

Department of Economics, University of Warwick
Monash Business School, Monash University

as part of
Monash Warwick Alliance

**Enhancing Employee Pension Fund Performance for
Sustainable Economic Growth in Indonesia**

Yuli Susanti

Warwick-Monash Economics Student Papers

September 2024

No: 2024/80

ISSN 2754-3129 (Online)

The Warwick Monash Economics Student Papers (WM-ESP) gather the best Undergraduate and Masters dissertations by Economics students from the University of Warwick and Monash University. This bi-annual paper series showcases research undertaken by our students on a varied range of topics. Papers range in length from 5,000 to 8,000 words depending on whether the student is an undergraduate or postgraduate, and the university they attend. The papers included in the series are carefully selected based on their quality and originality. WM-ESP aims to disseminate research in Economics as well as acknowledge the students for their exemplary work, contributing to the research environment in both departments.

Recommended citation: Susanti, Y. (2024). Enhancing employee pension fund performance for sustainable economic growth in Indonesia. *Warwick Monash Economics Student Papers 2024/80*.

WM-ESP Editorial Board¹

Sascha O. Becker (University of Warwick)

Mark Crosby (Monash University)

James Fenske (University of Warwick)

Atisha Ghosh (University of Warwick)

Cecilia T. Lanata-Briones (University of Warwick)

Gordon Leslie (Monash University)

Thomas Martin (University of Warwick)

Vinod Mishra (Monash University)

Natalia Zinovyeva (University of Warwick)

¹ Warwick Economics would like to thank Gianna Boero and Samuel Obeng for their contributions towards the selection process.

Enhancing Employee Pension Fund Performance for Sustainable Economic Growth in Indonesia

Yuli Susanti¹

Abstract

In an era of unprecedented financial challenges, health emergencies, and technological disruptions, pension funds are critical to economic stability. Focused on the contexts of Indonesian employee pension funds, the study navigates the intricate dynamics of pension systems within the broader economy. Against an evolving global landscape marked by financial uncertainties and demographic shifts, the research scrutinizes how distinct pension schemes adopted by Indonesian employee pension funds shape the resilience and efficacy of their respective pension funds.

The research employs two distinct yet complementary models to investigate the dynamic of pension fund outcomes amidst varying macroeconomic conditions and micro-level management practices. Firstly, a Vector Autoregression (VAR) model is utilized to explore the intricate interactions between macroeconomic variables. The VAR model allows for the simultaneous examination of multiple variables to understand the short and long-term effects on pension fund dynamics. Secondly, a micro-level panel data regression model is employed to delve deeper into specific factors influencing pension fund performance, including contribution rates, investment strategies, coverage, regulatory frameworks, and risk management practices. The analysis incorporates treatment variables related to the COVID-19 pandemic to examine the resilience of pension funds to external shocks. The empirical findings reveal significant associations between various macroeconomic factors, micro-level management practices, and pension fund performance outcomes. Notably, higher contribution rates, broader coverage, and effective risk management are found to positively impact pension fund performance, while certain aspects of the funding mechanism and regulatory framework exhibit negative associations. The study

¹ yuli.susanti.chang@gmail.com

contributes to the existing literature by offering insights into the complex interplay between macroeconomic conditions, micro-level management practices, and pension fund outcomes, providing valuable implications for policymakers, practitioners, and stakeholders in the pension fund industry.

Keywords: Pension funds, Economic stability, Investment strategies, Risk management, Macroeconomic, VAR model, Indonesia pension funds

JEL Classifications: C33; E21; G22; G23; G53; H55; J32

1. Introduction

Pension fund systems are critical in ensuring the global financial security of aging populations (Lyons et al., 2018). As demographic shifts (Poterba, 2014) and economic challenges continue to impact retirement security (Mikhalev, 1996; Suryahadi et al., 2014; Tri et al., 2020), understanding the dynamics of pension systems becomes increasingly important. One of the world's greatest demographic challenges is the aging population, caused by increasing life expectancies and falling fertility rates. The trajectory of human longevity, while a testament to advancements in healthcare and living standards, ushers in a new era characterized by a greying populace with global average lifespans increasing from 50.9 in 1960 to 73.1 in 2023 (The World Bank, 2023). Simultaneously, diminishing fertility rates challenge the traditional demographic pyramid with a decline in global fertility from an average of 4.7 to 2.3 births per woman from 1960 to 2021 (The World Bank, 2023), tilting it towards an age structure that demands a paradigm shift in our approach to societal and economic frameworks. Moreover, the old-age dependency ratio of people older than 64 to the working-age population aged 15-64 continues to rise from 9 in 1960 to 15 in 2022 (The World Bank, 2023). This rising old-age dependency ratio challenges long-term economic growth and fiscal outlook (Intergenerational Report, 2021). The financial burden on working-age individuals will intensify as they are responsible for supporting an expanding older generation. This demographic shift necessitates increased government expenditure on healthcare, the pension fund, and end-of-life support. The growing elderly population also poses challenges to participation and productivity growth. As the aging trend places additional strain on the budget, it becomes imperative for government policies to evolve, emphasizing the importance of adapting and fostering economic growth. This adaptation is crucial in addressing fiscal challenges and aligning with the performance of pension funds, which play a pivotal role in sustaining financial security for retirees amidst changing demographic dynamics.

In Southeast Asia, including Indonesia, the retirement benefits provided are insufficient to enable older individuals to lead active lives, as outlined in the active aging framework (WHO, 2022). The notion of active aging has sparked discussions surrounding the potential postponement of retirement age, the extension of working years, and efforts to ensure the long-term viability of pension systems (Foster, 2018). Essentially, the pension is a supplemental or supplementary element rather than a primary source ensuring financial sufficiency in old age. Senior citizens often rely on additional financial assistance from their employment, familial contributions, community support, or other government interventions to meet their financial needs. Recently, this has resulted in a rise in the percentage of elderly individuals actively participating in the labor force, up to 41.7% in 2019 in Indonesia (OECD, 2023). Coupled with a surge in inflation, resulting in escalated expenditures, the heightened significance of enhancing the performance of employee pension funds becomes paramount to cover daily spending.

Moreover, the Indonesian employee pension system has undergone notable transformations over the years, reflecting the broader socio-economic developments within the nation. Indonesia issued Act No. 11 concerning the Pension Fund in 1992 and continued the reform

until the post-2008 global financial crisis, including structuring the pension system based on the three-pillar model (Rachmatarwata, 2017; Sudjono, 2017), combining defined benefit (DB) and defined contribution (DC) scheme. The efficacy of employee pension fund schemes stands as a linchpin for sustainable growth, with critical factors such as contribution rates, investment allocation strategies, coverage or retirement age, and the regulatory framework, including funding mechanism and risk management, wielding profound influence. Optimal contribution rates ensure the fund's financial health, while strategic investment allocation can drive returns crucial for long-term sustainability. Extending coverage, particularly considering retirement age, not only enhances the social safety net but also aligns with a more active aging workforce. The regulatory framework, including funding mechanism and risk management, is the cornerstone and establishes guidelines that foster transparency, stability, and adaptability, creating an environment conducive to robust pension fund performance and ultimately contributing to broader economic resilience and prosperity.

As Indonesia transitions to an emerging economic powerhouse, the role of employee pension funds takes center stage in ensuring the financial well-being of its workforce during their post-employment years. Despite undergoing reforms for over twenty years, there has been a limited exploration of the performance of Indonesian employee pension funds. Thus, this research delves into the unique contexts of pension schemes in Indonesian employee pension funds, aiming to shed light on how these schemes impact the performance of pension funds and increase economic growth. This study addresses the gap by providing an in-depth analysis of the Indonesian context, examining how unique socio-economic factors influence the relationship between pension schemes and fund performance that ultimately leads to economic growth.

The primary objective of this research is to conduct a comprehensive analysis of pension fund dynamics in Indonesian employee pension funds. By scrutinizing the intricate relationship between pension schemes and fund performance, we aim to identify key factors contributing to outcome variations. The study seeks valuable insights for policymakers, practitioners, and stakeholders in Indonesia, contributing to the broader disclosure of the effectiveness of the pension system. To guide our inquiry, the following objectives will be addressed:

- a. Scrutinizing the characteristics of pension schemes within the Indonesian employee pension sector.
- b. Evaluating the historical performance of employee pension funds and case studies.
- c. Recommendations for optimizing pension fund schemes based on empirical findings.

The research holds significance on multiple fronts. Firstly, it can provide policymakers with evidence-based insights into how different pension schemes influence the performance of employee pension funds. This information can be crucial for crafting effective policies to optimize the impact of pension systems on economic stability and the financial well-being of retirees. Secondly, the study findings can offer valuable insights to pension fund managers, guiding their strategic decision-making processes. Understanding how different pension schemes impact fund performance allows for more informed investment strategies and risk

management practices. Lastly, as pension funds typically have a long-term investment horizon, the study can inform long-term economic planning. This is particularly relevant for a country like Indonesia, aligning pension systems with broader economic development goals and contributing to social welfare by providing a secure retirement income.

The remainder of this report is organized as follows: The Literature Review provides a comprehensive overview of existing research on pension systems and fund performance. The Theoretical Framework establishes the conceptual basis and economic theory for our analysis. Data and Methodology details the data sources and econometric methods employed. Empirical Strategy and Results provide an in-depth pension fund performance analysis. Case Studies provide practical examples to support policy recommendations. The report concludes with policy implications, study limitations, and recommendations for future research. By examining the impact of pension schemes on fund performance, this research aims to contribute valuable insights to the ongoing disclosure surrounding the pension system's effectiveness.

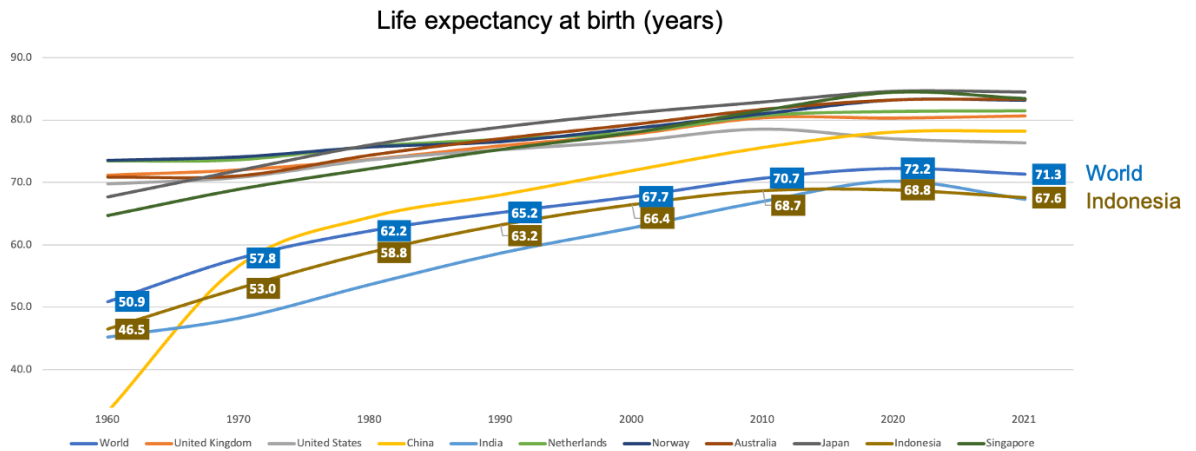
2. Literature Review

2.1. Aging Population and Employee Pension Funds

The global landscape is witnessing a profound transformation as populations age at an unprecedented rate. Increasing life expectancies and declining fertility rates have collectively contributed to a demographic shift characterized by a burgeoning aging population (Gu et al., 2021; Guseh, 2016). Globally, life expectancies have increased over the years due to advancements in healthcare, nutrition, and living conditions. In 1960, the global average life expectancy was around 50.9 years, and by 2021, it had risen to approximately 71.3 years, according to the World Bank (2023) data in Figure 1. Fertility rates, on the other hand, have generally been declining from around 4.7 births per woman in 1960 to 2.3 births per woman in 2021 (Figure 2). These trends are also shown in Indonesia as life expectancy rose from 46.5 in 1960 to 67.6 in 2021, and fertility rates declined from 5.5 in 1960 to 2.2 in 2021.

Figure 1

Life expectancy at birth (years)

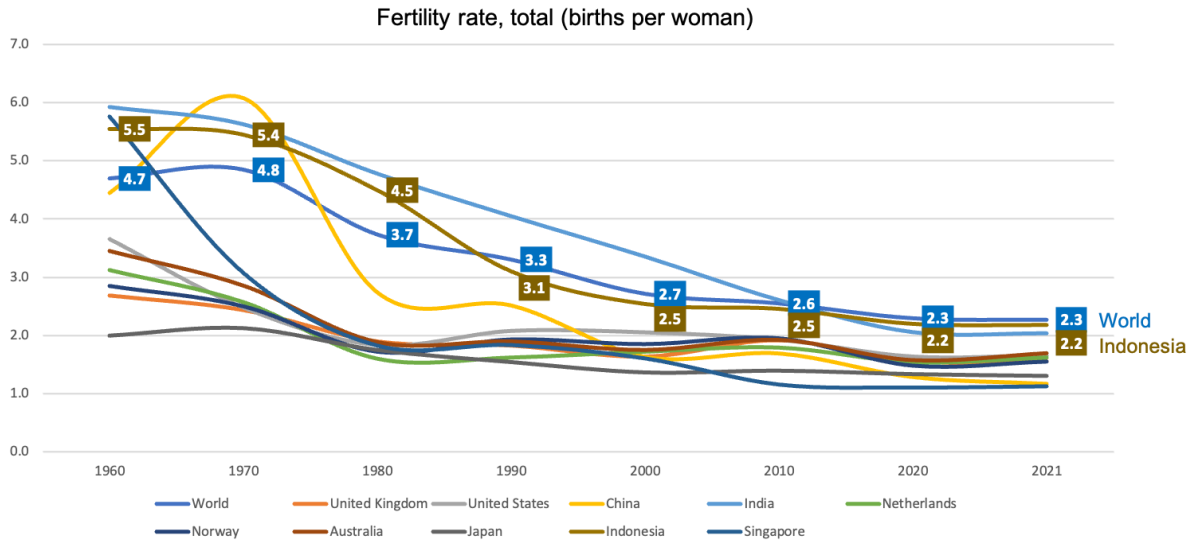


Note. Total Life expectancy at birth in selected countries. Adapted from *The World Bank, 2023* (<https://data.worldbank.org/indicator/SP.DYN.LE00.IN>). Own work.

These conditions increase the old-age dependency ratio to 15.1% in 2022 globally and 10.1 in Indonesia (Figure 3), which poses significant challenges for the economic and fiscal dimensions of a nation. This demographic shift signifies a larger retired population drawing on various forms of public support, such as pensions, healthcare, and social services. This decline in the working-age population led to economic productivity and growth slowdown and heightened pressure on the government to sustain pension systems as a larger portion of the population transitioned into retirement (Hock & Weil, 2012; Lee, 2016).

