Research Article

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What are Cash-Balance Pension Plans and How Do They Compare?

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We offer a comprehensive explanation of cash-balance pension plans in the public sector, including a comparison to defined-benefit and defined-contribution plans. Comparisons are made with respect to design, management, costs, and long-term viability. Three important aspects of pension fund management are discussed: pension benefits and contributions, pension governance and reasons for cash-balance plan adoption, and pension funding. Four unique cases – Nebraska Public Employees Retirement System (NPERS), Kansas Public Employees Retirement System (KPERS), Kentucky Public Pensions Authority (KPPA), and Texas Municipal Retirement System (TMRS) – help to illustrate these three important points.

Keywords: Cash-Balance, Financial Sustainability; Pension Systems, Public Pension

In recent decades, the private sector has pivoted from traditional defined benefit (DB) pension systems to defined contribution (DC) and cash-balance (CB) plans (Clark & Schieber, 2004). In the public sector, DB plans remain the most prominent, however, since the economic crisis of 2007-2009 affected pension investment and funding levels, an increasing number of state and local governments began offering hybrid pension plans or DC plans. While there are concerns about the financial burden of government-sponsored DB plans, there are equal concerns about the adequacy of retirement savings for those under DC plans. Admitting those concerns, the CB plan – a hybrid model combining DC and DB plan features – is getting increased attention (Biggs, 2011; Ghilarducci & Weller, 2007; Johnson & Steuerle, 2004).

Appreciating that each pension design has unique characteristics, this study highlights the major features of public pension plans and then describes the CB pension design. This paper aims to address the following questions: (1) what are CB plans and how are they different from a DB or a DC plan; (2) what are the reasons state and local governments decide to adopt CB pension plans; (3) what are the implications of a CB pension plan on government financial

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management (investment risk, governance, funding) and employee benefits; and (4) what are the key factors in need of consideration for those considering a CB plan?

The study's contributions to the current pension management literature and practices are two-fold. First, this study sheds light on the reasons for the adoption of CB plans in the public sector. Currently, the few studies on CB plans in the public sector have been mostly descriptive (Biggs, 2011; Elliott & Moore, 2000; Johnson & Steuerle, 2004; Weller, 2005) and most studies of CB plans in the private sector are somewhat dated (Clark & Schieber, 2004; Coronado & Copeland, 2004; Purcell, 2005; Rappaport et al., 1997; Zall, 2002). The current CB literature does not discuss why some governments switched to a CB plan and how this change affected government pension plan management. Second, through a review of the literature and case-study analysis, the study discusses the consequences of migrating to a CB plan for both government employers and their employees.

The paper proceeds as follows: The next section describes CB plans and compares their features to DB and DC plans. The following section then offers four case studies that help illustrate the structure of CB plans, reasons for their adoption, plan design (contribution and benefits), financial management (investment returns and funding status), and key takeaways. Finally, the paper concludes with a discussion of the factors that need to be considered if converting to a CB plan.

Background

Defined Benefit vs Defined Contribution Plans

DB plans have been a staple of public-sector employment (Frank et al., 2012). State and local governments sponsor more than 5,400 systems that provide pension benefits for more than 21 million government workers (U.S. Census Bureau, 2017). In DB plans, pension benefits are defined based on a set formula that considers an employee's age, tenure, and average highest salary attained (Munnell et al., 2007). DB plans are a back-loaded system, meaning that the benefits accrued each year increase once workers have moved past the early decades of their careers and closer to retirement (Biggs, 2011). DB plans are also annuity plans, in which beneficiaries can receive pension benefits for the rest of their life upon retirement. Given their design, DB plans have been considered a key to the recruitment and retention of employees (Lewis & Frank, 2002). Employers, including state and local governments, bear the major responsibility of funding and managing these pension plans. Since pension benefits are guaranteed regardless of investment return, governments must ensure that the pension systems have sufficient funding, especially during economic downturns and low-return investment periods.

DC plans are similar to 401(k)'s; under this system, contributions are defined for both employers and employees. The two biggest differences between a DC and DB plan are that (1) employees are responsible for choosing their own investments and hence the total amount of benefits upon retirement, and (2) employees often receive pension benefits as a lump-sum payment. All pension benefits under a DC pension system are vested immediately and are not tied down to their employers. The portability of DC plans can be more attractive to younger and mobility workers (Cong et al., 2015). However, investment risk and insufficient retirement funds are concerns for employees under DC plans since not all public employees have the required knowledge to successfully manage their investment portfolios (Munnell, Aubry, & Quinby,

2011). Additionally, some DC plans do not offer annuities as an option at retirement, which can result in retirees withdrawing too much or too little from their retirement accounts. In other words, besides investment/market risks, employees under the DC plan also have to manage longevity risk (Abashidze et al., 2021; Aubry & Wandrei, 2021; Mitchell & Mulvey, 2004).

Cash-Balance Plan

CB plans calculate and pay retirement benefits similar to a DC plan, yet the plans are administered, funded, and invested similar to a DB plan (Biggs, 2011; Elliott & Moore, 2000; Johnson & Steuerle, 2004; Purcell, 2005; Weller, 2005). CB plans' assets are usually pooled and professionally invested, as with DB plans. Employers that offer CB plans are responsible for investing the plan assets and, therefore, bear the risk of investment gains and losses (Cahill & Soto, 2003). Conversely, unlike DB plans, retirement benefits for CB participants are based on contribution amounts and guaranteed credits at a rate specified by their employer (Brainard & Brown, 2018a, 2018b). Upon retirement, employees under the CB plan can choose a lump sum distribution option or elect to buy an annuity, depending on the plan design. While CB participants have their accounts, they are "notional," meaning that CB plan participants do not manage or invest their assets like DC participants. Finally, CB plans offer portability to employees, similar to DC plans (Biggs, 2011; Elliott & Moore, 2000). Table 1 summarizes the main differences among traditional DB, DC, and CB plans.

Cash Balance Plans

Arguments Favoring Cash Balance Plans

Arguments favoring CB plans include cost predictability, mobility, and risk-sharing. A shift to CB plans is often driven by a need to redesign compensation packages, facilitate liability management, and attract a mobile workforce (Elliott & Moore, 2000). The benefit determination process based on an explicit guaranteed rate of return in CB plans makes them easier to understand, administer, and manage (Biggs, 2011; Zall, 2002).

As a replacement for some DB plans, CB plans can provide more predictable funding requirements and reduce the plans' vulnerability caused by volatile investment returns (Fuchsman et al., 2023; Pew Charitable Trusts, 2014; Schieber, 2007). By specifying employees' credited interest rates and, therefore, future pension benefits, CB plans allow governments to better control pension costs and experience less fluctuation in employer contributions (Elliott & Moore, 2000; Ghilarducci & Weller, 2007; Purcell, 2005). Additionally, unlike traditional DB plans, where benefit accruals are often back-loaded and spike near retirement, CB plan benefits accrue as a constant percentage of salary over an employee's career, leading to a smoother and more predictable benefits accumulation pattern (Cahill & Soto, 2003; Purcell, 2005). Along with responsible funding strategies, this consistent accrual pattern can result in a more stable and predictable pension funding environment (Munnell & Soto, 2004).

