient	Higher real return estimates with power distance.	Power Distance (Gini) not significant and therefore no support for H2 However, Corruption significantly positive, supporting Superior Access hypothesis.	Superior access to information associated with greater social hierarchy Superior Access and Superior Information Frameworks
Masculinity	Gender pay gap (the degree that male's pay is more than female's pay)	Higher real return estimates with masculinity.	Gender Pay Gap significantly positive, supporting H3.	Indifference Framework: Pensions a stigma for recipients that society does not value or care about.
Uncertainty Avoidance	Percent of population foreign born lessens uncertainty avoidance	Lower real return estimation with uncertainty avoidance.	Percent Foreign Born significantly positive, supporting H4	Careful Framework: Higher uncertainty avoidance associated with more diligent and prudent managing of income-protection vehicles.

Table 3

Descriptive Statistics and Summary of Data Sources

This table lists the mean, standard deviations and sources of variables used in panel regressions for 2001–2011 reported in Tables 4 and 5.

Variable	Mean	Stdev	Stdev/mean	Min	Max	Source
Real ERR	4.14	2.38	0.58	-73.08	7.16	Projected inflation adjusted returns Boston College's Center for Retirement
Intnl Diversification	0.48	0.31	0.65	0.00	6.40	Ratio of Intnl Invests equity to domestic equity Boston College's Center for Retirement Research.
Plan Type	1.51	0.66	0.44	1.00	3.00	Plan type indicator: general, teacher, or police & fire; 1=General Employees Plan; 2=Teachers Plan; 3=Police and Fire Plan Boston College's Center for Retirement Research
Equity/Debt	2.22	1.18	0.53	0.00	27.50	Created as ratio of equites over bonds Boston College's Center for Retirement Research
Fund Age	4.01	0.46	0.12	0.00	4.80	Natural log of fund's age Boston College's Center for Retirement Research
Fund Size	16.02	1.26	0.08	12.37	19.36	Natural log of actuarial fund size Boston College's Center for Retirement Research
Collectivism	49.83	9.87	0.20	31.00	91.00	An index of Collectivism across US states from Vandello and Cohen (1999)
Uncertainty Avoidance	2.45	1.34	0.55	1.00	5.00	Foreign-Born Population as Percent of State Population: 2010 with this variable negatively related to Uncertainty Avoidance.
Power Distance	21.91	4.00	0.18	15.00	36.00	Income Gini Coefficient in 2010 from the American Community Survey conducted by the US Census Bureau
Masculinity	0.46	0.02	0.04	0.42	0.50	100 minus ratio of women's pay to men's pay from 2012 American Community Survey as reported by "The Geography of the Males/Females Ratio Pay Gap: Women's Earnings by State" Meghan Casserly 9/19/2013 www.forbes.com.
Corruption	3.93	1.90	0.48	0.79	9.19	Cross-state measure of Corruption levels Glaeser and Saks (2004)
GDP/Capita	-3.19	0.17	-0.05	-3.55	-2.78	Natural log of 2010 GDP value: Millions of chained (2005) dollars divided by state population from U.S. Bureau of Economic Analysis
Male/Female Ratio	97.25	2.83	0.03	89.50	108.50	Calculated as the state number of males per 100 females. From 2010 US Census
Median Age	37.29	2.07	0.06	29.20	42.70	State Median Age 2010 US Census
Educ Level	86.33	3.56	0.04	79.90	91.80	2009 High school graduate or more from 2010 US Census
RtToWrk Law	0.66	0.47	0.72	0.00	1.00	National Right to Work Legal Defense Foundation http://www.nrtw.org/rtws.htm
Prtsn Voting	1.04	9.04	8.69	-20.00	22.00	Cook Partisan Voting Index
Political Competition	7.67	4.88	0.64	0.00	22.00	Absolute value of Cook Partisan Voting Index

Table 4

Determinants of US Public DB Pension Plan Real Expected Returns (ERRs): Results of Panel Regressions, 2001-2011

This table reports results of random effects panel regressions for US states, for 2001-2011. Dependent and independent variables are defined in equation 1 and Table 3. Variance inflation factors are less than 10 for all variables and models. Breusch Pagan LM tests are significant and so results of random-effects estimates are reported. P-values in parentheses.