Figure 2

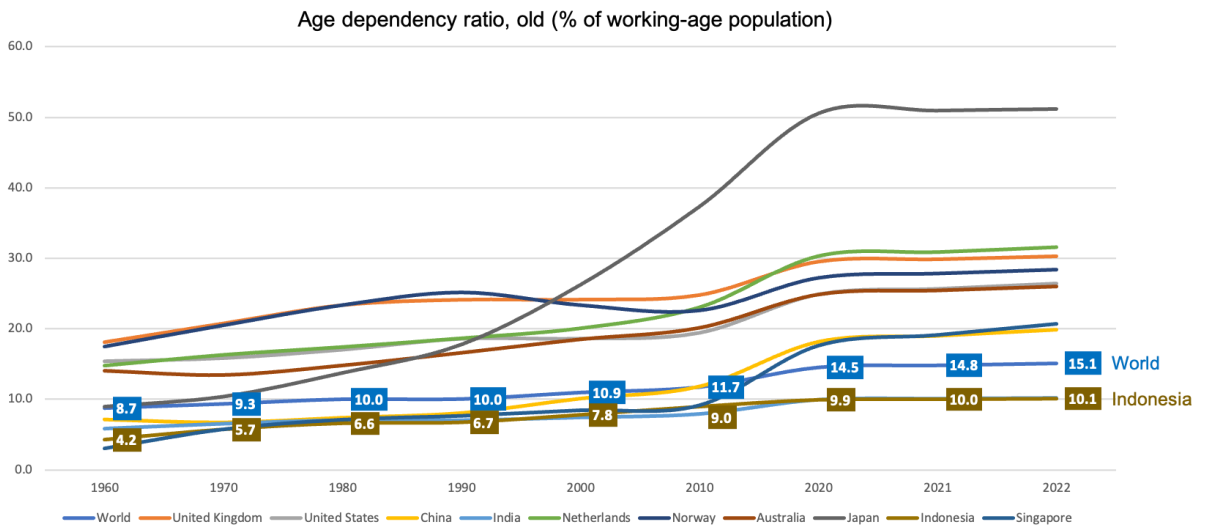
Fertility rate, total (births per woman)



Note. Total Fertility rate in selected countries. Adapted from *The World Bank*, 2023 (<https://data.worldbank.org/indicator/SP.DYN.TFRT.IN?contextual=region>). Own work.

Figure 3

Age dependency ratio, old (% of working-age population)



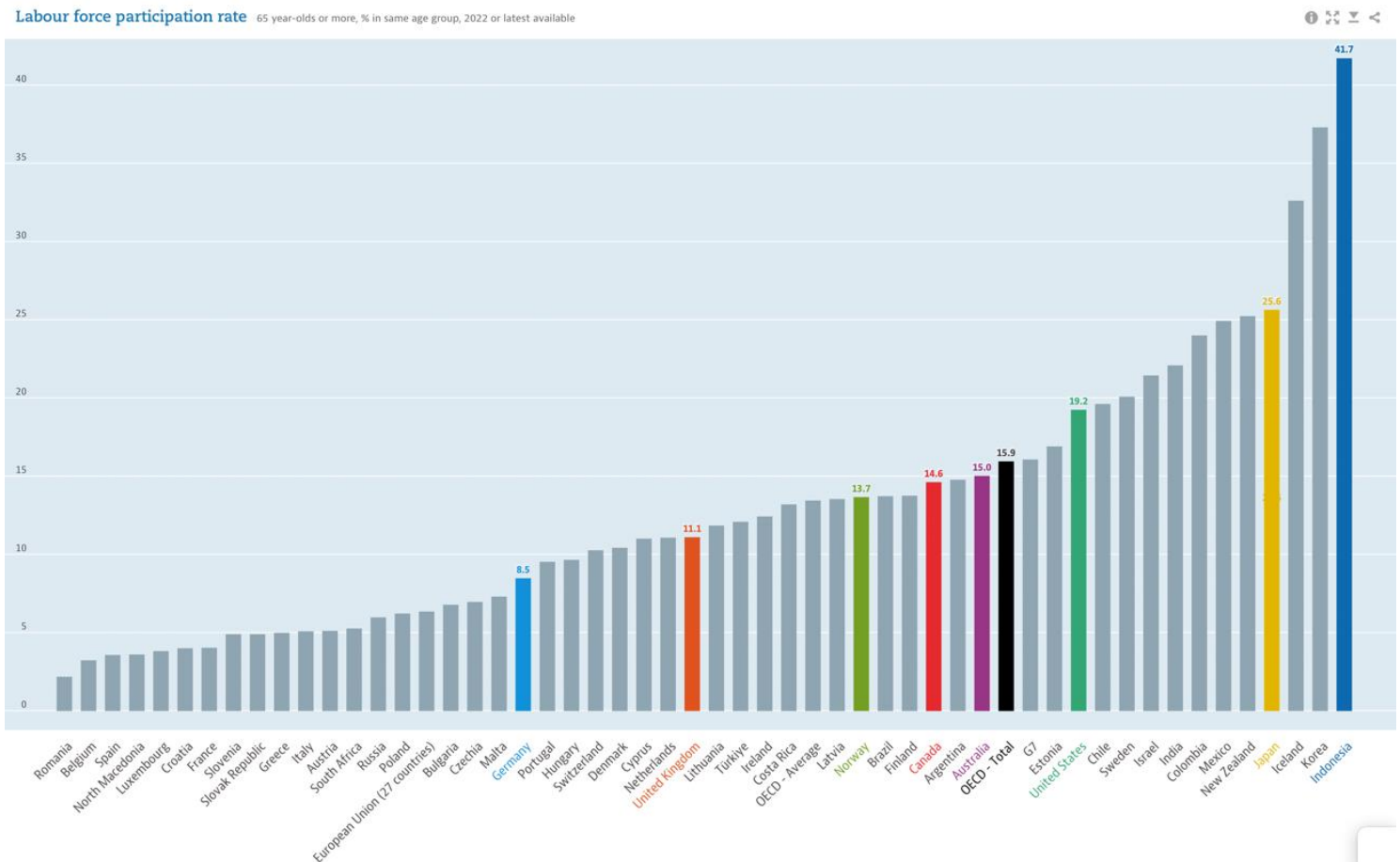
Note. Old-age dependency ratio in selected countries. Adapted from *The World Bank*, 2023 (<https://data.worldbank.org/indicator/SP.POP.DPND.OL>). Own work.

The concurrent rise in inflation to its highest rate in 40 years and the increasing need for financial support for the elderly to cover their daily spending adds a layer of complexity

to the economic challenges associated with demographic shifts. Many elderly individuals rely on fixed-income sources such as pensions and savings. In an inflationary environment, the real value of these fixed incomes decreases, making it harder for retirees to maintain their standard of living (Padley, 2022). The retirement benefits also fall short of providing adequate support for older individuals to lead active lives, especially in Southeast Asia, including Indonesia (Park & Estrada, 2012). This inadequacy of retirement benefits compels older individuals to reenter the labor force, with Indonesia reaching the highest of 41.7% (OECD, 2023). Thus, improving the performance of employee pension funds becomes a strategic solution to address the evolving dynamics of an aging population.

Figure 4

Old labor participation rate, old (%)



Note. The labor force participation rate for 65 years old or more. Adapted from *OECD Data*, 2023 (<https://data.oecd.org/emp/labour-force-participation-rate.htm>). OECD.

2.2. Employee Pension Fund Schemes, Performance, and Economic Growth

The architecture of employee pension fund schemes is a pivotal element in shaping the financial well-being of individuals post-retirement and contributing to the broader economic landscape. These schemes exhibit diverse structures, with the two primary models being defined benefit (DB) and defined contribution (DC) plans. DB plans offer predetermined retirement benefits based on a specific formula that considers factors like years of service and salary. Applied in Employee Pension Funds (EPFs), contributions fluctuate based on actuarial calculations, and employers bear most, if not all, risks, including investment risks. DC plans involve fixed contributions specified in regulations, accumulating in individual participant accounts with benefits determined by contributions and investment returns. Employers' obligations are limited to fixed contributions, and participants bear investment risks, contrasting with the paternalistic approach of DB plans (Indonesia Financial Service Authority [OJK], 2022).

Clements et al. (2014) questioned whether reforming the DB system or transitioning to a DC system is more effective. Lin et al. (2021) conducted a GDP per capita and long-term economic growth comparison, concluding that reform within the DB system yields better results than a shift to a DC system. The suggested reform involves a higher retirement age, increased labor force participation, and reduced benefits for new cohorts. In contrast, World Bank publications (Holzmann & Hinz, 2005; Holzmann et al., 2008) propose a five-pillar pension system as an alternative, combining elements of DB and DC systems to optimize advantages and achieve financial stability while maintaining fiscal sustainability.

According to World Bank publications, the “zero-pillar” ensures older individuals avoid poverty through demogrants, means-testing, or targeted social assistance funded by the state budget. The first pillar, a mandatory defined contribution under the DB system, aims to sustain retirees' pre-retirement living standards using current tax revenue. The second pillar, mandatory but not DB, involves retirees accumulating invested savings. Voluntarily, the third pillar employs a DC system, allowing workers to invest savings for retirement. The fourth pillar entails non-financial transfers, potentially from family or communities. Countries can tailor their pension systems using different combinations and weights of the five pillars based on their specific conditions (Holzmann & Hinz, 2005; Holzmann et al., 2008). Table 1 outlines key concerns related to the World Bank's five pillars.

Table 1

Concerns in World Bank's five pillars

No	Pension scheme/multi pillar	Issues	
		Performance	Stability
1.	Basic Needs Security/Zero Pillar	Insufficient coverage leads to gaps in the safety net for vulnerable populations.	Adequacy of benefits in meeting basic needs, especially for those without additional sources of income.

2.	Pay-as-you-go (PAYG)/DB/First Pillar – Mandatory	Sustainability challenges due to demographic shifts.	Adequacy of benefits and potential impact on public finances if not well-adjusted to demographic trends.
3.	DC/Fully Funded/Second Pillar – Mandatory	Investment risks impacting individual account balances and overall fund performance.	Ensuring an adequate rate of return on investments to meet retirement income needs.
4.	Individual Savings/Third Pillar – Voluntary	Encouraging participation and addressing barriers to entry for individuals to contribute to voluntary savings.	Providing incentives for voluntary contributions, such as tax benefits of employer matching programs.
5.	Family Support/The Fourth Pillar - Voluntary	Vulnerability of individuals without strong family support networks, leads to financial insecurity.	Policy considerations for supporting those without adequate family support structures.

Note. Analyze from World Bank publications. Own work.

The employee pension fund schemes highly determine its performance and constitute a critical component of the financial landscape (McCarty, 2014), wielding a substantial influence on economic growth through various mechanisms (Davis, 2007). The key components of employee pension fund schemes that will be the focus of this study include contribution rates, investment allocation strategies, coverage or retirement age, and the regulatory framework, including funding mechanisms and risk management.

Contribution rates and coverage within employee pension fund schemes play a central role in determining the adequacy of retirement benefits. This policy directly impacts the financial health of pension funds and, consequently, the retirement outcomes for individuals, highlighting the need for thoughtful policy design and implementation (Choi, 2015; Dushi & Iams, 2010; Huberman et al., 2007). A study by Karam et al. (2010) shows that rising contribution rates can result in distortions in the labor supply, causing adverse effects on both the short and long-term real economic activity. This, coupled with a decrease in aggregate demand for real disposable income, contributes to a dampening impact on overall economic performance. Meanwhile, increasing the coverage (retirement age) lowers total pension benefits over a lifetime. Encouraging extended working lives with higher incomes may decrease savings but boost consumption during the working years. Moreover, the resulting increase in fiscal savings can positively impact long-term output by reducing capital costs and fostering investment.

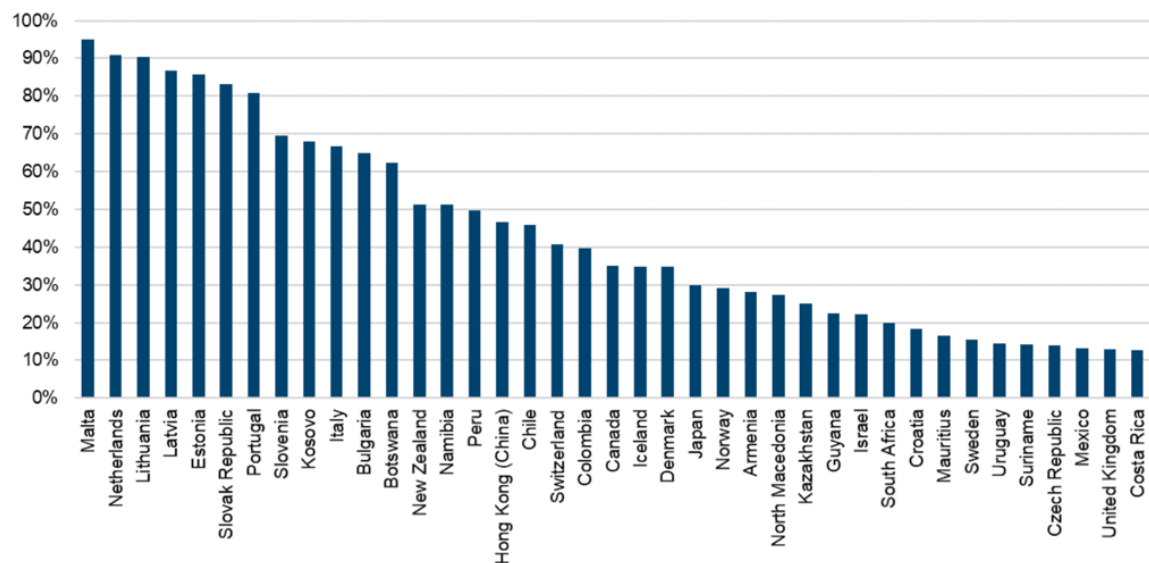
Investment allocation strategies within employee pension fund schemes form another critical area of study, such as the allocation of funds across different asset classes, the role of diversification, and the implications of investment decisions on fund performance (Onyango, 2011; Rosentraub & Shroitan, 2004; Wahyudi et al., 2020). Understanding how these investment strategies align with the long-term goals of pension funds is vital for optimizing returns, managing risks, and ensuring the financial health of the funds over time. The current worldwide pension funds demonstrate investment trends such as increasing diversification in asset allocation and increasing the proportion of pension assets invested abroad and in multiple markets, and the rate of return becoming a key

determinant for investment decisions (HKEX, 2022). On average, the share of assets invested abroad increased from 28.6% in 2010 to 34.8% in 2020, with Japan, Canada, Switzerland, and New Zealand reaching 30%, 35.1%, 40.7%, and 51.3%, respectively (OECD, 2021) as shown in Figure 5. From 2010 to 2020, the average annualized real investment rate of return for the primary retirement savings plans in the top 20 countries was 3.99%. notably, Costa Rica, the Netherlands, and Australia achieved the highest value at 6.54%, 5.90%, and 5.59%, respectively (Figure 6).

The regulatory frameworks (including funding mechanisms and risk management) governing employee pension fund schemes also represent a crucial dimension as they influence the design and effectiveness of pension schemes. This encompasses governance structures, disclosure requirements, and risk management standards. The intricacies of the regulatory environment significantly impact the operational dynamics of pension funds, shaping their ability to deliver stable and secure retirement benefits (Erzurumlu & Ucardag, 2021).