Risk-sharing mechanism can also make CB plans more attractive, especially during market volatility. Evidence suggests that CB plan conversion can reduce the risk/uncertainty of managing the pension system because the plan design allows the sharing of financial market risks between employers and employees (Mitchell & Mulvey, 2004; Pew Charitable Trusts, 2014). Since CB plans have more predictable contribution rates for employers and employees

Table 1. Defined Benefit, Defined Contribution, and Cash balance Pension Plans

	Traditional DB	Traditional DC	Cash Balance
Primarily responsible for ensuring pension benefits upon retirement	Employers	Employees	Employers
Determination of pension benefit amount	Benefit formulation (benefit multiplier x YOS x FAS). The benefits can be adjusted for COLA.	Depending on contributions (EE and ER), and investment return	Depending on contributions (EE and ER), and pre-determined credited interest rate
Benefit growth	Backloaded – slow at the start, rises sharply towards retirement	Depending on employee contributions and investment	Steady accumulation based on contribution and guaranteed credit rate
Benefit payment	Benefits are paid as lifetime guaranteed annuity	Benefits are paid as a lump sum	Allow lump sum distribution of benefits or have options to convert to annuity
Contributions	Fixed contribution rates for employees; employer contributions are determined using the sets of actuarial assumptions.	Fixed employee and employer contribution rates.	Fixed employee and employer contribution rates.
Management of assets	Pooled and professionally managed	Dependent on employee	Pooled and professionally managed
Investment risk is primarily borne by	Employers	Employees	Employers
Longevity risk of pension payment	Since the payment is an annuity, there is little longevity risk for employees	Employees face both investment and longevity risks in managing their pension benefits	Employees face longevity risk. Some pension plans offer annuities.

Note: YOS: years of service; FAS: final average salary; COLA: Cost-of-Living Adjustments; ER: Employer; EE: Employee

and only guarantee a minimum investment return that is typically lower than the expected investment returns of DB plans, CB plans can reduce employers' investment risk. Furthermore, as the credit interest rate is fixed, employers may also retain some short-term investment gains if the rate of return on those investments is higher than the promised credit interest rate (Cahill & Soto, 2003).

CB plans are also more portable than traditional DB plans. Carrying accrued benefits across jobs in the form of lump-sum distributions can make CB plans favorable to mobile employees (Biggs 2011; Lazonick, Ghilarducci, & Weller, 2007; Rodriguez & Grillo-Chope, 2007; Zall, 2002). Both Schrager (2009) and Haverstick et al. (2010) found that younger workers who experience higher job turnover and wage variability often prefer highly mobile pension benefits, such as DC or CB plans. Studies also indicate that younger workers, who are more likely to change jobs, can also accrue higher pension wealth under CB plans when compared to traditional DB plans (Weller & Ghilarducci, 2007). This portability also removes barriers for mid-career employees to leave and can prevent scenarios where employees feel compelled to stay in positions out of fear of benefit losses (Biggs, 2011).

Concerns with Conversion to Cash Balance Plans

CB plans can also present challenges and concerns that impact employers and employees. A key issue when converting from traditional DB plans to CB plans is the reduction of benefits for workers with longer tenure. The elimination of early retirement benefits, for instance, can lead to significant financial losses for long-service workers (Clark & Schieber, 2004; Weller, 2005). Without grandfathering benefits or offering transition credits, some workers can lose up to 50 percent of their expected benefits during a DB-CB conversion (GAO, 2005; Varnhagen, 2007). For instance, a typical married 40-year-old male employee could lose up to $1,500 per year in retirement benefits, which translates to approximately $28,000 in lifetime losses during a CB plan conversion (Madland, 2007; VanDerhei & Copeland, 2004). The interest credit in CB plans is usually lower than the actual market returns in a DB plan, potentially making the final accrual benefits for employees under a CB plan lower than if they were under a DB plan (Brainard & Brown, 2018a).

CB plans can also create more challenges for workers to accumulate pension wealth. Specifically, "wear-away" – a period during which participants do not earn additional benefits – can occur due to the plan's design, elimination of early retirement benefits, and/or interest rate fluctuations. This phenomenon often arises when the initial account balance in a CB plan is set lower than the present value of already accrued benefits. This leads to periods where employees do not accrue new benefits until the notional account balance catches up (Weller, 2005). Furthermore, some studies have found that CB plans typically have longer vesting periods compared to 401(k) plans, which can often result in many workers not vesting (General Accountability Office, 2005; Varnhagen, 2007). The General Accountability Office estimates that nearly 40 percent of workers never vest under a CB plan (General Accountability Office, 2005).

While CB plans offer employees greater flexibility, research suggests that many beneficiaries prefer lump sum distributions over annuities when given a choice. These behaviors can increase the risk of retirees outliving their savings and produce asset leakage, where retirement savings are used for non-retirement expenses (Brown, 1999; General Accountability Office, 2000; Weller, 2005). Finally, while some studies suggest that CB plan conversions can reduce overall pension costs for employers, the actual impact can vary. For instance, one study found that average pension costs fell by only one percent following a shift to CB plans, and over one-third of plan sponsors adopted changes that increased pension expenditures (Mitchell & Mulvey, 2004).

In summary, the literature on public sector CB plans offers three propositions:

- *Proposition 1*: CB plan benefits do not reward senior or long-term employees with the level of benefit security and generosity as DB plans, which can raise the issue of worker retention. Employees under CB plans have a higher probability of longevity risk. Conversely, CB plans provide more portable pension benefits that can help attract mobile workers.
- *Proposition 2*: On the funding side, CB plans provide state and local governments with more predictable contribution costs and less variability in funding levels caused by investment losses or [demographic, economic, or actuarial] assumption changes.
- *Proposition 3*: Compared to DC pension plans, CB plans can reduce employee investment risk since the assets are pooled and professionals often manage the investments. On the government side, there is less investment risk because the guaranteed credit rate is often lower than the assumed rate of returns. Additionally, for local governments with limited administrative capacity, a multiple-employer pension system can help reduce administrative burdens since they are often administered by state pension systems or a pooled management of participating governments.

Methodology

Case studies of three state plans (Nebraska, Kansas, and Kentucky) and a local plan (Texas Municipalities) were conducted to examine the current structure of CB plans in the public sector and highlight the key decisions that lead to their adoption. One of the advantages of case study research in comparison to a quantitative (large-N) study is its ability to directly observe slow-moving variables (time-invariant variables or unobserved information that are likely to be absorbed in a fixed-effect model) or independent variables that are hard to quantify (Honig, 2019). This characteristic makes case-study analysis an effective research strategy for studying nuances in CB plans where the adoption processes were typically prolonged and context-dependent. Considering its ability to explain the complexity of public pension governances and the endogenous effects of those changes to pension plan's financial management, the case study research method was applied by previous studies to analyze the institutional context and path dependence of pension governance (Cong et al., 2017; Matkin, Chen, & Khalid, 2019). Following Yin's (2014) recommended steps for case-study research, multiple sources of data were collected: (1) annual comprehensive financial reports (ACFRs) from pension systems regarding CB plans' financial data including contributions, funding ratios, and investment return; (2) legislative reports and studies conducted by pension systems, which contains information on the decisions to adopt CB plans; (3) pension task force report (if available) and reports from pension oversight authority (pension review board); and (4) relevant independent reports published by think tanks, research institutes, and research articles.

Case Studies

Nebraska Public Employees Retirement Systems

Table 2. NPERS Membership and Assets

Plans	Membership				Total Assets**
	Active	Inactive	Retirees	Totals	
State DC	1,489	1,086	-	2,575	$723,757,960
State CB	16,036	10,769	2,757	29,562	$2,215,351,467
County DC	601	477	-	1,078	$225,181,225
County CB	7,425	4,620	999	13,044	$751,436,685
School – DB*	43,853	29,064	28,854	101,717	$15,229,692,564
Judges - DB	146	2	208	356	$235,106,994
Patrol - DB	389	48	517	954	$528,686,000

Source: NPERS (2024b)

*Since the school plan has the most membership and the largest asset size and is relatively more comparable than the other two DB plans, we use school-DB plan statistics for the rest of the analysis when comparing them to the state and county-CB plans.