	Real ERR			
	1	**2**	**3**	**4**
Intercept	–0.20 (0.769)	–1.53 (0.400)	1.70 (0.435)	14.48 (0.185)
Plan Type	0.10 (0.266)	0.12 (0.152)	0.12 (0.131)	0.11 (0.157)
Equity/Debt Investments	–0.01 (0.573)	–0.01 (0.598)	–0.01 (0.537)	–0.01 (0.531)
Fund Age	0.38*** (0.000)	0.24** (0.022)	0.22** (0.039)	0.23** (0.030)
Fund Size	0.17*** (0.000)	0.18*** (0.000)	0.18*** (0.000)	0.16*** (0.000)
Intnl Diversification	0.07 (0.119)	0.08* (0.090)	0.08* (0.074)	0.08* (0.074)
Collectivism		–0.01* (0.067)	–0.01 (0.128)	–0.01* (0.072)
Neg Uncertainty Avoidance		0.04*** (0.002)	0.03* (0.078)	0.04** (0.040)
Power Distance		0.52 (0.898)	–1.02 (0.803)	–9.40 (0.264)
Masculinity		0.08*** (0.000)	0.06*** (0.002)	0.06*** (0.002)
Corruption			0.07** (0.027)	0.09** (0.008)
GDP/Capita			0.71* (0.083)	0.87 (0.150)
Males/Females Ratio				–0.07* (0.096)
Median Age				–0.03 (0.418)
Education Level				–0.00 (0.909)
Number of Observations	1090	1016	1016	1016
Number of funds	119	112	112	112
Breusch-Pagan LM	2757.74*** (0.000)	2335.15*** (0.000)	2198.53*** (0.000)	2149.40*** (0.000)
Wald Chi Square	62.72*** (0.000)	63.00*** (0.000)	74.08*** (0.000)	77.21*** (0.000)
Overall R-square	0.09	0.14	0.20	0.22

*** significance at 1% level, ** significance at 5% level, * significance at 10% level

Table 5

Cross-State Determinants of US Public DB Pension Plan Real Expected Returns (ERRs): Results of Panel Regressions Controlling for Endogeneity and Political Variables

This table reports results of panel regressions for US states, for 2001-2011. Dependent and independent variables are defined in equation 1 and Table 3. Variance inflation factors are less than 10 for all variables and models. Breusch Pagan LM tests are significant and so results of random-effects estimates are reported. P values in parentheses.