Figure 5

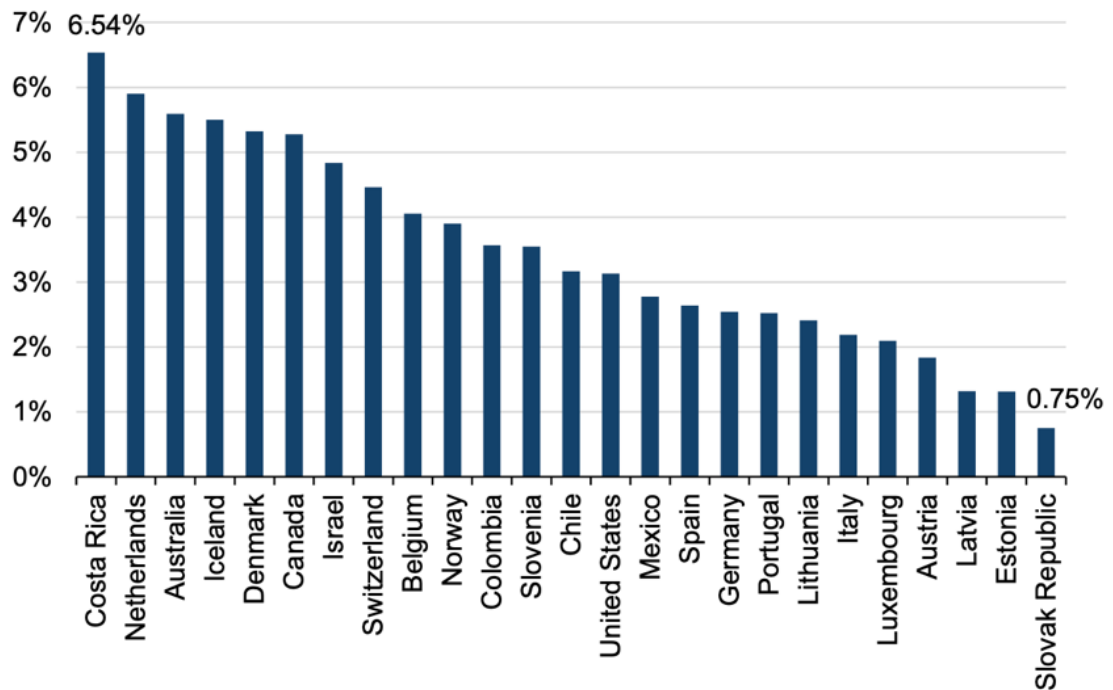
Share of pension assets invested abroad



Note. The share of pension assets invested abroad in selected countries (2020 or latest year available). Adapted from OECD, *Pension Market in Focus 2021*.

Figure 6

Real rate of return on pension fund by country



Note. Real rate of return on pension fund by country (10-year annualized rate of return from 2010 to 2020). Adapted from *OECD, Pension Market in Focus 2021*.

Furthermore, as institutional investors, employee pension funds accumulate significant capital from contributions made by employees and employers and become a formidable force for economic growth by fueling investment in myriad financial instruments (Morina & Grima, 2022). Empirical studies, such as those conducted by Davis and Hu (2004) and Martin and Minns (1995), underscore the pivotal role played by employee pension funds in capital formation, providing stable and substantial funding for sectors ranging from infrastructure to emerging industries. The long-term investment horizon characteristic of employee pension funds also aligns seamlessly with the needs of projects with extended payback periods (Pedraza et al., 2017), enhances market liquidity and efficiency (Jackson & Vitols, 2004), and brings positive spillover effects on economic growth and technological advancement (Maity & Sinha, 2021). The economic impact extends to reducing dependency on public welfare systems (Murphy, 1982) and allows governments to allocate resources more efficiently, directing funds toward other critical areas of public welfare and economic development (Nwanne, 2015; Rosentraub & Shroitman, 2004).

2.3. Indonesian Employee Pension Funds

The Indonesian pension landscape has undergone significant transformations through Act No. 11 concerning the Pension Fund in 1992 and continued the reform until the post-

2008 global financial crisis, including structuring the pension system based on the three-pillar model (Rachmatarwata, 2017; Sudjono, 2017), combining defined benefit (DB) and defined contribution (DC) scheme. Exploring Indonesia’s employee pension funds (EPF) involves an examination of their structure, regulatory frameworks, investment strategies, and impact on the broader economic landscape. The structure of employee pension funds in Indonesia encompasses both public and private sectors as the second pillar DC/DB according to the World Bank’s five pillars. The Employee Social Security Agency (BPJS Ketenagakerjaan) represents a key player in the public sector, managing national security programs, including pension schemes. In the private sector, numerous pension funds operate, each tailored to specific industries or sectors. The Financial Services Authority (OJK) and the Ministry of Manpower are key regulatory bodies overseeing the private and public pension sectors. Understanding this dual structure is essential for comprehending the diversity of pension offerings available to Indonesian workers.

Indonesia’s employee pension fund consists of 3 (three) types: the EPF-DB (Employee Pension Fund-Defined Benefit), EPF-DC (Employee Pension Fund-Defined contribution), and FIPF (Financial Institution Pension Funds). According to OJK (2022), the average Indonesian employee pension fund investment growth is 6.36% in the last 5 (five) years, increased by 5.18% or IDR 16.56 trillion from IDR 319.37 trillion in 2021 to IDR 335.9 trillion in 2022 (Figure 7). The participation also increased by 2.03% from 4,112,803 people in 2021 to 4,196,190 in 2022. The total net assets increased by 4.46% from IDR 327.74 trillion to IDR 342.37 trillion, with the composition and trend shown in Figure 8.

Despite these positive trends, the contribution of the Indonesian pension fund to GDP ratio remains relatively low, around 2% in 2020, in contrast to 12.3% in Norway and 131.7% in Australia (OECD, 2020). The return on investment (ROI) of pension funds has exhibited fluctuations in recent years, as depicted in Figure 9. Given these dynamics, it becomes imperative to improve the pension scheme to optimize the performance of employee pension funds.

Figure 7

Growth of Pension Fund Investments from 2018 to 2022 (IDR trillion)



Note. Adapted from *Indonesia Financial Service Authority, 2022 Pension Fund Statistic Book.*

Figure 8

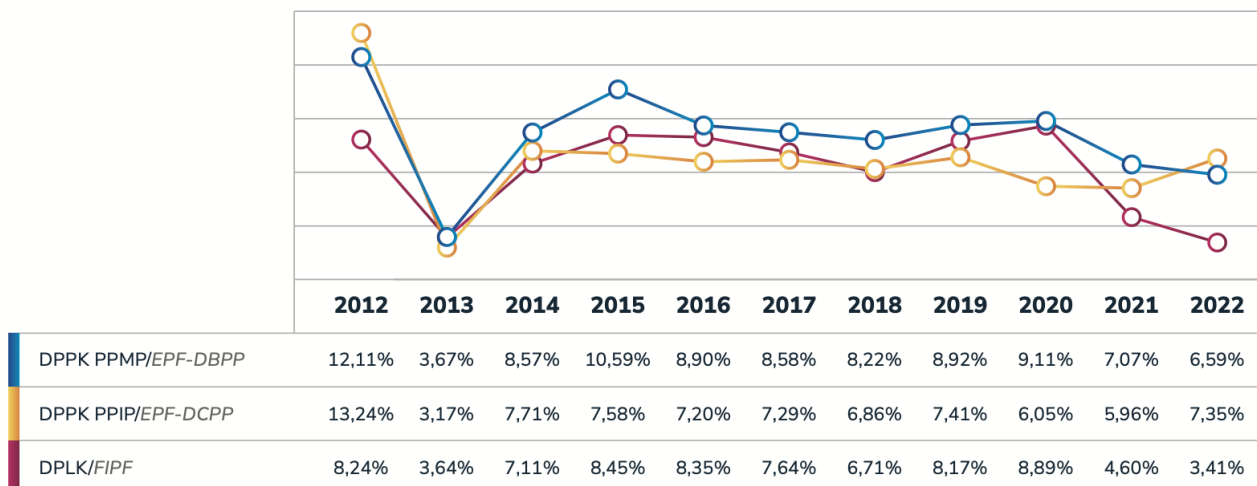
Growth of Pension Fund Net Assets from 2018 to 2022 (IDR trillion)



Note. Adapted from *Indonesia Financial Service Authority, 2022 Pension Fund Statistic Book.*

Figure 9

Return on Investment of Pension Fund from 2012 to 2022 (IDR trillion)



Note. Adapted from *Indonesia Financial Service Authority, 2022 Pension Fund Statistic Book.*

3. Theoretical Framework

This research is grounded in several key theories and concepts related to the employee pension fund scheme and its impact on pension fund performance. The labor economics and public finance theory grounded this study. Assessing contribution rates requires a comprehensive examination alongside potential alterations in the labor income tax rate. The combined impact of these changes determines both effective marginal and average tax rates (Caminada & Goudswaard, 2008; Omori & Kitamura, 2020), significantly influencing decisions regarding labor participation and hours worked. The incentive effects of heightened social contributions may be mitigated if perceived as implying increased benefit entitlement. However,

countering spending pressures in the pay-as-you-go system through elevated contribution rates typically distorts labor supply, potentially diminishing the economy's potential output.

Similarly, coverage or retirement age influences labor force participation beyond a certain point, as increased coverage can slow the rise in the pension system dependency ratio. This results in reduced pension transfer payments, increased contributions, and higher tax revenues due to elevated income and consumption, leading to heightened public savings (Carta & De Philippis, 2024; Etgeton et al., 2023; Karam et al., 2010). Over the long run, output increases as firms demand more capital inputs to accommodate a larger labor force. Anticipating a shorter retirement period, forward-looking consumers reduce savings and increase consumption before retirement, expecting enhanced future income from an extended working period. This initial drop in savings is compensated by earning income over a more extended working period, contributing positively to their long-term wealth accumulation. This multifaceted dynamic aligns with principles from labor economics and public finance theories, offering a comprehensive theoretical framework for understanding the implications of policy adjustments on individual and economic outcomes.

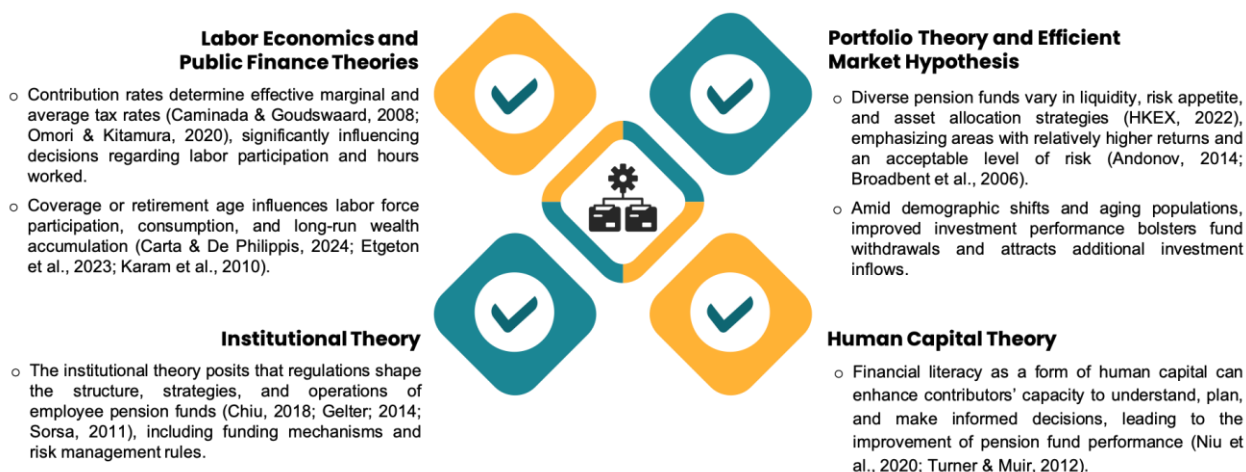
Moreover, investment allocation strategies align with economic theories, such as portfolio theory, emphasizing diversification and risk-return tradeoffs. Additionally, it reflects principles from the efficient market hypothesis, where investors adapt to changing conditions to optimize returns given available information. Effective pension fund investment management significantly influences the sustainability of a country's social security. Diverse pension funds vary in liquidity, risk appetite, and asset allocation strategies (HKEX, 2022). Major global pension funds typically engage in capital market investments to enhance returns, ensuring ample reserves for future withdrawals. In times of falling bond yields, they often diversify their asset allocation, emphasizing areas with relatively higher returns and an acceptable level of risk, notably in equity investments (Andonov, 2014; Broadbent et al., 2006). Pension funds also exhibit a flexible asset allocation style, allowing them to transition to more cost-effective assets to enhance income. Amid demographic shifts and aging populations, improved investment performance not only bolsters fund withdrawals but also attracts additional investment inflows.

Furthermore, the institutional theory posits that regulations shape the structure, strategies, and operations of employee pension funds (Chiu, 2018; Gelter; 2014; Sorsa, 2011), including funding mechanisms and risk management rules. For instance, regulatory bodies may outline acceptable methods and sources for acquiring funds and prescribe risk management practices. Thus, an employee pension funds scheme that effectively manages its regulatory framework is expected to experience improved performance and stability.

Human capital theory complements the framework by highlighting financial literacy, which can be seen as a form of human capital that can enhance contributors' capacity to understand, plan, and make informed decisions about their pension contributions and investments and lead to the improvement of pension fund performance (Niu et al., 2020; Turner & Muir, 2012).

Figure 10

Theoretical Framework for the study



Note. Theoretical framework. Own work.

Based on these theoretical foundations, the following hypotheses are proposed for empirical testing: Hypothesis 1: There is a significant relationship between pension fund performance and economic growth. Hypothesis 2: There is a significant relationship between alterations in contribution rates, coverage, investment strategies, and regulatory frameworks with the performance of employee pension funds in Indonesia. These hypotheses will guide the empirical analysis, enabling a deeper understanding of the relationship between employee pension fund schemes and fund performance in Indonesia.

4. Data and Methodology

In this study, the data will be obtained from various sources to examine the impact of employee pension fund schemes on pension fund performance and stability in Indonesia. Financial reports and annual statements of employee pension funds will be the primary data sources, providing information on pension fund performance, stability, and other financial indicators. Additionally, pension scheme databases from each of the employee pension funds and government publications will be consulted to gather relevant information on pension scheme components. The data collection process will cover six years from 2017 – 2022, encompassing both pre-pandemic and pandemic periods, to analyze the impact of economic downturns caused by the pandemic. The details of the data for the study are shown in Table 2.