** Market value as of 2023.

Table 3. NPERS Plan Contributions and Vesting

Plans	Employer Contribution	Employee Contribution	Vesting Period
State DC or CB	156% of EE contribution (~7.5%)	4.8%	3 years
County DC or CB	150% of EE contribution (~6.75%)	4.5%	3 years
Schools - DB	101% of EE contribution (~9.87%)	9.78%	5 years

Source: NPERS (2024b)

Prior to 2003, the Nebraska Public Employees Retirement Systems (NPERS) consisted of three DB plans for school, judges, and state patrol employees, and two DC plans for state and county employees. The legislature passed LB687 on April 19, 2002, to approve the conversion of two states' DC plans to CB plans (NPERS, 2024a.). The CB plan applies to all state and county new hires since January 1, 2003, and those previously hired under the DC plan and who opted into the CB plan. A key justification for the DC-CB transition in Nebraska was the retention and attraction of workers (Biggs, 2011; Chambers, 2015). The Benefit Review Study of the Nebraska Retirement Systems in 2000 found that the state's DC pension benefits were low compared to other government plans in the region, and the investment rates among DC plans were lower than DB plans (Buck Consultants, 2000). Another pronounced reason is the outperformance of the DB plan compared to the DC plan. The average investment rate among DC plans from 1983 to 1999 was 6 percent, which was much lower than the 11% average investment returns of the state DB plan (Buck Consultants, 2000). Table 2 provides the composition of plan memberships for the state-administered pension plans as of 2023.

In terms of pension design, pension benefits under the NPERS-CB plan depend on fixed contributions by the employees and employer, as shown in Table 3, and the pre-determined credited interest rate of 5 percent set by NPERS. CB pension benefit growth accumulates until

Table 4. NPERS Investment Returns – DB and CB plans

	FY2017	FY2018	FY2019	FY2020	FY2021	FY2022	FY2023
NPERS Investment Returns	13.7%	8.3%	6.7%	2.4%	29.9%	-8.6%	9.9%

Source: NPERS (2024b)

Table 5. Cash Balance Plan Returns and Interest Credit Rates, 2023

	1-Year	3-Year	5-Year	10-Year
Average Returns	14.6%	5.6%	9.5%	7.5%
Benchmark	15.3%	3.8%	9.0%	7.1%
Interest Credit rate	5.7%	5.2%	5.1%	5.1%

Source: Nebraska Investment Council (2023)

retirement, and participants can either purchase an annuity or be paid a lump sum at retirement or at the time of termination. Also, employer and employee contributions are made "pre-tax."

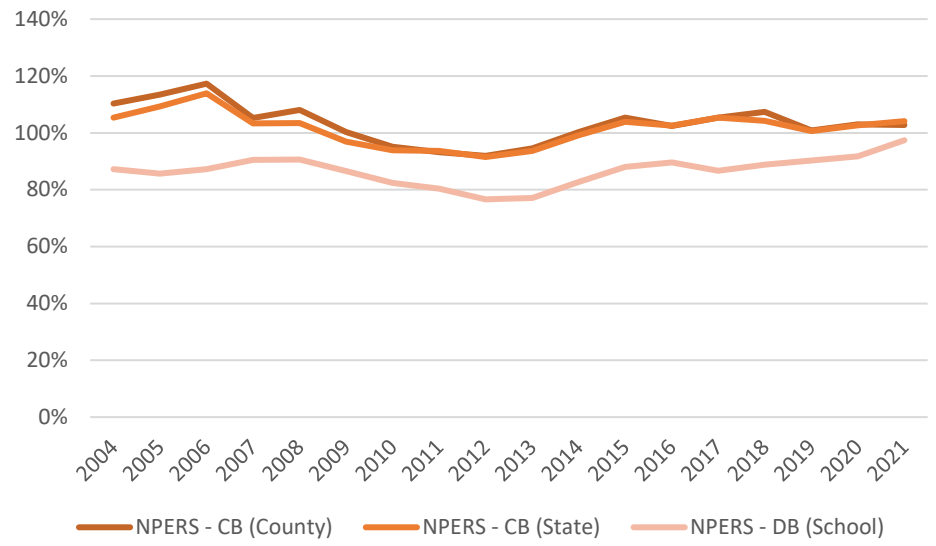
Participants in the NPERS-CB plan receive an "interest credit rate" (rate of return) based on the federal mid-term rate plus 1.5 percent. When the federal mid-term rate falls below 3.5 percent, accounts receive a 5 percent minimum interest credit rate. All employee and employer contributions are held in a trust fund. Professional fund managers invest in this trust fund under the direction of the Nebraska Investment Council. For CB plans, asset allocations mirror the investment strategies of DB Plans for schools, judges, and state patrols. As shown in Tables 4 and 5 below, the annual investment returns for the CB plans (and DB alike) fluctuated over the ten years, with the average investment return at 7.5 percent, which was still higher than the state-guaranteed credit rate.

NPERS–CB plan has been fully funded for most years since 2004 (except some years after the 2007-2008 recession), as shown in Figure 1. As of January 2021, NPERS reported that the funding ratio was 102.74 percent for the county's CB plan and 104.09% for the State's CB plan (NPERS, 2022b). Since its inception, these CB plans have mostly maintained 100 percent funding status, except for the years 2010 – 2013, when the funding ratios fell to 95.1 percent, 93.2 percent, 91.9 percent, and 94.5 percent for the County CB plan and 93.9 percent, 93.6 percent, 91.5 percent, and 93.6 percent for the State CB plan, respectively. As for the NPERS–DB School plan, the funding status shows a funded ratio of at least 80% except for the years 2012 and 2013, when the funding level was 76.6% and 77.1%, respectively. As of July 2021, the DB plan reported an almost fully funded ratio of 97.4% (NPERS, 2022a).

Kansas Public Retirement Systems

Kansas Public Retirement Systems (KPERS) is the state-administered pension plan for state, school, and local government employees. KPERS offers members three tiers, with Tiers I and II being DB plans and Tier III being a CB plan. Following the 2008 recession, investment losses significantly weakened the financial health of KPERS trust funds. The funded ratios decreased from 71 percent in 2007 to 59 percent in 2008 and fluctuated around 60 percent during 2008-2011 to the lowest point of 56 percent in 2012. In 2012, the state legislature created KPERS tier III (the CB plan, effective on January 1, 2015) and adopted other benefit cuts to the existing DB