	Real ERR			
	1	**2**	**3**	**4**
Intercept	16.30 (0.148)	16.30 (0.148)	17.00 (0.130)	15.26 (0.165)
Plan Type	0.11 (0.158)	0.11 (0.154)	0.11 (0.158)	0.11 (0.165)
Equity/Debt	–0.01 (0.516)	–0.01 (0.524)	–0.01 (0.516)	–0.01 (0.529)
Fund Age	0.22** (0.036)	0.22** (0.037)	0.22** (0.036)	0.23** (0.030)
Fund Size	0.17*** (0.000)	0.17*** (0.000)	0.17*** (0.000)	0.16*** (0.000)
Intnl Diversification	0.08* (0.077)	0.08* (0.074)	0.08* (0.077)	0.08* (0.076)
Collectivism	–0.01* (0.097)	–0.02* (0.063)	–0.01* (0.097)	–0.01* (0.074)
Neg Uncertainty Avoidance	0.03* (0.081)	0.03 (0.148)		
RESID_Neg Uncertainty Avoidance			0.03* (0.081)	0.04** (0.044)
Power Distance	–10.36 (0.226)	–9.13 (0.280)	–6.61 (0.445)	–5.21 (0.539)
Masculinity	0.06*** (0.003)	0.07*** (0.002)	0.04*** (0.025)	0.03*** (0.044)
Corruption	0.08*** (0.010)	0.09*** (0.008)	0.08*** (0.010)	0.09*** (0.009)
GDP/Capita	0.92 (0.130)	0.85 (0.162)	1.38*** (0.010)	1.38*** (0.010)
Male/Female Ratio	–0.07* (0.084)	–0.06 (0.149)	–0.07* (0.084)	–0.07* (0.099)
Median Age	–0.04 (0.317)	–0.04 (0.324)	–0.04 (0.317)	–0.03 (0.422)
Educ Level	–0.01 (0.777)	–0.01 (0.745)	–0.01 (0.777)	–0.00 (0.906)
RtToWrk Law	0.11 (0.466)		0.11 (0.466)	
Prtsn Voting		–0.01 (0.518)		
Political Competition				–0.00 (0.979)
Number of Observations	1016	1016	1016	1016
Number of funds	112	112	112	112
Breusch-Pagan LM	2154.57*** (0.000)	2135.81*** (0.000)	2154.57*** (0.000)	2149.88*** (0.000)
Wald Chi Square	77.47*** (0.000)	77.41*** (0.000)	77.47*** (0.000)	76.86*** (0.000)
Overall R-square	0.22	0.22	0.22	0.22

*** significance at 1% level, ** significance at 5% level, * significance at 10% level

Appendix 1: Table of Pearson Correlation Coefficients

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1	Real ERR	1																		
2	Intnl Diversification	0.15	1																	
3	Plan Type	0.09	-0.05	1																
4	Equity/Debt	0.08	-0.07	0.04	1															
5	Fund Age	0.07	0.09	-0.02	0.15	1														
6	Fund Size	0.22	0.02	-0.13	0.14	0.30	1													
7	Collectivism	0.06	-0.03	-0.01	-0.15	0.16	0.26	1												
8	Uncertainty Avoidance	0.20	0.12	0.09	-0.07	0.10	0.31	0.32	1											
9	Power Distance	0.14	0.04	0.06	-0.02	0.21	0.39	0.44	0.49	1										
10	Masculinity	0.07	-0.05	-0.01	-0.02	-0.15	-0.19	-0.03	-0.68	-0.34	1									
11	Corruption	0.22	-0.02	-0.02	0.13	0.09	0.14	0.25	-0.10	0.23	0.18	1								
12	GDP/Capita	0.29	0.13	0.07	0.02	0.09	0.09	-0.05	0.57	0.09	-0.29	0.03	1							
13	Male/Female Ratio	-0.07	0.00	-0.02	-0.04	-0.15	-0.32	-0.31	-0.04	-0.63	0.07	-0.09	0.30	1						
14	Median Age	-0.06	-0.06	-0.04	0.11	0.05	0.06	-0.19	-0.27	0.01	0.00	0.10	-0.30	-0.50	1					
15	Educ Level	0.04	-0.03	-0.01	0.18	-0.04	-0.16	-0.61	-0.30	-0.67	0.14	-0.13	0.27	0.30	0.29	1				
16	RtToWrk Law	0.11	0.13	0.00	0.19	0.16	0.12	-0.24	0.14	0.09	-0.28	0.04	0.18	-0.11	0.40	0.28	1			
17	Prtsn Voting	-0.14	-0.08	-0.02	-0.09	-0.25	-0.29	-0.08	-0.57	-0.30	0.68	0.06	-0.39	0.29	-0.31	-0.13	-0.63	1		
18	Political Competition	0.06	-0.01	-0.12	-0.15	-0.04	-0.06	0.27	0.04	0.05	0.33	0.22	-0.03	0.13	-0.31	-0.26	-0.30	0.45	1	