Table 2

The data sources for the study

No	Data	Variable	Period	Source
1.	Performance Indicators (Financial reports)			

	Public employee pension funds			BPJS Ketenagakerjaan https://www.bpjsketenagakerjaan.go.id/kinerja-badan.html
	Private employee pension funds	- Return on Investment (ROI)	2017 – 2022	Financial Services Authority https://ojk.go.id/id/kanal/iknb/data-dan-statistik/dana-pensiun/Default.aspx PT Taspen https://bprtaspen.com/laporan-keuangan/ PT Asabri https://www.asabri.co.id/page/49/Laporan_Keuangan
	Civil Servants employee pension funds	- Pension Asset		
	Military employee pension funds			
2.	Pension Scheme Components			
	Contribution rates	- Employee contribution rate - Employer contribution rate	2017 – 2022	Annual Report from 16 Employee Pension Funds (EPF) in Indonesia - BNI EPF https://www.dapenbni.co.id/xpage/5/0
	Investment allocation strategies	- Equity allocation - Fixed-income allocation - Alternative investment	2017 – 2022	- Bank Mandiri EPF https://dapenbankmandiri.co.id/laporan-tahunan - BTN EPF https://dapenbtn.co.id/laporan-keuangan/
	Coverage	Eligibility criteria such as age, employment status, working hours, or length of service	2017 – 2022	- Danareksa EPF https://dpdanareksa.com/laporan-tahun-2022/ - BPD Jawa Timur EPF https://www.dapenbankjatim.co.id/laporan/0
	Funding mechanism	Fund Adequacy Ratio	2017 – 2022	- BPD South Sulawesi and West Sulawesi EPF https://www.dapenbanksulselbar.or.id/?s=laporan+keuangan
	Regulation	Regulatory framework and changes	2017 – 2022	- LIA EPF https://www.dapenlia.co.id/category/laporan/ - Perhutani EPF https://www.dapenperhutani.com/dewan-pengawas
	Risk management	Risk tolerance, operational risk, risk monitoring	2017 – 2022	- BI EPF https://dapenbi.co.id/#/unduh/laporan-tahunan - Pertamina EPF https://dp-pertamina.com/laporan/laporan-tahunan/ - Antam EPF

				https://dapen.antam.com/frontend/web/site/tata_kelola/3/Keuangan-dapen-antam - BPD Riau EPF https://www.dapenbankbrk.co.id/home/index.php/laporan/laporan-keuangan - BNI FIPF https://www.bni.co.id/id-id/perseroan/hubungan-investor/laporan-presentasi - Manulife Indonesia FIPF https://www.manulife.co.id/id/tentang-kami/laporan-keuangan.html - BCA Life FIPF https://www.bcalife.co.id/tentang-kami/laporan-keuangan - Bank Muamalat Indonesia FIPF https://www.dplksyariahmuamalat.co.id/re_dplk/dplk_app/laporan-keuangan
3.	Economic Conditions			
	GDP	Real GDP growth rate	2017 – 2022	Indonesia Central Agency of Statistics https://www.bps.go.id/en/statistics-table/2/MTA0IzI=/-2010-version--growth-rate-of-gdp-2010-version.html
	Inflation	Consumer Price Index (CPI) inflation rate	2017 – 2022	Indonesia Central Agency of Statistics https://www.bps.go.id/id/statistics-table/2/MTcyMSMy/indeks-harga-perdagangan-besar-indonesia-2018-100-.html
	Interest rates	Central Bank policy rate	2017 – 2022	Indonesia Central Agency of Statistics https://www.bps.go.id/id/statistics-table/2/Mzc5IzI=/bi-rate.html

Note. The data sources for the study. Own work.

The key variables in this paper include pension fund scheme and performance. Pension fund schemes will be measured through indicators such as contribution rates, investment allocation strategies, coverage, funding mechanisms, regulation, and risk management. Pension fund performance will be quantified using Return on Investment (ROI) and Pension Asset. Some variables in the pension schemes, such as regulation and risk management, are likely to be qualitative. Thus, we will create categorical levels for the regulatory framework and a composite index for risk management variables. Regulatory framework was categorized into three levels: Level 1 (stringent) represents pension funds operating under a regulatory environment

characterized by strict rules, limited flexibility, and high compliance requirements. Level 2 (moderate) represents pension funds subject to a regulatory framework that balances oversight and flexibility, adhering to international standards. Level 3 (lenient) represents pension funds operating in a relatively relaxed regulatory environment, providing greater freedom and flexibility in their operations. This categorical approach allowed for capturing the varying degrees of sophistication in regulatory framework across the companies. Risk management, on the other hand, will be measured using composite indices. Composite indices were constructed by aggregating multiple indicators that capture different dimensions of risk management. This allowed for a comprehensive assessment of the overall risk management level within the companies. To ensure data quality and reliability, multiple sources were cross-referenced, and verification procedures were employed. The dataset was then set up by organizing the variables into a structured format, ensuring data compatibility and facilitating subsequent analysis, as shown in Table 3.

Table 3

The regulatory framework and risk management variables

No	Construct	Variables	Weight
1	Regulatory Framework		
	- Level 1	Stringent Regulatory Framework <ul style="list-style-type: none"> - Comprehensive regulatory framework with strict rules and standards. - Rigorous oversight and compliance requirements. - Limited flexibility for pension funds in their investment and operational decisions. - High degree of adherence to international best practices. 	
	- Level 2	Moderate Regulatory Framework <ul style="list-style-type: none"> - Balanced regulatory framework with a reasonable level of oversight. - Clear rules and standards but with some flexibility for pension funds. - Provides a balance between investor protection and operational flexibility. - Adherence to international standards, with room for adaptation to local conditions. 	
	- Level 3	Lenient Regulatory Framework <ul style="list-style-type: none"> - Relatively relaxed regulatory environment with fewer restrictions. 	

- Pension funds operate with more freedom and flexibility in their management practices.

- Emphasis on allowing pension funds to explore innovative investment strategies.

- May have fewer international standards imposed.

2 Risk Management

- Risk Identification	Identify how well the pension fund identifies potential risks.	0.3
- Risk Assessment	Evaluate the effectiveness of risk assessment methods.	0.2
- Risk Mitigation Strategies	Assess the pension funds' strategies for mitigating identified risks.	0.4
- Risk Monitoring	Evaluate ongoing monitoring processes to track and manage risks.	0.1

Note. The regulatory framework and risk management variables. Own work.

To ensure the robustness of the analysis, several control variables will be incorporated, such as company size and industry characteristics. These control variables will account for other factors that may influence the pension fund's performance and potentially confound the relationship between pension fund schemes and their performance.

The collected data will be analyzed using regression analysis to test the proposed hypotheses. Through this analysis, the study aims to provide empirical evidence on the importance of pension fund schemes in driving pension fund performance of employee pension funds in Indonesia.

5. Empirical Strategy and Results

The research project employs two distinct yet complementary models to comprehensively analyze the dynamics of employee pension fund performance in Indonesia. The first model utilizes a Vector Autoregression (VAR) framework to explore the intricate interactions between macroeconomic variables and pension fund outcomes, drawing insight from Sims (1980) and Christiano (2012). This VAR model allows for the simultaneous examination of multiple variables, including GDP, inflation, and pension asset, to understand how changes in the macroeconomic environment impact pension fund performance. By estimating the lagged effects of these variables on pension fund outcomes, the VAR model provides valuable insights into the short and long-term dynamics shaping the pension fund landscape amidst broader economic conditions (Matthiasardottir & Zarges, 2021; Stock & Watson, 2001).

In addition to the VAR model, the research project employs a micro-level model to delve deeper into the specific factors influencing pension fund performance. This micro-level model, formulated as a panel data regression, considers various aspects of pension fund management, including contribution rates, coverage, investment allocation strategies, regulatory frameworks, funding mechanism, and risk management practices. By analyzing

these micro-level factors alongside macroeconomic variables, the model offers a comprehensive understanding of the drivers behind pension fund performance. Furthermore, the inclusion of treatment variables related to the covid-19 pandemic allows for the examination of how external shocks impact pension fund dynamics, providing timely insights into the resilience and adaptability of pension funds in the face of economic disruptions.

Together, these two models provide a holistic framework for investigating the complex interplay between macroeconomic conditions, pension fund management practices, and performance outcomes. By leveraging both macro and micro-level perspectives, the research project aims to uncover the underlying mechanisms driving pension fund performance in Indonesia, offering valuable insights for policymakers, practitioners, and other stakeholders in the pension fund industry.

5.1. The VAR Model

The model specification employs a structural vector autoregression (VAR) framework, which is a robust method for analyzing the dynamic interrelationships among multiple time series variables (Christiano, 2012; Sims, 1980). In this model, we consider the vector $\mathbf{x}_t = [y_t \ p_t \ h_t]$, where y_t is log real GDP, p_t is the log of consumer price index, and h_t is the average pension asset in quarter t . These variables are selected to capture key aspects of the economic environment affecting and being affected by pension fund performance (Jin & Simone, 2020; Matthiasardottir & Zarges, 2021). The stationary VAR model is assumed to adequately represent the reduced-form dynamics of the first differences of these series:

$$\Delta \mathbf{x}_t = \mathbf{c} + \sum_{k=1}^K \mathbf{F}_k \Delta \mathbf{x}_{t-k} + \mathbf{e}_t, \quad (1)$$

Where \mathbf{c} is a vector of constants, \mathbf{F}_k is a matrix of coefficients, and \mathbf{e}_t is a vector of normally distributed forecast errors with mean zero. We set the lag order K to eight, meaning the model considers the influence of the past eight quarters on the current quarter's variables (Ivanov & Kilian, 2005). This lag length helps to capture medium-term dynamics and potential delayed effects within the economic relationships.

Estimation of the Steady State

The Beveridge-Nelson (1981) decomposition is used to estimate the steady state of the series given a reduced-form time-series model in (1). This decomposition technique separates each time series into its permanent (trend) and transitory (cyclical) components, providing a clearer understanding of the long-term movements and short-term fluctuations in the variables (Blasques et al., 2024). By distinguishing between these components, we can more accurately assess the underlying economic trends affecting GDP, inflation, and pension assets. This is crucial for understanding how long-term economic growth and inflationary pressures influence the sustainability of pension funds. Specifically, in the context of Indonesia, this approach helps to identify how structural economic changes and short-term shocks impact the performance and stability of

pension funds, guiding more effective policy interventions to ensure sustainable economic growth and robust pension systems.

Identifying Structural Shocks

Moreover, long-run identifying restrictions by Blanchard and Quah (1989) imposed on the relationship between the observable data and the structural shocks to determine short-run effects. These restrictions help to distinguish between different types of shocks affecting the system, such as demand shocks, supply shocks, and specific shocks to the pension assets. The structural model is described by an infinite-order moving-average process:

$$\Delta \mathbf{x}_t = \mathbf{m} + \sum_{k=0}^{\infty} \mathbf{A}_k \Delta \mathbf{v}_{t-k}, \quad (2)$$

Where \mathbf{m} is a vector of deterministic drifts for the level variables in \mathbf{x}_t , \mathbf{A}_k is a matrix of shock coefficients, and \mathbf{v}_t is a vector of three structural shocks. The shocks' means, variances, and cross correlations are all assumed to be zero, as is the shock coefficients' compliance with the requirements for stationarity. By applying these identifying restrictions, we can isolate the impact of each type of shock on the economic variables. For instance, in the context of Indonesia's pension fund performance, these structural shocks could help identify how unexpected changes in economic output (GDP) or inflation rates influence the average pension asset values. Understanding these relationships is vital for policymakers to design measures that can mitigate the adverse effects of economic shocks on pension funds, ensuring their long-term sustainability and their role in promoting sustainable economic growth.

The Long-Run Restrictions

The identification restrictions also imposed:

$$\sum_{k=0}^{\infty} a_{12,k} = 0, \quad \sum_{k=0}^{\infty} a_{13,k} = 0, \quad \sum_{k=0}^{\infty} a_{23,k} = 0, \quad (3)$$

Where $a_{ij,k}$ is the i, j th element of \mathbf{A}_k . The restrictions in (3) impose that the first structural shock has no long-run effect on the pension asset, the second structural shock has no long-run effect on output and pension asset, and the third structural shock is the only one that affects the pension asset in the long run.

In the context of Indonesia's pension fund performance, these long-run restrictions (Lutkepohl & Velinov, 2016) are crucial for isolating the specific impacts of different types of economic shocks. For example, the first restriction helps identify shocks that may affect GDP or inflation in the short term but do not have a lasting impact on pension assets, such as temporary fiscal policies. The second restriction ensures that only shocks with temporary effects on both output and pension assets are captured, such as short-term demand fluctuations. The third restriction isolates shocks that have a permanent impact on pension assets, which could be due to structural changes in the financial markets or long-term demographic shifts. By understanding these long-run relationships,

policymakers can better predict and manage the impacts of various economic shocks on pension funds.

Cholesky Decomposition

We then order the restrictions in (3) with Cholesky decomposition:

$$\begin{bmatrix} e_t^{\Delta \text{ pension asset}} \\ e_t^{\Delta \text{ output}} \\ e_t^{\Delta \text{ inflation}} \end{bmatrix} = \begin{bmatrix} a_{11} & 0 & 0 \\ a_{21} & a_{22} & 0 \\ a_{31} & a_{32} & a_{33} \end{bmatrix} \begin{bmatrix} \varepsilon_t^{\text{ Pension shock}} \\ \varepsilon_t^{\text{ AS shock}} \\ \varepsilon_t^{\text{ AD shock}} \end{bmatrix}, \quad (4)$$

The ordering using Cholesky decomposition helps to identify causal relationships and interpret the economic implications of the structural shocks (Bazinas & Nielsen, 2022) among the variables of interest: changes in pension assets, output, and inflation. By expressing the structural shocks in terms of a lower triangular matrix, where the elements below the main diagonal are zero, the Cholesky decomposition helps disentangle the interplay between exogenous shocks and endogenous variables. This decomposition is particularly useful in understanding the dynamics between pension fund dynamics and broader macroeconomic outcomes in Indonesia, as it allows for a clearer interpretation of the Impulse Response Function (IRF).

Implications for Pension Fund Performance and Economic Growth

The impulse response function (IRF) results in Figure 11 provide valuable insights into the relationship between pension fund dynamics and macroeconomic outcomes in Indonesia. These findings not only shed light on the direct impact of pension fund performance on the broader economy but also highlight the interconnectedness between financial markets and macroeconomic outcomes. Such insights are particularly pertinent for policymakers seeking to design effective regulatory frameworks and investment strategies to optimize pension fund contributions to sustainable economic growth in Indonesia. Furthermore, anchoring these findings in empirical data strengthens the relevance and reliability of the analysis, fostering informed decision-making in the realm of pension policy and economic development. The explanation of each shock based on the IRF are as follows:

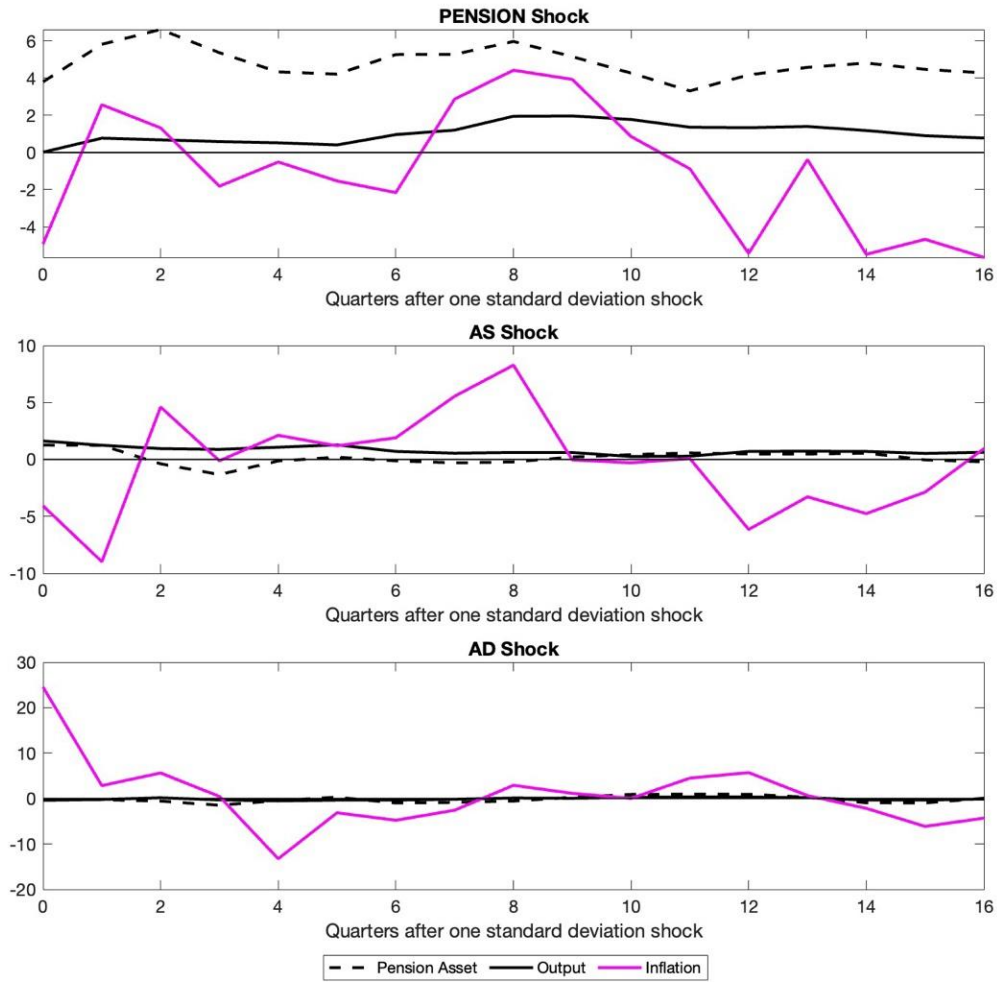
a. Pension Asset Shock

The positive response in pension assets and output following a pension asset shock suggests a symbiotic relationship between pension fund performance and economic growth. When pension assets experience a positive shock, it indicates increased accumulation of retirement savings, potentially driven by factors such as robust investment returns or higher contribution rates. This uptick in pension wealth can stimulate economic activity through various channels. For instance, retirees with higher pension savings may have increased spending power, driving consumption and investment in the economy. Additionally, pension funds may allocate more capital to productive investments, fostering economic expansion and job creation. The negative

response in inflation implies that higher pension assets may alleviate inflationary pressures by diverting funds into long-term investments rather than immediate consumption, thereby stabilizing price levels.