Figure 1. NPERS Funded Ratio, 2004-2021



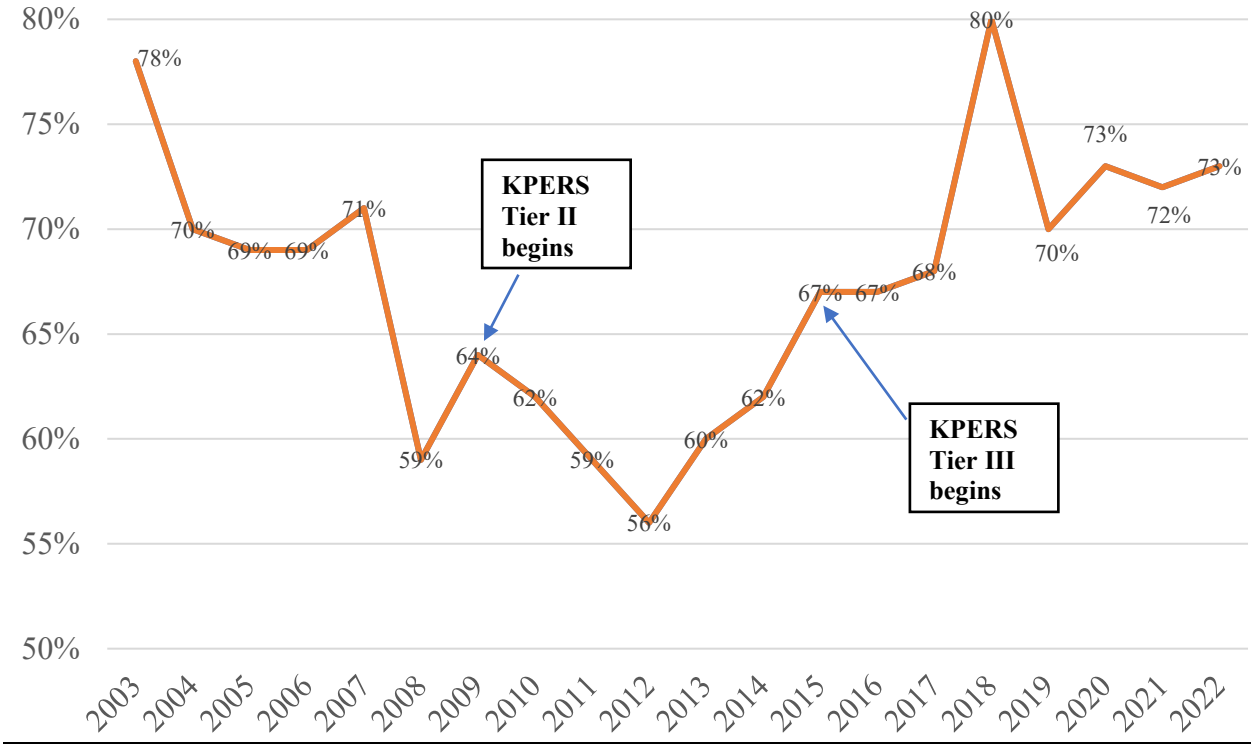
Source: NPERS (2022a, 2022b)

Table 6. KPERS Plan Description

Plans	**Tier I (hired before July 1, 2009)**	**Tier II (hired July 1, 2009, to December 31, 2014)**	**Tier III (hired January 1, 2015 and after)**
Total Active member	60,995	29,542	1,078
EE contribution	Originally 4%, increased to 5% in 2014, and to 6% in 2015	6%	6%
ER contribution			3-6% depending on YOS
Benefit multiplier	1.75% with 2% COLA before 2014 After 2014, benefit multiplier increased to 1.85% (eliminated COLA)		
Credited rate			Guaranteed rate of 4% (plus additional dividend or shared interest)
Vesting requirement	5 years		
Normal retirement requirement	normal retirement age of 65 with 5 YOS or 60 with 30 YOS		

Source: KPERS (2024)

Figure 2. KPERS Funded Ratio, 2003-2022



Source: KPERS (2021)

Table 7. KPERS Investment Returns

FY2014	FY2015	FY2016	FY2017	FY2018	FY2019	FY2020	FY2021	FY2022	FY2023
6.7%	0.5%	8.9%	14.4%	-2.6%	17.5%	11.5%	16.1%	-9.4%	11.1%

Source: KPERS (2024)

pension plans by suspending COLA and increasing employee contribution (KSLPA, 2024). Table 6 compares pension benefits, contributions, and retirement eligibility among three tiers.

The KPERS – Tier III (CB plan) implementation, which went into effect in 2015, was intended to reduce the state's financial costs and help replenish the state's pension trust fund. On the investment side, KPERS did not separate investment for the DB plans (Tier I & II) and the CB plan (Tier III). While the system's investment returns have fluctuated over the years as shown in Table 7, it achieved a 25-year average return of 6.9% in 2023 (KPERS, 2024). As for the current funding status, since the changes made by the legislature, the KPERS funded ratio has increased by six percentage points, from 67 percent in 2015 to 73 percent in 2022, as shown in Figure 2. However, it is not clear how the CB plan contributed to these increases (Wu, Renick, & Scott, 2021).

The introduction of the Tier III–CB plan reduced retirement benefits for employees. In the 2024 audited report, the state legislature found that in comparison to other tiers, KPERS Tier III requires higher employee contributions and shares more costs and financial risks while employees receive lower benefits (KSLPA, 2024). The study's simulation also showed that the

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replacement ratio for an employee under KPERS III was only 54 percent, which is 15 percentage points lower than the ratio for an employee with similar employment conditions. At the same time, the cost share is much higher for employees under KPERS Tier III (roughly around two-thirds of the total benefit is shared by employee contributions and the investment return on those contributions, and around one-third is shared by employer contributions and the investment return on those contributions), which is opposite to the cost-share proportion for KPERS Tier II employees (two-third shared by employer contributions and investment returns, and one-third shared by employees contributions and investment returns).

Pension benefits for Tier III–CB plan members are also dependent on fixed contributions by the employees and employer and the pre-determined credited interest rate of 4 percent, as shown in Table 6 above. Members of the Tier III CB plan can earn above 4 percent through dividends, which only occurs if the 5-year average return exceeds 6 percent. A legislative report showed that pension types (DB or CB plan) did not affect the ability of governments to hire new employees. However, the report found that DB plans were more likely to help retain workers, as employees under Tier I and II often have higher levels of satisfaction with their pension benefits compared to those covered under Tier III (Wu et al., 2021).

Kentucky Public Pensions Authority

Kentucky Public Pensions Authority (KPPA) is the state-administered pension plan and consists of three systems – CERS for county employees, KERS for general state employees, and SPRS for state police. For this analysis, we focus on the CERS and KERS since they comprise the majority of the plan members and are more replicable than the unique state police pension plans. CERS and KERS members are classified into three tiers, with Tiers I and II being DB plans and Tier III consisting of a CB plan.

Facing high levels of unfunded pension liabilities ($13.9 billion and a 50% system-wide 50% funded ratio in 2012 [Pew Charitable Trusts, 2013]), the 2012 General Assembly adopted House Resolution 162 to create the Task Force on Kentucky Public Pension. Among the recommendations concerning pension benefits, investment, and funding, the task force recommended the adoption of a hybrid CB plan for new participants in KERS, CERS, and SPRS. On April 4, 2013, the governor signed the pension reform legislature to overhaul Kentucky's pension systems to limit annual COLA's unless fully paid, increase employer contributions, and create a Tier III (CB plan) for workers hired on January 1, 2014. The CB plan was promised to provide a more predictable cost structure and address a range of issues, including fluctuation in investment returns or changes in demographic assumptions, salary growth, etc. (KPPA, 2023a). The comparison of pension benefits, contributions, and retirement requirements for the three tiers is listed in Table 8.

Regarding pension investment, KPAA did not separate its investments between the DB plans (Tier I & II) and the CB plan (Tier III). KPPA's investment returns have fluctuated over the past few years, though with a recent high of 25% in 2021 and a low of -5.7% in 2022 as shown in Table 9. KPPA's target asset allocation of CERS is included in Table 10, which is still higher than the guaranteed credit rate.