Figure 11

Impulse response functions for structural shocks



Note. Impulse response function. Own work.

b. Aggregate Supply (AS) Shock

A positive response in pension assets and GDP following an AS shock underscores the importance of supply-side factors in shaping pension fund dynamics and economic performance. An AS shock, characterized by improvements in productivity, technology, or resource availability, leads to an expansion of both pension assets and economic output. This suggests that advancements in productivity and efficiency enhance pension

fund returns and drive overall economic growth. The negative response in inflation indicates that increases in aggregate supply may mitigate inflationary pressures by reducing production costs or expanding output capacity, promoting price stability.

c. Aggregate Demand (AD) Shock

The negative response in pension assets and GDP following an AD shock highlights the vulnerability of pension funds and the broader economy to fluctuations in demand. A decline in aggregate demand, stemming from factors such as reduced consumer spending or investment, leads to contractions in both pension assets and economic output. This suggests that weakened demand conditions can dampen pension fund growth and economic activity, posing challenges to long-term sustainability. The positive response in inflation indicates that declines in aggregate demand may exert inflationary pressures, possibly due to cost-push factors or supply shortages as businesses reduce production in response to lower demand.

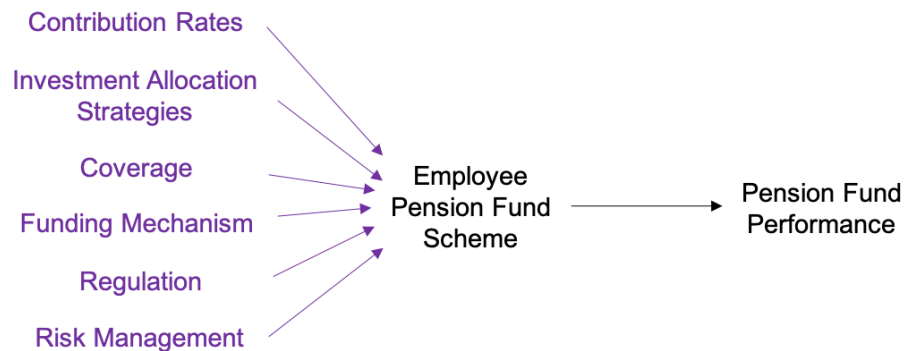
5.2. The Micro Model

In the second model, the employee pension funds scheme is conceptualized as a multidimensional construct encompassing several key components: contribution rates, investment allocation strategies, coverage, funding mechanism, regulation, and risk management. These components reflect how organizations actively manage their employee pension fund to enhance performance. Contribution rates refer to the percentage of an employee's salary or a fixed amount regularly contributed to the pension fund by both the employer and the employee. Investment allocation involves distributing the pension fund's investment across various asset classes, such as stocks, bonds, and real estate, based on a strategic plan. Coverage refers to the extent to which employees are included in the pension scheme, which involves determining eligibility criteria and the proportion of the workforce covered. The funding mechanism outlines how the pension fund receives financial support, including contributions from employers, employees, and potential investment returns. Regulation encompasses the legal and regulatory framework governing employee pension funds, including rules related to contributions, investments, disclosures, and overall fund management. Lastly, risk management involves identifying, assessing, and mitigating various types of risks that could impact the pension fund, such as market risk, credit risk, and operational risk. By leveraging these employee pension fund schemes, organizations can enhance their ability to organize and leverage pension fund assets, improving its performance and ultimately leading to increased economic growth.

Figure 12 illustrates the interconnectedness between employee pension fund schemes and pension fund performance, highlighting the key components of both constructs. At the core of the DAG is the concept of pension fund schemes, which encompasses various practices aimed at harnessing and leveraging its performance.

Figure 12

Relationship surrounding employee pension fund scheme and its performance



Note. The graph outlines the relationship surrounding the employee pension fund scheme and its performance in Directed Acyclic Graphs (DAG). Own work.

The six key components that contribute to employee pension fund schemes reflect the processes and activities undertaken by organizations to capture, generate, organize, share, and utilize pension funds effectively. On the outcome side, pension fund performance is represented by financial indicators that eventually lead to economic growth. By employing this extended DAG as a theoretical framework, this study aims to investigate the causal relationships between employee pension fund schemes and pension fund performance. It provides a comprehensive and structured representation of how these interconnected factors interact and contribute to pension fund success. The empirical analysis will explore the mediating roles of the economic conditions, providing insights into how employee pension fund schemes impact different dimensions of pension fund performance.

For the analysis, a difference-in-difference (DID) approach will be employed to examine the impact of the COVID-19 pandemic to examine the effect of the economic downturn on employee pension fund schemes and its subsequent effects on pension fund performance. To implement the DID approach, we compare the ROI before and after the pandemic, using the pre-pandemic period as a quasi-control group. The DID approach allows isolating the specific effects of the employee pension schemes by considering the differences in ROI trends between the pre-pandemic and post-pandemic periods. By taking the difference in the changes observed in the treatment group and the pre-pandemic period, we can estimate the causal impact of employee pension fund schemes on their performance. We also include fixed effects for individual employee pension funds in the analysis to help control for time-invariant heterogeneity, such as company size and industry characteristics, and ensure that the estimated effects are driven by pension fund schemes rather than other company-specific factors. The econometric framework allows us to control for potential confounding factors and analyze the causal effects of pension fund schemes on its performance.

More formally, we estimate the following model:

$$Y_{it} = \beta_0 + \beta_1 Con_{it} + \beta_2 Inv_{it} + \beta_3 Cov_{it} + \beta_4 Fund_{it} + \mathbf{Reg}'_{it}\alpha + \mathbf{RM}'_{it}\gamma + \mathbf{si}'_i\lambda + \beta_5 Treat_i + \beta_6 Post_t + \beta_7 (Treat \times Post)_{it} + \varepsilon_{it}$$

Where:

1. Y_{it} is the outcome variable, which is the Return on Investment (ROI) of employee pension fund i for time t .
2. Con_{it} is the contribution rates of employee pension fund i for time t .
3. Inv_{it} is the investment allocation strategies of employee pension fund i for time t .
4. Cov_{it} is the coverage of employee pension fund i for time t .
5. $Fund_{it}$ is the funding mechanism of employee pension fund i for time t , measured by the fund adequacy ratio.
6. \mathbf{Reg}'_{it} is the regulation framework of employee pension fund i for time t .
7. \mathbf{RM}'_{it} is the risk management of employee pension fund i for time t .
8. \mathbf{si}'_{it} is the fixed effect for company size and industry, capturing the time-invariant heterogeneity across companies.
9. $Treat_i$ is a binary variable that equals 1 if company i is in the treated group (subject to the COVID-19 pandemic) and 0 otherwise.
10. $Post_t$ is a binary variable that equals 1 after the COVID-19 pandemic ($t \geq$ COVID-19 year) and 0 otherwise.
11. $(Treat \times Post)_{it}$ is the interaction term between the treatment and post-implementation period, capturing the treatment effect.
12. ε_{it} represents the error term, accounting for unobserved factors and random variations.

The equation allows us to examine the impact of the employee pension fund scheme on the pension fund performance while also considering the effects of the treatment (COVID-19 pandemic) and potential interactions.

To establish a causal interpretation of the results, several key assumptions need to hold. Firstly, the model assumes that there is no omitted variable bias, meaning that all relevant variables influencing both the independent and dependent variables are included in the model. This assumption ensures that the estimated coefficients capture the true causal relationships between the variables of interest. Secondly, the model assumes no endogeneity, implying that the independent variables are exogenous and not influenced by the error term. This ensures that any observed effects of the independent variables on the outcome variable are not biased by reverse causality or omitted variable bias.

Additionally, the model assumes the absence of multicollinearity among the independent variables, meaning that they are not highly correlated with each other. Multicollinearity can distort the estimated coefficients and lead to inaccurate interpretations of their effects. Moreover, the model relies on the assumption of homoscedasticity, which means that the variance of the error term is constant across all observations. This ensure that the model's predictions are equally precise for all values of the independent variables.

Figure 13

The regression results

	OLS	DID	FE COMSIZE	FE INDUSTRY	FE COMSIZE AND INDUSTRY	DID AND FE
(Intercept)	-403.821+	-345.720				
	(232.237)	(228.474)				
CON	0.274***	0.274***	-0.050	0.256***	-0.050	-0.042
	(0.021)	(0.020)	(0.043)	(0.029)	(0.044)	(0.044)
INV	-1.024	-1.250	0.438	0.849	0.438	-0.896
	(0.789)	(0.779)	(1.798)	(0.656)	(1.840)	(2.047)
COV	9.671**	9.681**	40.714	3.439	40.714	43.085
	(3.307)	(3.236)	(31.162)	(2.089)	(31.886)	(31.195)
FUND	-3.795***	-4.010***	-0.933*	1.006+	-0.933*	-1.147*
	(0.874)	(0.860)	(0.395)	(0.493)	(0.404)	(0.464)
REG	-41.411	-38.842	-58.537	-631.115***		
	(34.612)	(33.883)	(34.694)	(11.479)		
RM	742.452***	739.729***	1783.038	807.668***		
	(87.008)	(85.141)	(1063.377)	(59.711)		
TREAT		-73.755*				-42.145
		(32.141)				(26.485)
POST		-62.555				-29.329
		(40.603)				(27.665)

	OLS	DID	FE COMSIZE	FE INDUSTRY	FE COMSIZE AND INDUSTRY	DID AND FE
Num.Obs.	96	96	96	96	96	96
R2	0.895	0.901	0.966	0.941	0.966	0.968
R2 Adj.	0.887	0.892	0.959	0.932	0.957	0.958
R2 Within			0.051	0.929	0.042	0.092
R2 Within Adj.			-0.022	0.924	-0.010	0.016
AIC	1233.5	1231.1	1144.1	1188.1	1152.1	1151.0
BIC	1254.0	1256.7	1190.2	1221.5	1208.5	1212.5
Log.Lik.	-608.728	-605.546				
F	125.865					
RMSE	137.27	132.80	77.65	102.90	77.65	75.62
Std.Errors			by: COMSIZE	by: INDUSTRY	by: COMSIZE	by: COMSIZE
FE: COMSIZE			X		X	X
FE: INDUSTRY				X	X	X

+ p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001

Note. The regression results. Own work.

The regression results in Figure 13 provide valuable insights into the relationship between pension fund schemes and the performance outcomes of employee pension funds. Beginning with the Ordinary Least Squares (OLS) model, the coefficients reveal the estimated effects of each independent variable on the dependent variable, which represents the ROI of the pension funds. The next models are the DID model, the model with the company size as fixed effect, the model with the industry characteristics as fixed effect, the combination of both fixed effects, and the model with DID and fixed effect.

Notably, contribution rates exhibit a significant positive association with pension fund performance, indicating that higher contribution rates tend to correspond with increased returns or assets. This suggests that a higher level of contributions from both employers and employees positively impacts the overall financial health of the pension fund.

The investment allocation strategies reveal a mixed relationship with pension fund performance, with some strategies showing positive effects while others exhibit negative impacts. This nuanced finding suggests that the relationship between investment allocation and pension fund performance is multifaceted and depends on various factors

such as the specific nature of the investment strategy, market conditions, and the risk tolerance of the pension fund. These contrasting findings underscore the importance of carefully evaluating and selecting investment allocation strategies based on their risk-return profiles and alignment with the pension fund's objectives and obligations.

The coverage also reveals a positive relationship with pension fund performance, suggests that higher coverage levels are associated with improved performance outcomes for pension funds. Increased coverage expands the contribution base, leading to larger asset pools and greater investment potential. This influx of funds enables pension funds to pursue diverse investment opportunities, potentially yielding higher returns and enhanced asset growth. Moreover, broader coverage contributes to stability and sustainability within the pension system by spreading risk across a larger participant base and reducing dependency ratios. Higher coverage levels also promote social and economic inclusion, supporting individuals' financial security during retirement and fostering overall societal well-being.

The analysis reveals predominantly negative associations between the funding mechanism, measured by the fund adequacy ratio and pension fund performance. This suggests that as the pension fund's financial support increases, its performance tends to decrease. This finding may indicate several factors at play, including potential inefficiencies associated with overfunding, conservative investment strategies adopted to preserve capital, additional costs incurred in maintaining high fund adequacy ratios, and the impact of external economic conditions such as the COVID-19 pandemic. While a well-funded pension fund is essential for long-term sustainability, the negative relationship with performance underscores the complexity of balancing financial stability with optimizing returns in the Indonesian pension fund landscape. The regulatory framework also demonstrates negative relationship with pension fund performance. It implies that as the regulatory environment becomes more lenient, pension fund performance decreases. This finding might suggest that a relaxed regulatory environment could lead to less accountability or oversight, potentially resulting in lower performance or riskier investment practices within pension funds.

The positive relationship observed between risk management and pension fund performance indicates the importance of effective risk mitigation strategies in enhancing fund outcomes. Pension funds that demonstrate robust risk management practices are better equipped to navigate market uncertainties, mitigate potential losses, and capitalize on opportunities for growth.

The negative relationship observed with the treatment variable suggests that companies subjected to the COVID-19 pandemic experienced adverse effects on their pension fund performance. This finding implies that external shocks, such as economic downturns or global crises like the COVID-19 pandemic, can exert detrimental impacts on pension fund outcomes. Moreover, the statistically significant findings with $p < 0.01$ for the contribution rates, coverage, funding mechanism, and risk management variables underscores their importance in influencing pension fund performance. The adjusted $R^2 > 0.8$ also

demonstrated a strong explanatory power underscores the effectiveness of our models in capturing the complex dynamics influencing pension fund outcomes.

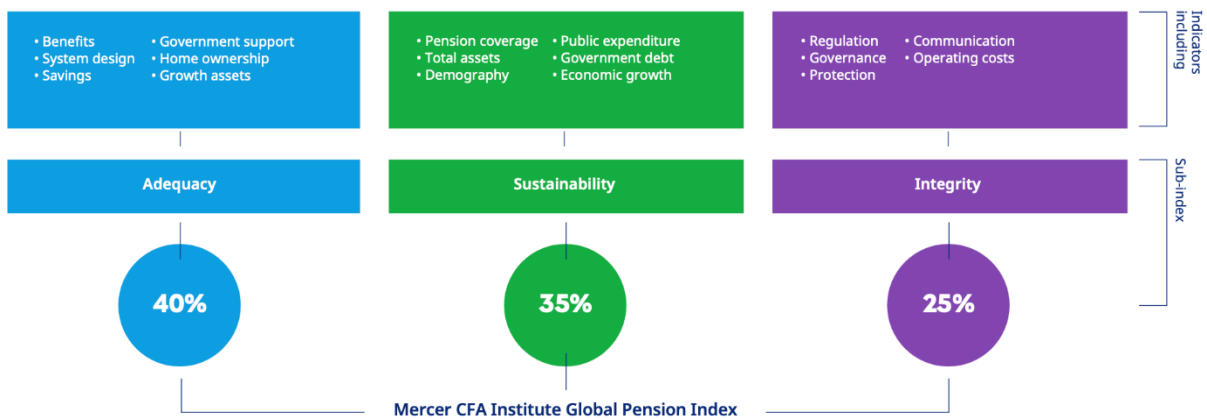
6. Case Studies

In this section, we conduct a case studies of pension fund systems in Australia and Norway to gain insights for Indonesia pension fund system. The Mercer CFA Institute developed the Mercer CFA Institute Global Pension Index to monitor the pension system’s implementation in collaboration with Monash University and the Victorian Government in Australia. The survey covers 43 nations or two-thirds of the world’s population. The Mercer CFA Institute Global Pension Index compares each retirement income system against more than 50 variables using three sub-indices: adequacy, sustainability, and integrity, as shown in Figure 14 (Mercer CFA Institute, 2023).

Australia and Norway own one of the best pension systems, with a B+ grade. The comparison of the Mercer CFA Institute Global Pension Index 2022 is depicted in Table 4. It shows that Australia was ranked six with a score of 76.8 and Norway was ranked 7 with 75.3, while Indonesia was ranked 39 with 49.2. Australia and Norway’s indexes have increased from 2021 to 2022 by 2.4%, and 0.13% respectively. On the other hand, Indonesia’s index has decreased by -2.38% from 2021 to 2022 due to a decrease in the adequacy sub-indices from 44.7 in 2021 to 39.3 in 2022.

Figure 14

The Mercer CFA Institute Global Pension Index Sub-Indices



Note. The Mercer CFA Institute Global Pension Index Sub-indices 2022. Adapted from *The Mercer CFA Institute*, 2023 (<https://www.mercer.com/insights/investments/market-outlook-and-trends/mercercfa-global-pension-index/>). Copyright 2023 by The Mercer CFA Institute.

Table 4*Comparison of the Mercer CFA Institute Pension Index 2022*

Indicators	Indonesia	Australia	Norway
Ranking	39	6	7
Grade	D	B+	B+
Adequacy Sub-Index	39.3 (43 th)	70.2 (20 th)	79 (10 th)
Sustainability Sub-Index	44.5 (31 th)	77.2 (5 th)	60.4 (15 th)
Integrity Sub-Index	71.5 (27 th)	86.8 (6 th)	90.3 (2 th)
2022 Index	49.2	76.8	75.3
Compare to 2021 Index	50.4 in 2021	75.0 in 2021	75.2 in 2021

Note. Comparison of the Mercer CFA Institute Pension Index 2022 for Indonesia, Australia, and Norway. Adapted from *The Mercer CFA Institute*, 2023 (<https://www.mercer.com/insights/investments/market-outlook-and-trends/mercer-cfa-global-pension-index/>). Own work.

While Indonesia faces challenges, insights from Australia and Norway suggest that continuous improvement in governance, sustainability, and adequacy can positively impact the overall pension system. Some insights from Australia and Norway are as follows:

a. Compulsory contribution and adequacy

The success of Australia's pension system lies in its compulsory superannuation contributions, ensuring a broad and inclusive participation in the pension scheme. This mandatory approach has contributed to the country's high Adequacy Sub-Index, reflecting well on the retirement income provided to its citizens. Norway, with its unique sovereign wealth fund model financed by natural resource revenues, has demonstrated the importance of sustainable funding source. The Adequacy Sub-Index for Norway is notably high, indicating that the country effectively utilizes its resource-backed funds to ensure financial security for retirees. Indonesia could explore the effectiveness of compulsory contributions or alternative sustainable funding sources to improve the adequacy of its pension system, addressing the challenges highlighted in the Mercer index.

b. Governance and transparency

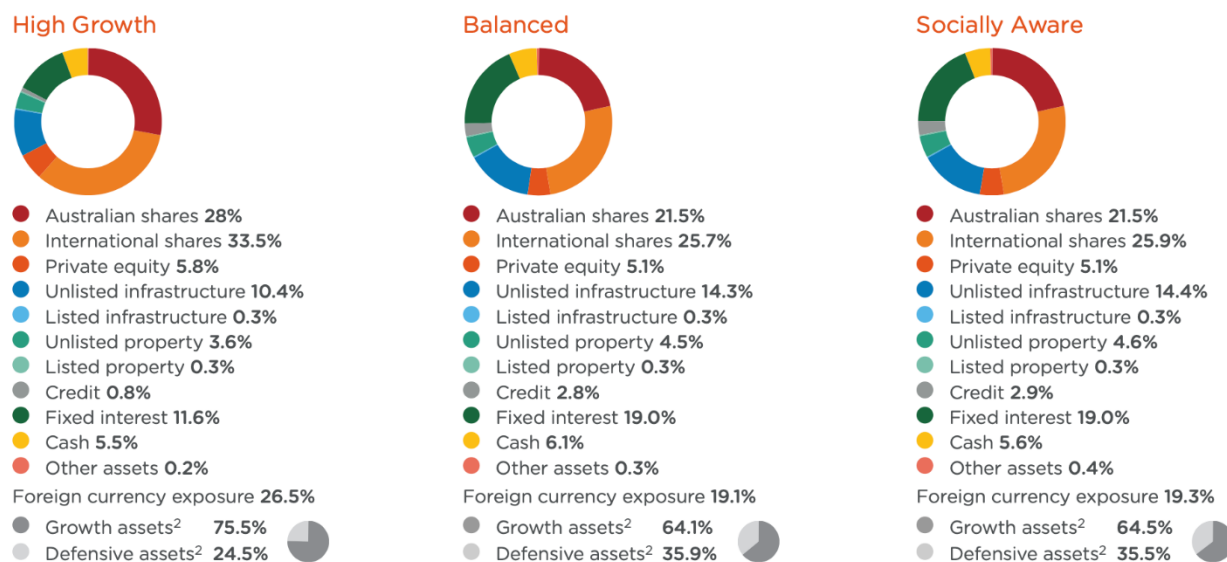
Australia's high ranking in the Integrity Sub-Index reflects a robust regulatory framework overseen by the Australia Prudential Regulation Authority (APRA). This emphasizes the importance of effective governance and transparency in pension fund management. Norway excels in integrity, with a highly transparent and ethical investment approach. The country's commitment to ethical investment practices, including environmental and social considerations, showcases the significance of aligning pension fund strategies with broader societal values. Improving governance and transparency within the pension system can positively impact Indonesia's Integrity Sub-Index. Strengthening regulatory oversight, adopting ethical investment practices, and enhancing disclosure mechanisms could contribute to a more transparent and accountable pension system.

c. Diversification and global investment

Australia's success is attributed to diversified investment strategies, balancing risk and return through a mix of asset classes. This reflected in the Sustainability Sub-Index, emphasizing the importance of effective investment allocation for long-term sustainability. The data of AustralianSuper (Figure 15) show that the asset allocation reveals a strategic emphasis on international shares, constituting the highest share at 33.5%. This allocation strategy signifies a global investment approach, reflecting a diversified portfolio with an ROI that reached its highest at 24.35% in 2021 and remain robust at 10.48% in 2023 (AustralianSuper, 2023). For Norway, a key observation is the evolution of its asset allocation over time. The portion of equity investment has grown steadily, indicating a strategic shift towards higher-risk assets (Figure 16, Figure 17). The ROI trajectory for Norway's Government Pension Fund Global (GPF) reached a remarkable 35.62% in 2009, showcasing the fund's ability to navigate challenging economic conditions, and stands at a resilient 10% in 2023 (Norges Bank, 2023).

Figure 15

The Asset Allocation of AustralianSuper 2023



Note. The Asset Allocation of AustralianSuper in 2023. Adapted from *AustralianSuper, 2023* (<https://www.australiansuper.com/investments/your-investment-options/pre-mixed-investment-choice>). Copyright 2023 by AustralianSuper.

Figure 16

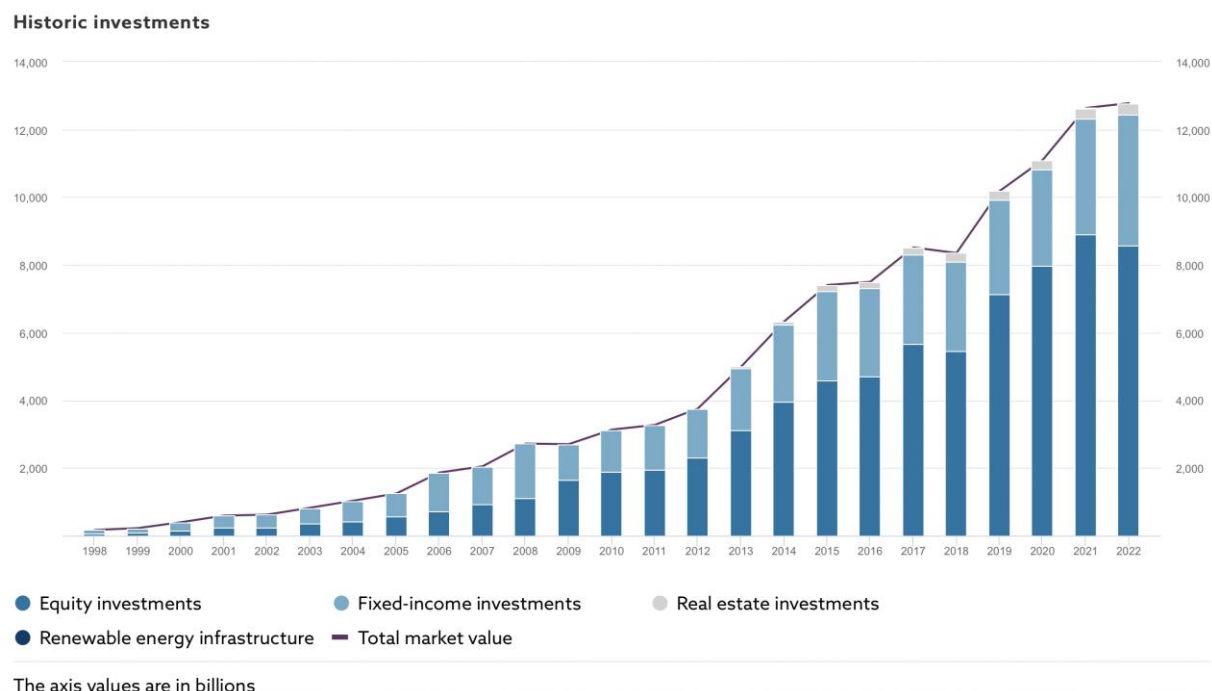
The Norway's Government Pension Fund Global (GPFG)

Time	Adjustment of investment strategy in fixed-income assets
At formation	All funds invested in extremely low-risk government bonds
1998	60% of funds allocated to fixed-income assets
2001	Investments in Asian (mainly Japan) and Oceanian markets gradually reduced; allocations to US and European government bonds increased
2002	Corporate bonds and asset-securitised products included as investment options
2009	Allocations to fixed-income assets reduced to 40%; allocations to European government bonds and credit bonds gradually reduced
2012	Allocations to fixed-income assets reduced to 39.3%; allocations to government bonds in emerging markets increased
2013-2018	Allocations to fixed-income assets gradually reduced to 30%

Note. The Norway's Government Pension Fund Global (GPFG) development over time. Adapted from *HKEX*, 2022. Copyright 2022 by HKEX.

Figure 17

The Norway's Government Pension Fund Global (GPFG) Investment



Note. The Norway's Government Pension Fund Global (GPFG) investment over time. Adapted from *The Norges Bank*, 2023. Copyright 2023 by The Norges Bank.

7. Conclusion

In conclusion, the research employs a comprehensive approach, integrating both macro and micro-level models to analyze the dynamics of employee pension fund performance in Indonesia. This study tested two main hypotheses: Hypothesis 1: There is a significant relationship between pension fund performance and economic growth. Hypothesis 2: There is a significant relationship between alterations in contribution rates, coverage, investment strategies, and regulatory frameworks with the performance of employee pension funds in Indonesia.

Through the VAR framework, we explored the complex interactions between macroeconomic variables and pension fund outcomes, shedding light on the interdependencies between economic conditions and pension fund dynamics. The micro-level model, on the other hand, delved deeper into the specific factors influencing pension fund performance, considering key components such as contribution rates, investment allocation strategies, coverage, funding mechanisms, regulation and risk management.

The findings from the VAR model supported Hypothesis 1, revealing nuanced responses to different structural shocks. Positive responses were observed in pension assets and output following pension asset and aggregate supply shocks, while aggregate demand shocks resulted in negative responses in pension assets and GDP. These insights underscored the intricate relationship between pension fund performance and broader economic conditions, highlighting the importance of considering macroeconomic factors in pension fund management and policy formulation. This significant relationship implies that well-performing pension funds can stimulate economic growth by providing a stable source of long-term investment. Conversely, economic downturns or demand shocks can adversely affect pension fund performance, demonstrating the bidirectional nature of this relationship. Thus, fostering robust pension fund performance is crucial not only for the financial security of retirees but also for the overall economic health of Indonesia.

In the micro-level analysis, several key determinants emerged as significant drivers of pension fund performance, lending support to Hypothesis 2. Contribution rates, coverage, and risk management practices demonstrated positive associations with pension fund outcomes, emphasizing the importance of robust financial management and risk mitigation strategies. However, challenges were evident in funding mechanisms and regulatory frameworks, where negative associations were observed, indicating potential areas for policy intervention and reform. To improve the integrity of the pension fund system and maintain public confidence, Indonesia should focus on several key areas such as strengthening regulatory frameworks, regular review and adjustment of contribution rates, flexible retirement age policies, diversification and innovation in investment strategies, enhancing financial literacy programs, and international collaboration and knowledge exchange.

Additionally, the impact of external shocks, such as the COVID-19 pandemic, was evident in the analysis, with companies subjected to the pandemic experiencing adverse effects on their

pension fund performance. This underscores the vulnerability of pension fund to economic disruptions and the need for resilience and adaptability in pension fund management.

Overall, the research provides valuable insights for policymakers, practitioners, and stakeholders in the pension fund industry, offering guidance on optimizing pension fund performance, enhancing financial resilience, and navigating challenges posed by economic uncertainties. By understanding the complex interplay between macroeconomic conditions, regulatory frameworks, and pension fund management practices, stakeholders can make informed decisions to ensure the long-term sustainability and effectiveness of pension funds in Indonesia. The confirmation of both hypotheses reinforces the critical role that both macroeconomic factors and specific pension fund management practices play in shaping the performance and stability of pension funds.