Figure 3 presents data on KERS and CERS-funded ratios over time. Kentucky pension system was fully funded in the early 2000. The market downturns of 2000 – 2002 and the 2007 – 2008 recession caused some major declines in pension funding ratios; however, decreases in investment returns only explained 18.7% of the unfunded problem. The other contributing

Table 8. KPPA Plan Description

Plans	Tier I (DB plan, hired before September 1, 2008)	Tier II (DB plan, hired between September 1, 2008 to December 31, 2013)	Tier III (CB plan, hired on January 1, 2014)
Final compensation	5-year for non-hazardous, and 3-years for hazardous occupations		
EE contribution	KERS - Nonhazardous: 2.5% - 4% prior to August 1986, 5% up to now. Hazardous: 7% prior to July 15, 2000, 8% up to now CERS - Nonhazardous: 2.5% - 4.25% prior to August 1998, 5% up to now. Hazardous: 7% prior to August 1998, 8% up to now	8%	8%
ER contribution			
Benefit multiplier	KERS: 1.97-2% for non-hazardous and 2.50% for hazardous occupation CERS: 2 – 2.20% for non-hazardous and 2.50% for hazardous occupation	Same for both KERS and CERS - 1.10% to 2.00% for non-hazardous and 1.30 – 2.50 % for hazardous occupation, depending on the months of services	
Credited rate			Guaranteed rate of 4% (plus additional dividend or shared interest)
Vesting requirement	60 months of services (~ 5 years)		
Normal retirement requirement	For nonhazardous - normal retirement age of 65 with at least 1 month of credited service; or any ages with 27 or more YOS For hazardous - normal retirement age of 55 with at least 1 month of hazardous credited service; or any ages with 20 or more YOS Allow early retirement with reduced benefits	For nonhazardous - normal retirement age of 65 with 5 YOS; or age 57 if met the Rule of 87 For hazardous - normal retirement age of 60 with 5 YOS; or any ages with 25 or more YOS Allow early retirement with reduced benefits	For nonhazardous - normal retirement age of 65 with 5 YOS; or age 57 if met the Rule of 87 For hazardous - normal retirement age of 60 with 5 YOS; or any ages with 25 or more YOS Not allow early retirement with reduced benefits

Source: KPPA (2022)

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Table 9. KPPA Investment Returns

	FY2017	FY2018	FY2019	FY2020	FY2021	FY2022	FY2023
KPPA System-wide	13.47%	8.57%	5.83%	1.15%	25.00%	-5.73%	9.54%

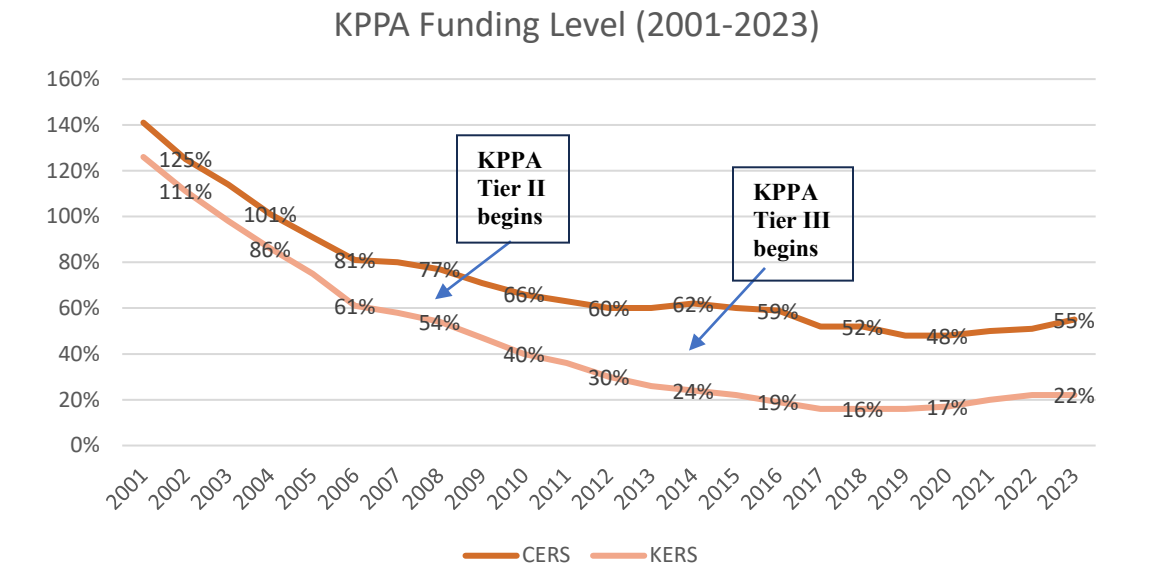
Source: KPPA (2023)

Table 10. KPPA Average Returns, 2023

Average Returns	1-year	3-year	5-year	10-year
KPPA System-wide	9.54%	8.88%	6.68%	7.16%
Benchmark	8.88%	8.46%	6.41%	6.90%

Source: KPPA (2023)

Figure 3. KPPA Funded Ratio, 2001-2023



Source: PPD (2023)

factors, including funding shortfall for COLA (18.2%), decrease in employer contributions (17.4%), changes in assumptions and benefits (14.2%), assumptions not met (6.8%), and others (24.6%) (Pension Task Force, 2012; Pew Charitable Trusts, 2013). For instance, over the period between 2005 and 2012, when the investment return did not match the actuarial return assumption, it added $3.6 billion to unfunded pension liabilities. Besides, changes in demographics and salaries also added nearly $800 million to pension debt (Pew Charitable Trusts, 2013). The introduction of Tier II was insufficient to avert this decreasing funding trend. Hence, in addition to legislative actions of suspending COLA (until fully paid) and increasing state pension contribution, the introduction of the CB plan was considered as part of the major reforms in Kentucky pension systems to provide a more predictable cost structure and reduce the uncertainty caused by inaccurate assumptions in projecting pension cost. The KPPA-funded ratios for CERS and KERS somewhat stabilized from years 2016 to 2023 with some promising trends in funded ratio. However, it takes time for the pension systems to address these large

Table 11. TMRS Plan Description

Plans	Membership	Total Net Assets	Social Security Participation	EE Contribution	ER Contribution	Funded Ratio*
TRS – DB plan	953,295 actives 489,921 annuitants	$187,170,535,558	No	8.25%	9.48%	77.53%
ERS – DB plan	139,958 actives 124,504 annuitants	$34,049,730,384	No	9.08%	15.97%	70.8%
TMRS – CB plan	119,723 actives 80,608 annuitants	-	Yes	6.72%	14.42%	82.79%
TCDRS – CB plan	145,226 actives 82,031 annuitants	-	Yes	6.78%	12.31%	88.59%

Data source: Texas Pension Review Board (2022).
EE and ER Contributions for the CB plans can be differed for each participating city. The number shown here is the system reported average city rate.
*Funded ratio of 2023

funding gaps accumulated in the past.

While the funding for KPPA has improved, concerns have been expressed about employee pension benefits. A report on KPPA by Urban Studies in 2014 compared employees' benefits under DB and CB plans using simulations of non-hazardous employees (5% EE contribution and 4% ER contribution) (Johnson & Southgate, 2014). The analysis found that state and county employees' benefits varied under the CB and DB plans depending on their age of entry into their position and years of service. Employees who were hired at a relatively young age and remained in government for no more than 25 years accumulated equal to or, in some cases, more benefits in the CB plan. However, those with more years of service or those hired at older ages accumulated more benefits under the traditional DB plan (Johnson & Southgate, 2014).

Texas Municipal Retirement System

Texas Municipal Retirement System (TMRS) is a CB pension plan established in 1947 and serves city employees throughout Texas. While there are 99 public pension plans in Texas, the four state-wide pension systems, including two DB plans - Teacher Retirement System (TRS) and the Employee Retirement System (ERS), and two CB plans – Texas Municipal Retirement Systems (TMRS) and Texas County and District Retirement System (TCDRS), accounted for 89 percent of the total membership (Jansen et al., 2021). The composition of plan memberships as of 2019 is listed in Table 11.