8. Policy Recommendation

Drawing insights from the comprehensive analysis conducted in this study, the following policy recommendations are proposed:

a. Strengthening regulatory frameworks

A resilient regulatory framework is fundamental for the stability and transparency of employee pension funds. Policymakers should continually assess and strengthen regulatory mechanisms, ensuring alignment with the evolving economic landscape. Clear guidelines on funding mechanisms, risk management, and governance will fortify the stability and performance of pension funds.

In light of recent instances of pension fund mismanagement in Indonesia, as evidenced by cases such as those shown in Figure 18, resulting in significant financial losses and undermining public trust, the importance of strengthening regulatory frameworks cannot be overstated. These instances highlight the urgent need for policymakers to take proactive measures to enhance oversight and accountability within the pension fund sector.

In addressing the challenges, Indonesia can draw valuable lessons from international best practices, such as the Supervision Risk and Intensity (SRI) model implemented by the Australian Prudential Regulation Authority (APRA). The SRI model, as shown in Figure 19 offers a structured approach to supervisory oversight, incorporating tiering, risk assessment, and staging components to effectively identify, assess, and address risks within the pension fund industry.

Figure 18

Several cases of misuse of pension funds in Indonesia



Several cases of misuse of pension funds

2012-2019
Mismanagement of Asabri's pension fund investments resulted in losses of around 22 trillion Indonesian rupiah.

2013-2019
Evidence of unlawful acts in investment management by DP4 Pelindo, causing losses to the state amounting to 148 billion rupiah.

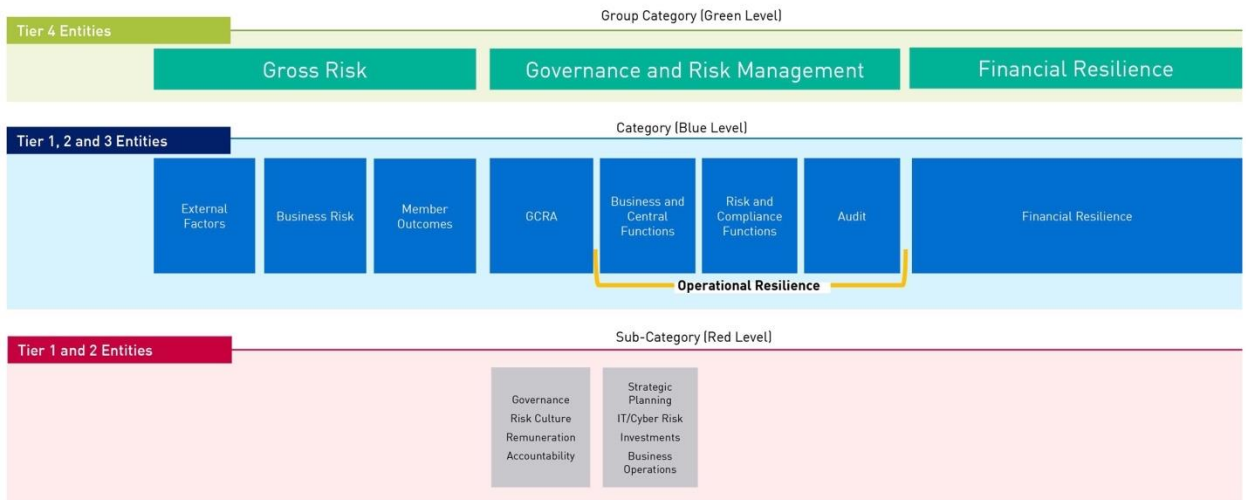
2023
Mismanagement of pension funds in several state-owned enterprises (BUMN) resulted in losses to the state of 300 billion rupiah.

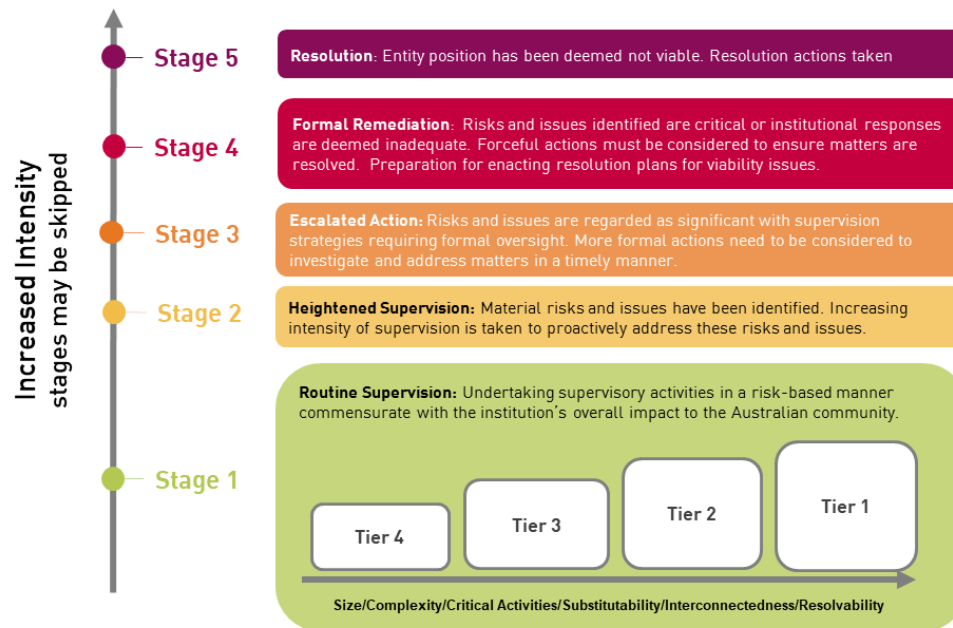
Note. Source from OJK and Kompas, 2023.

<https://www.kompas.id/baca/ekonomi/2023/10/10/kasus-dugaan-korupsi-dapat-perburuk-citra-dana-pensiun>.

Figure 19

The Supervision Risk and Intensity (SRI) Model





Note. Source from APRA, 2020. <https://www.apra.gov.au/supervision-risk-and-intensity-sri-model>.

The SRI framework can be tailored to the Indonesian context by Indonesia Financial Services Authority (OJK) through several key steps. Firstly, OJK can collaborate with relevant stakeholders, including pension fund managers, industry experts, and regulatory bodies, to adapt the tiering criteria to reflect the unique characteristics and challenges of the Indonesian pension fund landscape. Secondly, OJK can customize the risk assessment process within each tier to account for industry nuances and emerging risks specific to the Indonesian pension fund sector. Lastly, OJK can establish clear guidelines for staging pension funds based on their risk ratings, enabling OJK to tailor supervisory strategies and interventions according to the level of risk posed by each fund. Overall, the adoption of the SRI framework by OJK presents a strategic opportunity to strengthen regulatory oversight and enhance the stability and transparency of the Indonesian pension fund industry.

b. Regular review and adjustment of contribution rates

To ensure the financial viability of employee pension funds, policymakers should institute mechanisms for the regular review and adjustment of contribution rates. Periodic assessments, taking into account economic conditions and demographic trends, will help maintain contribution rates at levels optimal for sustaining the fund and supporting retirees.

In Australia, the pension system implemented a similar policy of regular review and adjustment of contribution rates. Initially set a 9% of employee ordinary time earnings from July 2002 to June 2013, the rate increased to 9.25% on July 1, 2013, and further to 9.5% on July 1, 2014. This rate is progressively rising by 0.5 percentage points each year, aiming

to reach 12% on July 1, 2025 (OECD, 2023). Indonesia could also apply this phased approach to ensure that contribution rates align with economic conditions and demographics trends, thereby enhancing the long-term sustainability of the pension fund system.

c. Flexible retirement age policies

Recognizing the diverse career trajectories of the modern workforce, policymakers should consider introducing flexible retirement age policies. Allowing individuals to choose their retirement age within a specified range can accommodate varied professional journeys, align with a more active aging workforce by promoting prolonged labor force participation and increased contributions to the pension fund.

In Norway, the retirement age is 67 and individuals have the autonomy to decide when and how they wish to draw their retirement pension, as well as the option to continue working alongside receiving pension benefits (Norden, 2023). Similarly, Australia offers a flexible retirement landscape where the superannuation benefits can be withdrawn from the age of 59 and can be deferred until after 65 years of age (OECD, 2023). Indonesia can also apply this flexible retirement age policies to cater to its workforce's diverse needs and preferences.

d. Diversification and innovation in investment strategies

Policymakers are encouraged to foster a culture of diversified and innovative investment strategies within pension funds. Embracing a blend of traditional and alternative investments, coupled with exploring innovative financial instruments, can enhance returns and contribute to the long-term sustainability of pension funds, aligning with global best practices observed in from AustralianSuper and Norway's GPF. These entities have successfully diversified their portfolios, investing in a wide range of assets worldwide to optimize returns.

e. Enhancing financial literacy programs

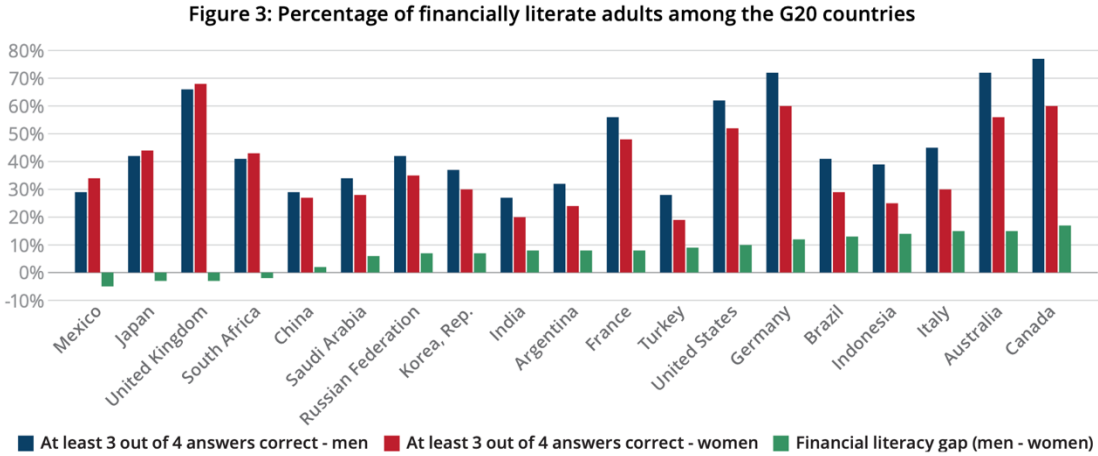
To fortify the foundation of employee pension funds schemes, policymakers should prioritize comprehensive financial literacy initiatives. By providing contributors with the knowledge to make informed decisions about their pension contributions and investments, these programs can cultivate a more financially empowered contributor base. Enhanced financial literacy can lead to better retirement planning, improved investment choices, and ultimately, greater security and confidence in the pension system.

Additionally, Hasler and Lusardi (2017) show that the literacy rates between women and men in Indonesia are among the countries with the highest gender gaps (Global Financial Literacy Excellence Center [GFLEC], 2017), as depicted in Figure 20. This significant disparity underscores the necessity of targeted financial education programs that address the specific needs of different demographic groups, particularly women. By closing the

financial literacy gender gap, Indonesia can ensure a more inclusive and equitable approach to retirement planning, benefiting the overall health of the pension fund system.

Figure 20

The percentage of financially literate adults in the G20 countries



Note. The percentage of financially literate adults among the G20 countries. Adapted from GFLEC, 2017 (<https://gflec.org/wp-content/uploads/2017/05/The-Gender-Gap-in-Financial-Literacy-A-Global-Perspective-Report.pdf>). Copyright 2017 by GFLEC.

f. International collaboration and knowledge exchange

In pursuing a robust employee pension fund system, policymakers are urged to foster international collaboration and knowledge exchange. Partnerships with global institutions and participation in forums will facilitate the sharing of experiences, enriching the nation’s pension fund management with international expertise and ensuring alignment with global standards.

9. Limitations and Future Research

This study is subject to several limitations that warrant consideration.

- a. Data limitations: the study relies on available data, and the quality and comprehensiveness of the data may influence the depth of the analysis. Incomplete or outdated data may constrain the study’s ability to capture recent developments accurately.
- b. Reporting standards: different companies may follow different accounting standards or reporting practices, which could introduce variations and comparability issues in the financial data. It is important to address these potential discrepancies when analyzing and interpreting the results.
- c. Assumptions in modeling: the study may involve assumptions in modeling relationships between pension fund schemes, economic variables, and performance indicators. Deviations from these assumptions could impact the accuracy of the results.

- d. **Dynamic economic conditions:** economic conditions are dynamic, and the study's snapshot approach may not capture the evolving nature of economic factors and pension fund performance over time. External shocks or policy changes not considered in the study might influence the outcomes.
- e. **Generalizability:** the findings may be specific to the context of Indonesia and its unique socio-economic factors. Extrapolating the results to other countries or regions should be done cautiously, considering potential variations in pension fund systems and economic landscapes.

Future research endeavors could build upon the present study to deepen our understanding of the complex interplay between employee pension fund schemes and economic growth. Cross-country comparative studies represent an avenue for exploration, shedding light on how different nations' pension fund systems influence economic outcomes. A longitudinal analysis could provide insights into trends and changes over time, offering a more comprehensive understanding of the sustainability and adaptability of pension systems. Investigating behavioral economics aspects, such as contributors' decision-making processes and responses to policy changes, is a promising direction for further exploration. Additionally, delving into the policy implications of the study's findings could guide policymakers in optimizing the relationship between employee pension fund schemes and economic growth. Considering the rapid advancements in financial technology, future research could explore the impact of digital innovations on pension fund performance. Finally, in-depth case studies within Indonesia and other countries could offer nuanced insights into specific aspects of pension fund dynamics, regulatory frameworks, or economic outcomes that complement the broader analysis presented in this study.