Table 12. TMRS Member Contribution

	Number of Participating Cities
Member contribution	
Member contribution rate – 3%	3
Member contribution rate – 5%	318
Member contribution rate – 6%	99
Member contribution rate – 7%	514
City match	
1:1 Match	166
1.5:1 Match	106
2:1 Match	662

Source: TMRS (2023)

Table 13. TMRS Investment Returns

Average Returns	FY2017	FY2018	FY2019	FY2020	FY2021	FY2022	FY2023
TMRS	13.82%	-2.38%	14.68%	7.55%	12.92%	-7.63%	11.64%

Source: TMRS (2023)

Table 14. TMRS Average Returns

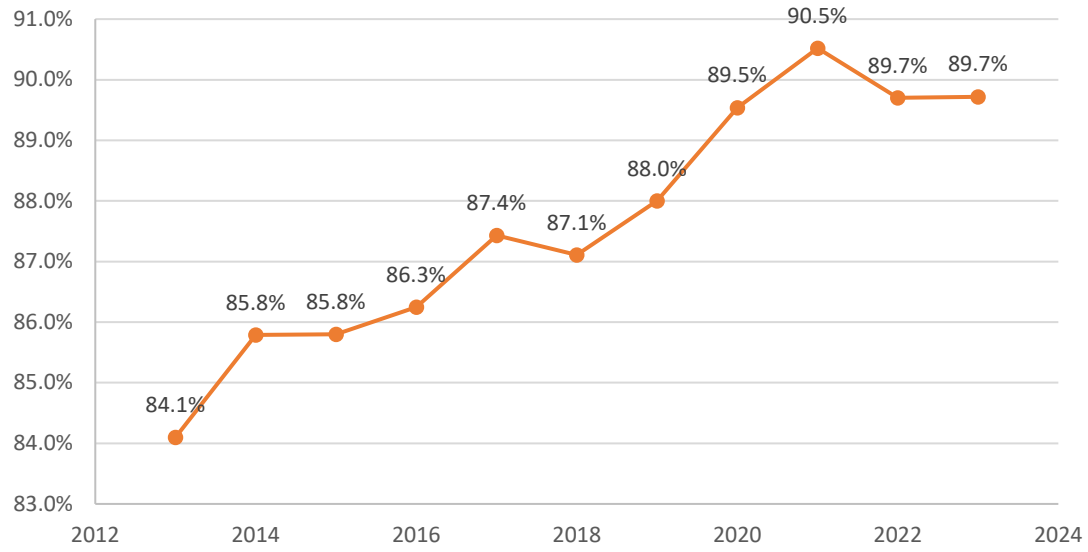
Average Returns 2023	1-year	3-year	5-year	10-year	Actuarial Investment Return Assumption
TMRS	11.64%	5.29%	7.79%	6.15%	6.75%

Source: TMRS (2023)

TMRS is a multiple-employer retirement system in which member cities can choose their benefit options and plan design and modify their benefits. Participating cities are required to pay 100 percent of their required contributions. Depending on each member city's plan option, TMRS calculates the actuarial contributions and provides funding status updates for each member city. TMRS started with eight participating cities and has grown to 936 participating Texas cities (TMRS, 2023a). Depending on the city's retirement plan provision, eligible members contribute between three and seven percent of payroll. The city matches at a chosen rate (1:1, 1.5:1, or 2:1). The pension contribution breakdown is shown in Table 12.

As shown above, pension benefits depend on fixed contributions by the employees and employer and the pre-determined credited interest rate of 5 percent – any investment gains or losses go to the government employer. CB pension benefit growth accumulates until retirement and a lifetime annuity is paid at retirement. Most member cities set a vesting period of 5 years (894 cities). Depending on the city's plan provision, a typical member is eligible to retire at the age of 60 with five years of service or at any age with 20 or 25 years of service. While the plan's investment returns have fluctuated over the years as shown in Table 13, the plan's 10-year average investment return was 6.15 percent, higher than the guaranteed credit rate (see Table 14). Over the last ten years, the plan's funded ratios ranged from 84 to 89 percent (see Figure 4).

Figure 4. TMRS Funded Ratio, 2012-2022



Source: PPD (2023)

Discussion

This analysis examined CB plans with the aim of shedding light on a pension plan that is receiving greater attention in the public sector. The analysis focused on plans in four states – Nebraska, Kansas, Kentucky, and Texas. For Nebraska, conversion to the CB plan was motivated by workforce recruitment and retention needs. Additionally, state policymakers recognized that the professionally managed investment (as it has always been for the state-administered DB plans) outperformed the investment returns among DC plans (managed by individual employees). In the case of Kansas and Kentucky, the adoption of CB plans was largely motivated by financial burdens caused by DB plans. Texas has managed CB plans for decades.

Compared to DB plans, CB plans can produce a more predictable cost structure for state and local governments and potentially contribute to an increase in funding levels at the expense of pension benefit reductions to employees. The adoption of CB plans in KS and KY was part of state pension reforms aimed at reducing pension unfunded liabilities and stabilizing pension funding.

The TMRS was designed as a multi-employer CB pension plan in which each city can choose its pension options within the system framework. The system grew in popularity and now includes more than 900 cities. The system maintains a relatively stable funding ratio (around 80 to 90 percent funded), and long-term investment returns tend to meet or surpass the credited rates. In both TMRS and NPERS-County plans, we also found some support for the advantages of the multi-employer pension systems in addressing some of the pension governance issues (Chen & Munnell, 2024; Ghilarducci & Weller, 2007). Either system is administered by the state like NPERS or administered by an appointed representative from participating cities like TMRS, where the multiemployer pension system reduces administrative burdens on cities and counties while increasing their investment capacity (i.e., asset size, professional management).

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In terms of pension benefit adequacy, our analysis found that compared to those employed under DB plans, those hired under CB plans received lower pension benefits. This effect is more pronounced for older workers and those with longer tenure. Studies in Kansas and Kentucky highlighted this concern about workforce retention. They suggested that employees hired under CB plans felt that their pension benefits were not as generous as their co-workers who were hired under DB plans. This raises concerns over pension equity among different generations of the workforce. Nevertheless, there is evidence from the four case studies that CB plans do not significantly affect state and local governments' recruitment. In either case, these findings do not bode well for Nebraska if employee recruitment and retention were a key goal for the plan's creation.

Conclusion

Researchers and practitioners alike have a keen interest in long-term liabilities in general and pensions in particular. Pension plans can be important employee recruitment and retention tools but are also costly obligations that can be challenging to manage. Traditionally, government officials only have a choice between DB and DC plans. An alternative that generates interest is the CB plan, which incorporates elements of these other plans.

This paper sought to answer the following questions: (1) what are CB plans, and how are they different from a DB or a DC plan; (2) what are the reasons state and local governments decide to adopt CB pension plans; (3) what are the implications of a CB pension plan on government financial management (investment risk, governance, funding) and employee benefits; and (4) what are some keys factors for those considering a CB plan?

We provided a thorough explanation of CB plans and offered a comparative analysis of CB plans across four states. In most instances, CB plans were adopted to save money, improve the pension funding ratios, or both. The evidence from our analysis suggests that CB plans can help contribute to lowering unfunded pension liabilities. For Nebraska, the CB plan is nearly fully funded. In Kansas, the state's funding ratio improved from 67 percent in 2015 to 73 percent in 2022 (partially attributed to CB plan adoption). In the case of Kentucky, pension reforms, including the adoption of the CB plan, helped remedy funding levels that fell to less than 30 percent in 2012 (Pew Charitable Trusts, 2013, 2022). TMRS has maintained 80-90 percent funding ratios, with more cities in Texas joining the system. Nebraska policymakers were motivated to adopt a CB plan for employee retention and recruitment; however, there is limited evidence that the state's CB plan had an effect. For the states studied, the move from a DB plan to a CB plan often increased employees' dissatisfaction with pension benefits.