References

- Acuna, R., Villar, L., & Villagomez, A. (2014). The private pension system's contribution to Latin America economic development.
- Amisi, S. (2012). *The effect of financial literacy on investment decision making by pension fund managers in Kenya* (Doctoral dissertation).
- Andonov, A. (2014). Pension fund asset allocation and performance.
- AustralianSuper. (2023). PreMixed Option Asset Allocation by weight.
<https://www.australiansuper.com/investments/your-investment-options/pre-mixed-investment-choice>
- Blasques, F., van Brummelen, J., Gorgi, P., & Koopman, S. J. (2024). A robust Beveridge–Nelson decomposition using a score-driven approach with an application. *Economics Letters*, 236, 111588-. <https://doi.org/10.1016/j.econlet.2024.111588>
- Broadbent, J., Palumbo, M., & Woodman, E. (2006). The shift from defined benefit to defined contribution pension plans—implications for asset allocation and risk management. *Reserve Bank of Australia, Board of Governors of the Federal Reserve System and Bank of Canada*, 1, 54.
- Caminada, K., & Goudswaard, K. (2008). Revenue effects of tax facilities for pension savings. *Atlantic Economic Journal*, 36, 233-246.
- Carta, F., & De Philippis, M. (2024). The forward-looking effect of increasing the full retirement age. *The Economic Journal*, 134(657), 165-192.
- Chiu, I. H.-Y. (2018). An Institutional Theory of Corporate Regulation. *Current Legal Problems*, 71(1), 279–334. <https://doi.org/10.1093/clp/cuy006>
- Choi, J. J. (2015). Contributions to Defined Contribution Pension Plans. *Annual Review of Financial Economics*, 7(1), 161–178. <https://doi.org/10.1146/annurev-financial-111914-041834>

- Christiano, L. J. (2012). Christopher A. Sims and Vector Autoregressions. *The Scandinavian Journal of Economics*, 114(4), 1082–1104. <https://doi.org/10.1111/j.1467-9442.2012.01737.x>
- Chybalski, F. (2014). Financial stability of pension systems: A cross country analysis. In *Proceedings of the 14th international conference on finance and banking* (pp. 150-158). Karvina: Silesian University.
- Clark, G. L. (2004). Pension fund governance: expertise and organizational form. *Journal of Pension Economics & Finance*, 3(2), 233-253.
- Clements, B. J., Eich, Frank., & Gupta, Sanjeev. (2014). *Equitable and sustainable pensions challenges and experience*. International Monetary Fund.
- Davis, E. P. (2004, May). Demographic and pension-system challenges to financial and monetary stability. In *Austrian Central Bank Conference, May, Vienna*.
- Davis, E. P. (2007). Pension funding, productivity, ageing and economic growth.
- Davis, E. P., & Hu, Y. (2004). Is There A Link Between Pension-Fund Assets And Economic Growth? - A Cross-Country Study. *IDEAS Working Paper Series from RePEc*.
- Doyo, P. A. (2013). *The effect of financial literacy on pension preparedness among members of the informal sector in Kenya*(Doctoral dissertation, University of Nairobi,).
- Dushi, I., & Iams, H. M. (2010). The impact of response error on participation rates and contributions to defined contribution pension plans. *Social Security Bulletin*, 70(1), 45–60.
- Erzurumlu, Y. O., & Ucardag, I. (2021). Private pension fund flow, performance and cost relationship under frequent regulatory change. *Journal of Financial Regulation and Compliance*, 29(2), 218–234. <https://doi.org/10.1108/JFRC-03-2020-0028>
- Etgeton, S., Fischer, B., & Ye, H. (2023). The effect of increasing retirement age on households' savings and consumption expenditure. *Journal of Public Economics*, 221, 104845.

- Foster, L. (2018). Active ageing, pensions and retirement in the UK. *Journal of population ageing*, 11, 117-132.
- Gelter, M. (2014). From Institutional Theories to Private Pensions. *Forthcoming in Company Law and CSR: New Legal and Economic Challenges (Ivan Tchotourian ed., Bruylant 2014), Fordham Law Legal Studies Research Paper*, (2463275).
- Gu, D., Andreev, K., & Dupre, M. E. (2021). Major trends in population growth around the world. *China CDC weekly*, 3(28), 604.
- Guseh, J. S. (2016). Aging of the World's Population. *Encyclopedia of Family Studies*, 1-5.
- Hock, H., & Weil, D. N. (2012). On the dynamics of the age structure, dependency, and consumption. *Journal of population economics*, 25(3), 1019-1043.
- Holzmann, R., & Hinz, R. (2005). *Old age income support in the 21st. The World Bank. Century*.
- Holzmann, R., Hinz, R., & Dorfman, M. (2008). *Pension systems and reforms conceptual framework*. The World Bank.
- Hong Kong Exchanges and Clearing Limited (HKEX). (2022). *Pension Fund Systems and Capital Markets: International Experience and Prospects for China*.
- Huberman, G., Iyengar, S., & Jiang, W. (2007). Defined Contribution Pension Plans: Determinants of Participation and Contributions Rates. *Journal of Financial Services Research*, 31(1), 1–32. <https://doi.org/10.1007/s10693-007-0003-6>
- Indonesia Financial Service Authority. (2022). 2022 Pension Fund Statistic Book. <https://ojk.go.id/id/kanal/iknb/data-dan-statistik/dana-pensiun/Default.aspx>
- Ivanov, V., & Kilian, L. (2005). A Practitioner's Guide to Lag Order Selection For VAR Impulse Response Analysis. *Studies in Nonlinear Dynamics & Econometrics*, 9(1), 2-. <https://doi.org/10.2202/1558-3708.1219>

- Jackson, G., & Vitols, S. (2004). Between financial commitment, market liquidity and corporate governance: occupational pensions in Britain, Germany, Japan and the USA. In *Comparing Welfare Capitalism* (pp. 193-211). Routledge.
- Jin, X., & Nadal De Simone, F. (2020). Monetary policy and systemic risk-taking in the Euro area investment fund industry: A structural factor-augmented vector autoregression analysis. *Journal of Financial Stability*, 49, 100749-.
<https://doi.org/10.1016/j.jfs.2020.100749>
- Karam, P. D., Muir, D., Pereira, J., & Tuladhar, A. (2010). Macroeconomic effects of public pension reforms.
- Kigen, A. K. (2016). *Effect of fund size on the financial performance of pension funds in Kenya* (Doctoral dissertation, KCA University).
- Knell, M., Köhler-Töglhofer, W., & Prammer, D. (2006). The Austrian pension system—How recent reforms have changed fiscal sustainability and pension benefits. *Monetary Policy & the Economy Q*, 2, 69-93.
- Lee, R. (2016). Macroeconomics, aging, and growth. In *Handbook of the economics of population aging* (Vol. 1, pp. 59-118). North-Holland.
- Lin, H.-C., Tanaka, A., & Wu, P.-S. (2021). Shifting from pay-as-you-go to individual retirement accounts: A path to a sustainable pension system. *Journal of Macroeconomics*, 69, 103329-. <https://doi.org/10.1016/j.jmacro.2021.103329>
- Lütkepohl, H., & Velinov, A. (2016). Structural Vector Autoregressions : Checking Identifying Long-Run Restrictions via Heteroskedasticity. *Journal of Economic Surveys*, 30(2), 377–392. <https://doi.org/10.1111/joes.12100>
- Lyons, A. C., Grable, J. E., & Joo, S. (2018). A cross-country analysis of population aging and financial security. *The Journal of the Economics of Ageing*, 12, 96–117.
<https://doi.org/10.1016/j.jeoa.2018.03.001>

- Maity, S., & Sinha, A. (2021). Linkages between Economic Growth and Population Ageing with a Knowledge Spillover Effect. *Journal of the Knowledge Economy*, 12(4), 1905–1924. <https://doi.org/10.1007/s13132-020-00696-4>
- Martin, R., & Minns, R. (1995). Undermining the Financial Basis of Regions: The Spatial Structure and Implications of the UK Pension Fund System. *Regional Studies*, 29(2), 125–144. <https://doi.org/10.1080/00343409512331348853>
- Matthíasardóttir, D., & Zarges, L. (2021). The role of pensions: exploring the link between pension funds, monetary policy and economic performance: a case study of the Netherlands.
- McCarthy, Michael A. (2014). Turning Labor into Capital. *Politics & Society*, 42(4), 455–487. <https://doi.org/10.1177/0032329214547351>
- Mikhalev, V. (1996). Social Security in Russia under Economic Transformation. *Europe-Asia Studies*, 48(1), 5–25. <https://doi.org/10.1080/09668139608412331>
- Mitchell, O. S., & Hsin, P. L. (1994). Public sector pension governance and performance.
- Morina, F., & Grima, S. (2021). The Performance of Pension Funds and Their Impact on Economic Growth in OECD Countries. In *New Challenges for Future Sustainability and Wellbeing* (Vol. 2, pp. 17–47). Emerald Publishing Limited. <https://doi.org/10.1108/978-1-80043-968-920211003>
- Morina, F., & Grima, S. (2022). The impact of pension fund assets on economic growth in transition countries, emerging economies, and developed countries. *Quantitative Finance and Economics*, 6(3), 459–504. <https://doi.org/10.3934/QFE.2022020>
- Mugo, E. N. (2018). *Effect of Investment Strategies on Investment Returns: Evidence From Kenyan Pension Funds* (Doctoral dissertation, university of nairobi).
- Murphy, M. G. (1982). Regulating Public Employee Retirement Systems for Portfolio Efficiency. *Minn. L. Rev.*, 67, 211.

- Mwangi, J. N. (2014). *Effects of regulations on financial performance of the retirement benefits funds in Kenya*(Doctoral dissertation, University of Nairobi).
- Niu, G., Zhou, Y., & Gan, H. (2020). Financial literacy and retirement preparation in China. *Pacific-Basin Finance Journal*, 59, 101262-.
<https://doi.org/10.1016/j.pacfin.2020.101262>
- Norden. (2023). Retirement Pension in Norway. <https://www.norden.org/en/info-norden/retirement-pension-norway#:~:text=When%20can%20you%20receive%20a,want%20to%20work%20in%20parallel.>
- Nwanne, T. F. I. (2015). Impact of contributory pension scheme on economic growth in Nigeria. *Global Advanced Research Journal of Management and Business Studies*, 4(8), 333-337.
- Nyabuto, J. (2022). *Effect of Portfolio Diversification on Financial Performance of Pension Funds in Kenya* (Doctoral dissertation, University of Nairobi).
- Nyangeri, F. O. (2014). *The Effect of Firm Characteristics on the Financial Performance of Pension Schemes in Kenya*(Doctoral dissertation).
- OECD. (2020). Assets in Retirement Savings Plans and Public Pension Reserve Funds.
<https://www.oecd-ilibrary.org/docserver/d3f11cc6-en.pdf?expires=1704636391&id=id&accname=guest&checksum=2F0FCA76C02F0E4C28DE78DEF3463C60>
- OECD. (2021). Pension Markets in Focus 2021. <https://www.oecd.org/daf/fin/private-pensions/Pension-Markets-in-Focus-2021.pdf>
- OECD. (2023). *Labour force participation rate*. <https://data.oecd.org/emp/labour-force-participation-rate.htm>

- OECD. (2023). Pensions at a Glance 2023. <https://www.oecd.org/els/public-pensions/PAG2023-country-profile-Australia.pdf>
- Omori, K., & Kitamura, T. (2020). Effect of debt tax benefits on corporate pension funding and risk-taking. *Journal of Economic Studies*, 47(6), 1327-1337.
- Onyango, D. A. (2011). *The relationship between investment strategies and financial performance of pension funds in Kenya* (Doctoral dissertation).
- Pablo, A., & Fiona, S. (2009). *Private Pensions and Policy Responses to the Financial and Economic Crisis*. OECD Publishing. <https://doi.org/10.1787/224386871887>
- Padley, M. (2022). Retirement living standards: 2022 update.
- Park, D., & Estrada, G. B. (2012). Developing Asia's pension systems and old-age income support.
- Pedraza, A., Fuentes, O., Searle, P., & Stewart, F. (2017). Pension funds and the impact of switching regulation on long-term investment. *World Bank Policy Research Working Paper*, (8143).
- Poterba, J. M. (2014). Retirement Security in an Aging Population. *The American Economic Review*, 104(5), 1–30. <https://doi.org/10.1257/aer.104.5.1>
- Purwanti, E. (2023). Analysis of The Differences in the Financial Performance of The GKJ Pension Fund before and During the Covid-19 Pandemic. *ProBisnis: Jurnal Manajemen*, 14(4), 213-219.
- Putri, L., Sakti, I. M., & Atahau, A. D. R. (2020). Does ownership moderate the effects of size on pension funds' efficiency and investment performance. *Jurnal Keuangan dan Perbankan*, 24(3), 253-266.
- Rachmatarwata, I. (2017). *Harmonization in Regulatory Framework for Pension and Savings: Voluntary vs. Mandatory*. Paper presented at the Indonesia Pension Conference. 25 Years of Pension Savings: "Way Forward for Next Quarter Century." Jakarta.

<http://www.ojk.go.id/id/kanal/iknb/berita-dan-kegiatan/info-terkini/Pages/OJK-dan-World-Bank-Gelar-Indonesia-Pension-Conference.aspx>

- Rosentraub, M. S., & Shroitman, T. (2004). Public Employee Pension Funds and Social Investments: Recent Performance and a Policy Option for Changing Investment Strategies. *Journal of Urban Affairs*, 26(3), 325–337. <https://doi.org/10.1111/j.0735-2166.2004.00202.x>
- Rudolph, H., Hinz, R., Antolín, P., & Yermo, J. (2010). Evaluating the financial performance of pension funds. *Evaluating the Financial Performance of Pension Funds*, 1.
- Sims, C. A. (1980). Macroeconomics and Reality. *Econometrica*, 48(1), 1–48. <https://doi.org/10.2307/1912017>
- Sorsa, V.-P. (2011). *Pension fund capitalism in europe: institutional organisation and governance of finnish pension insurance companies*. ProQuest Dissertations Publishing.
- Stock, J. H., & Watson, M. W. (2001). Vector Autoregressions. *The Journal of Economic Perspectives*, 15(4), 101–115. <https://doi.org/10.1257/jep.15.4.101>
- Sudjono, M. M. (2017). Employer Pension Funds: Prospects and Challenges. Paper presented at the Indonesia Pension Conference. 25 Years of Pensions Savings: "Way Forward for Next Quarter of Century". Jakarta. <http://www.ojk.go.id/id/kanal/iknb/berita-dan-kegiatan/info-terkini/Pages/OJK-dan-World-Bank-Gelar-Indonesia-Pension-Conference.aspx>
- Suryahadi, A., Febriany, V., & Yumna, A. (2014). Expanding Social Security in Indonesia: The Current Processes and Challenges. In *Towards Universal Health Care in Emerging Economies* (pp. 373–403). Palgrave Macmillan UK. https://doi.org/10.1057/978-1-137-53377-7_14
- The World Bank. (2023). *Age dependency ratio, old (% of working-age population)*. <https://data.worldbank.org/indicator/SP.POP.DPND.OL>

The World Bank. (2023). *Fertility rate, total (births per woman)*.

<https://data.worldbank.org/indicator/SP.DYN.TFRT.IN?contextual=region>

The World Bank. (2023). *Life expectancy at birth, total (years)*.

<https://data.worldbank.org/indicator/SP.DYN.LE00.IN>

Thomas, A., & Spataro, L. (2016). The Effects Of Pension Funds On Markets Performance: A Review. *Journal of Economic Surveys*, 30(1), 1–33. <https://doi.org/10.1111/joes.12085>

Toharudin, W. U. (2021). Analysis of Pension Fund Investment Portfolio Diversification Policy and Its Impact on Financial Performance (Study on PLN Pension Fund 2010-2018). *Asian Journal of Social Science Studies*, 6(3), 34.

Tri, N. M., Quoc, N. A., & Lam, N. M. (2020). Impact of economic growth on social security in Vietnam. *International Journal of Humanities and Social Science*.

<https://doi.org/10.30845/ijhss.v10n3p9>

Turner, J. A., & Muir, D. M. (2012). Financial Literacy and Defined Contribution Pensions: A Global Snapshot of an Unrecognized Problem. *Compensation and Benefits Review*, 44(5), 280–290. <https://doi.org/10.1177/0886368712468259>

Wahyudi, S., Hasanudin, H., & Pangestutia, I. (2020). Asset allocation and strategies on investment portfolio performance: A study on the implementation of employee pension fund in Indonesia. *Accounting*, 6(5), 839-850.

Wahyudi, S., Hasanudin, H., & Pangestutia, I. (2020). Asset allocation and strategies on investment portfolio performance: A study on the implementation of employee pension fund in Indonesia. *Accounting*, 6(5), 839-850.

World Health Organization. (2002). *Active Ageing. A Policy Framework*. Geneva: WHO.

Xu, G., Liu, F. C., Hsu, H. T., & Lin, J. W. (2020). The impact of pension governance practices on the public defined benefit pension performance. *Benchmarking: An International Journal*, 27(1), 192-214.