For entities considering CB pension plans, these plans provide more predictable costs and lower investment risks for government employers. However, they can increase employee retirement risks and reduce overall benefits. Key factors that should be considered when examining pension plan changes, such as CB plans, are as follows. First, consider the legal framework related to public employees' benefits and the legacy costs of current pension plans (while considering CB plan conversion). Nebraska was a unique circumstance because prior to the creation of the CB plan, NPERS offered a DC plan to state and county employees, so there were no legacy costs moving toward the current CB plan. For those entities operating a DB plan with pension liabilities owed to their retirees and workers, it is critical to consider how the pension conversion (from DB to CB) affects the funding structure of those pension liabilities.

Additionally, the legal environment around pension benefits alternation, the scope of the law, and the power of public unions are noteworthy. In some states, pension benefits may be protected under state constitutions (e.g., Illinois) or state statutes; any changes to pension benefits can trigger judiciary actions.

The analysis is not without its limitations. One such limitation of this study is its generalizability since it is based on only four plans in different states. The challenge is further complicated by the unique design of pension systems/plans, which was evident when considering CB plans. Each plan had different eligibility levels, benefits, employee requirements, etc. Comparative analysis is further complicated by most governments' recent adoption of the CB plans. With the exception of Texas, whose plan was created in 1947, most were created within the past 20 years, affecting detailed examination of events over long periods. Therefore, it is still too early to confirm the overall impact of the CB plan on pension funding and governance. Additionally, the impacts of the CB plan on the public sector workforce are still unclear, partially because the relationship between pension benefits and workers' recruitment/retention can be moderated by different factors (i.e., education, skills, subfield, etc.) and the local labor market. More recent reports have indicated various factors, including low pay and hazardous working environments (e.g., correction and emergency workers), that contribute to current challenges with public sector recruitment and retention (Lavigna, 2023; Mission Square Retirement, 2024).

While the study provided unique features of those pension systems, the lack of statistical power and ability to control for other confounding factors can make it challenging to demonstrate any causal relation between the adoption of CB plans and public sector recruitment and retention. Despite these limitations, this study is one of the few thorough examinations of CB plans and is beneficial to readers given its comparative analysis case-study design. Since pension management depends on various institutional, legal, and governance factors, the advantage of our study and analysis approach is the ability to critically examine details often overlooked in other empirical analyses or fixed effect models.

Disclosure Statement

The authors declare that they have no conflicts of interest related to the research, authorship, or publication of this article.

References

Abashidze, N., Clark, R. L., Hammond, R. G., Ritter, B. M., & Vanderweide, D. (2021). Annuity pricing in public pension plans: Importance of interest rates. *Journal of Pension Economics & Finance*, *20*(1), 27-48. https://doi.org/10.1017/S1474747219000271

Aubry, J.-P., & Wandrei, K. (2021). *Do all state and local workers receive an annuity in retirement?* (Issue Brief 79). Center for Retirement Research, Boston College.

Biggs, A. G. (2011). *Public sector pensions in Nebraska: Are cash balance plans the answer?* (Working Paper No. 2239140). Social Science Research Network. https://papers.ssrn.com/abstract=2239140

Brainard, K., & Brown, A. (2018a). In-depth: Risk sharing in public retirement plans. *National Association of State Retirement Administrators*. https://www.nasra.org/sharedriskpaper

Brainard, K., & Brown, A. (2018b). Significant reforms to state retirement systems. *National Association of State Retirement Administrators*. https://www.nasra.org/content.asp?admin=Y&contentid=219

Brown, M. K. (1999). *Race, money, and the American welfare state*. Cornell University Press.

Buck Consultants. (2000). Benefit review study of the Nebraska retirement systems. *National Association of State Retirement Administrators*. https://www.nasra.org/Files/Topical%20Reports/Defined%20Contribution%20Plans/Nebraskastudy.pdf

Cahill, K. E., & Soto, M. (2003). *How do cash balance plans affect the pension landscape?* (Work Paper No. 14). Center for Retirement Research, Boston College.

Chambers, P. (2015, August 5). *Defined contribution and cash balance plans*. NCSL Legislative Summit. Seattle, Washington.

Chen, A., & Munnell, A. H. (2024). A multiple employer plans primer: Exploring their potential to close the coverage gap. Center for Retirement Research, Boston College. https://crr.bc.edu/wp-content/uploads/2024/01/A-Multiple-Employer-Plans-Primer_Exploring-Their-Potential-to-Close-the-Coverage-Gap.pdf

Clark, R. L., & Schieber, S. J. (2004). Adopting cash balance pension plans: Implications and issues. *Journal of Pension Economics & Finance*, *3*(3), 271-295. https://doi.org/10.1017/S1474747204001738

Cong, Y., Frank, H. A., Gianakis, G., & Guo, H. (2015). Critical issues in the transition from the defined benefit to the defined contribution pension model: Perceptions from Florida municipal finance and human resource directors. *Review of Public Personnel Administration*, *35*(4), 333-351. https://doi.org/10.1177/0734371X14533572

Cong, Y., Neshkova, M. I., & Frank, H. A. (2017). Path dependence in pension policy: The case of Florida local governments. *Public Budgeting & Finance*, *37*(4), 92-110. https://doi.org/10.1111/pbaf.12172

Coronado, J. L., & Copeland, P. C. (2004). Cash balance pension plan conversions and the new economy. *Journal of Pension Economics and Finance*, *3*(3), 297-314. https://doi.org/10.1017/S1474747204001684

Elliott, K. R., & Moore, J. (2000). Cash balance pension plans: The new wave. *Compensation and Working Conditions*, *5*(2), 3-12.

Frank, H., Gianakis, G., & Neshkova, M. I. (2012). Critical questions for the transition to defined contribution pension systems in the public sector. *American Review of Public Administration*, *42*(4), 375-399. https://doi.org/10.1177/0275074011406712

Fuchsman, D., Hengerer, D., Moody, J., & Randazzo, A. (2023). *The actuarial sources of the rise in unfunded liabilities in America's defined benefit plans in the 21st century* (Working Paper No. 23-01). Sinquefield Center for Applied Economic Research.

Government Accountability Office. (2000). *Cash balance plans: Implications for retirement income*. Government Accountability Office.

Government Accountability Office. (2005). *Recent experiences of large defined benefit plans illustrate weaknesses in funding rules* (Report No. GAO-05-294). Government Accountability Office.

Ghilarducci, T., & Weller, C. E. (2007). *Employee pensions: Policies, problems, and possibilities*. Cornell University Press.

Haverstick, K., Munnell, A. H., Sanzenbacher, G., & Soto, M. (2010). Pension type, tenure, and job mobility. *Journal of Pension Economics & Finance*, *9*(4), 609-625. https://doi.org/10.1017/S1474747209990321

Honig, D. (2019). Case study design and analysis as a complementary empirical strategy to econometric analysis in the study of public agencies: Deploying mutually supportive mixed methods. *Journal of Public Administration Research and Theory*, *29*(2), 299-317. https://doi.org/10.1093/jopart/muy049

Jansen, D. W., Liu, L., Navarro, C. I., & Rettenmaier, A. J. (2021). *Texas pension woes* (Policy Study No. 2103). Private Enterprise Research Center.

Johnson, R. W., & Southgate, B. G. (2014). How will state and county government employees fare under Kentucky's new cash balance pension plan? *The Urban Institute*.

Johnson, R. W., & Steuerle, E. (2004). Promoting work at older ages: The role of hybrid pension plans in an aging population. *Journal of Pension Economics & Finance*, *3*(3), 315-337. https://doi.org/10.1017/S147474720040017 4X

Kansas Public Employees Retirement System. (2024). *KPERS Fast Facts*. https://www.kpers.org/pdf/KPERSFastFacts.pdf

Kentucky Public Pensions Authority. (2022). *Summary plan description*. https://www.kyret.ky.gov/Publications/Books/Summary%20Plan%20Description.pdf

Kentucky Public Pensions Authority. (2023a). *About KPPA*. https://www.kyret.ky.gov/About/Pages/default.aspx

Kentucky Public Pensions Authority. (2023b). *Annual comprehensive financial report*. https://www.kyret.ky.gov/Publications/Books/2023%20Annual%20Report.pdf

Kansas Legislative Division of Post Audit. (2024). Reviewing the KPERS 3 Retirement Plan. https://www.kslpa.gov/audit-report-library/reviewing-the-kpers-3-retirement-plan/

Lavigna, R. J. (2023, March 2). A road map for dealing with government's workforce crisis. *Governing*. https://www.governing.com/work/a-road-map-for-dealing-with-governments-workforce-crisis

Lazonick, W., Ghilarducci, T., & Weller, C. (2007). Economic institutional change and employer pensions. In T. Ghilarducci & C. E. Weller (Eds.), *Employee pensions: Policies, problems & possibilities* (pp. 29-68). Labor and Employment Relations Association

Lewis, G. B., & Frank, S. A. (2002). Who wants to work for the government? *Public Administration Review*, *62*(4), 395-404. https://doi.org/10.1111/0033-3352.00193

Madland, D. (2007). The politics of pension cuts. In T. Ghilarducci & C. E. Weller (Eds.), *Employee pensions: Policies, problems & possibilities* (pp. 187-214). Labor and Employment Relations Association

Matkin, D. S. T., Chen, G., & Khalid, H. (2019). The governance of public pensions: An institutional framework. *Administration & Society*, *51*(1), 91-119. https://doi.org/10.1177/0095399715621945

McGrath, A. C. (2004). Pension law: Cash balance pension plans are not inherently age discriminatory: Cooper v. IBM personal pension plan defies a strong history of support for the cash balance design. *Oklahoma Law Review*, *57*(2), 429-463.

Mission Square Retirement. (2024, July 23). Recruitment challenges easing for state and local governments. https://www.missionsq.org/about-us/news-and-updates/media-inquiries/news-20240722-recruitmentchallengeseasing.html

Mitchell, O. S., & Mulvey, J. (2004). Potential implications of mandating choice in corporate defined benefit plans. *Journal of Pension Economics & Finance*, *3*(3), 339-354. https://doi.org/10.1017/S1474747204001805

Munnell, A. H., Aubry, J. P., & Quinby, L. (2011). Public pension funding in practice. *Journal of Pension Economics & Finance*, 10(2), 247-268. https://doi.org/10.1017/S1474747211000126

Munnell, A. H., Haverstick, K., & Soto, M. (2007). *Why have defined benefit plans survived in the public sector?* (Working Paper No. 2). Center for Retirement Research, Boston College.

Munnell, A. H., & Soto, M. (2004). The outlook for pension contributions and profits in the US. *Journal of Pension Economics & Finance*, *3*(1), 77-97. https://doi.org/10.1017/S1474747204001489

Nebraska Investment Council. (2023). Annual report. https://nic.nebraska.gov/sites/default/files/doc/2023%20Annual%20Report.pdf

Nebraska Public Employees Retirement Systems. (2022a). Actuarial valuation report. https://npers.ne.gov/SelfService/public/howto/publications/ActuarialReports/ActuarySchool2022.pdf

Nebraska Public Employees Retirement Systems. (2022b). Annual report. https://npers.ne.gov/SelfService/public/howto/publications/LegisReports/AnnualReport2022.pdf

Nebraska Public Employees Retirement Systems. (2024a). Plan overview. https://npers.ne.gov/SelfService/public/planInformation/state/statePlanInfo.jsp

Nebraska Public Employees Retirement Systems. (2024b). Annual report. https://npers.ne.gov/SelfService/public/howto/publications/LegisReports/AnnualReport2024.pdf

Pension Task Force. (2012). Report of the task force on Kentucky public pensions. *Kentucky Legislative Research Commission*. https://legislature.ky.gov/LRC/Publications/Research%20Memoranda/RM512.pdf

Pew Charitable Trusts. (2013). Kentucky's successful public pension reform. https://www.pewtrusts.org/en/research-and-analysis/issue-briefs/2013/09/27/kentuckys-successful-public-pension-reform

Pew Charitable Trusts. (2014). Public pension cash balance plans: A primer. www.pewtrusts.org/-/media/legacy/uploadedfiles/pcs_assets/2014/cashbalancebriefv7pdf.pdf

Pew Charitable Trusts. (2022). *Matrix assesses state pensions long-term fiscal health*. Pew Charitable Trusts.

Public Plans Data. (2023). Retirement system data: Kentucky Retirement Systems. https://publicplansdata.org/quick-facts/system/?system_id=37

Purcell, P. J. (2005). *Pension issues: Cash-balance plans* (Report No. RL30196). Congressional Research Service.

Rappaport, A. M., Young, M. L., Levell, C. A., & Blalock, B. A. (1997). Cash balance pension plans. In M. S. Gordon, O. S. Mitchell, & Marc M. Twinney (Eds.), *Positioning pensions for the twenty-first century* (pp. 29-44). University of Pennsylvania Press.

Rodriguez, E., & Grillo-Chope, L. (2007). How can defined contribution plans meet workers' needs? In T. Ghilarducci & C. E. Weller (Eds.), *Employee pensions: Policies, problems & possibilities* (pp. 123-142). Labor and Employment Relations Association

Schieber, S. J. (2007). Tales of the dodo bird and the Yellowstone wolf: Lessons for db pensions and the retirement ecosystem. In T. Ghilarducci & C. E. Weller (Eds.), *Employee pensions: Policies, problems & possibilities* (pp. 85-100). Labor and Employment Relations Association.

Schrager, A. (2009). The decline of defined benefit plans and job tenure. *Journal of Pension Economics & Finance*, *8*(3), 259-290. https://doi.org/10.1017/S1474747208003570

Texas Municipal Retirement System. (2023a). Actuarial valuation report. https://www.tmrs.com/uploads/files/general/down/Actuarial_Valuations/Final_TMRS_2023_valuation_report.pdf

Texas Municipal Retirement System. (2023b). Annual comprehensive financial report. https://www.tmrs.com/uploads/files/general/down/pubs/ACFR_2023/ACFR_2023.pdf

Texas Pension Review Board. (2022). Texas public pension data center. https://data.prb.texas.gov/datasets/dossier_actuarial_funded_ratio_338.csv

U.S. Census Bureau. (2017). *Annual survey of public pensions: State- and locally-administered defined benefit data summary report: 2016*. U.S. Department of Commerce.

VanDerhei, J., & Copeland, C. (2004). *ERISA At 30: The decline of private-sector defined benefit promises and annuity payments? What will it mean?* (Working Paper No. 550902). Social Science Research Network.

Varnhagen, M. (2007). U.S. federal pension policy: Its potential and pitfalls. In T. Ghilarducci & C. E. Weller (Eds.), *Employee pensions: Policies, problems & possibilities* (pp. 163-186). Labor and Employment Relations Association

Weller, C. (2005). *Ensuring retirement income security with cash balance plans*. Center for American Progress.

Weller, C., & Ghilarducci, T. (2007). Pension policy options: Meeting in the middle. In T. Ghilarducci & C. E. Weller (Eds.), *Employee pensions: Policies, problems & possibilities* (pp. 215-232). Labor and Employment Relations Association

Wu, S., Renick, M., & Scott, J. G. (2021). Kansas Public Employees Retirement System's retirement plans and history. *Kansas Legislative Research Department*. https://klrd.org/publications/briefing-book-2021/kansas-public-employees-retirement-systems-retirement-plans-and-history/

Yin, R. K. (2014). *Case study research: Design and methods*. Sage.

Zall, M. (2002). Cash balance plans. *Strategic Finance*, *83*(9), 29-31.