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OCTOBER 2025

# EUROPE'S PRODUCTIVE CAPITAL GAP

**Mobilising pension and household savings to scale up risk capital**

## AUTHORS

AUGUSTIN, PATRICK – MCGILL UNIVERSITY
BETERMIER, SEBASTIEN – MCGILL UNIVERSITY
GORMLEY, EMMA – MCGILL UNIVERSITY
PARENT, MARIE – MCGILL UNIVERSITY

ALFI would like to express our sincere thanks to the team at McGill University for their valuable contribution to this publication.
Their expertise, research, and thoughtful analysis have greatly enriched the final work, and we truly appreciate their collaboration and dedication throughout the process.

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# 1. Introduction

In recent decades, Europe's economy has fallen further behind the United States and China in productivity, capital formation, and technological and business innovation. Between 2002 and 2023, the GDP gap between the U.S. and the EU nearly doubled, from 17% to 30% (Draghi, *2024a*). The Draghi Report on *The Future of European Competitiveness diagnoses* one core cause of this decline as the insufficient supply of long-term "risk capital," i.e., financial capital invested in risky asset classes such as public and private equities and infrastructure that drive productive investments.

One key driver of this productive capital gap is the limited scale and depth of funded pension systems. In most European countries, household retirement wealth is concentrated in public pay-as-you-go (PAYG) social security systems, where pension contributions from active workers finance the pension benefits of retirees rather than being invested in financial markets. As a result, Europe's funded pensions are smaller and have less capital allocated to risky financial assets than those in leading pension markets.

Funded pension accounts are a natural source of long-term, risk capital. Their investment horizons are long and predictable, contributions typically grow with wages and the size of the workforce, and the resulting capital pool is uniquely patient and scalable. For individual savers, investments in risky financial assets supports long-term wealth accumulation. Higher expected returns from risky investments also help cushion the financial pressures of increasing life expectancy.

Starting in the 1990s, countries such as Australia, Canada and Sweden launched structural reforms to transition their pension systems from PAYG regimes to partly capitalised regimes, responding to demographic pressures that threatened the long-run solvency of their pension systems. Three decades later, these countries emerge as poster child examples for successful pension reforms. This study seeks to learn lessons from their experience. We ask how much risk capital these countries have accumulated after thirty years, and how it compares to that of countries that continue to operate predominantly as PAYG regimes? Looking ahead, what policies and conditions can best mobilise household and pension savings to scale the supply of risk capital across Europe?

We address these questions by comparing the stock of risk capital across nine countries. Our sample includes four European and two non-European countries that have successfully undergone capitalisation pension reforms (Denmark, Finland, the Netherlands and Sweden in Europe; Australia and Canada outside Europe), as well as three European countries that continue to predominantly operate as PAYG pension systems (Germany, France and Luxembourg). For each country, we quantify the risk capital accumulated across different pillars of the pension ecosystem. We then conduct in-depth case studies of pension reforms in Australia, Canada, and Sweden to identify the factors that enabled large-scale risk capital accumulation. From this analysis, we distill six key takeaways.

## TAKEAWAY 1:

**Thirty years later, the divide in accumulated risk capital between capitalised and predominantly PAYG retirement systems is striking.**

Today, workers in capitalised systems have about €209,234 in risky financial assets on average. In comparison, figures are roughly €91,600 in France and €66,000 in Germany per worker. In other words, funded systems hold two to three times more risk capital per worker than PAYG-dominant peers. Had France adopted the path of capitalised systems, its stock of risk capital could now be €6.5 trillion rather than €2.8 trillion. For Germany, **it could be €9 trillion instead of €2.8 trillion.**

## TAKEAWAY 2:

**The substantial growth of risk capital in reformed countries stems from structural pension reforms implemented gradually over time**.

The case studies of Australia, Canada and Sweden show that capitalisation pension reforms were implemented slowly and gradually, with increased contribution rates and system design changes phased in over many years. This incremental approach enabled governments to build political consensus, reduce transition costs associated with the reforms, and harness the power of compound returns over multiple decades.

## TAKEAWAY 3:

**Capital accumulation and risk-taking reinforce each other, creating a powerful amplification mechanism.**

Countries with higher savings per active worker also allocate a greater share of those savings to risky assets. This pattern appears both across countries and over time. For instance, Swedes hold about €332,000 in financial assets per worker - compared to €161,000 in Germany - and invest a much larger share in risky assets: 75% versus 41%. Over time, the combination of higher contributions and riskier allocations has compounded, driving far stronger risk capital formation in capitalised regimes.

**TAKEAWAY 4:**

**Exposure to risky assets through public and occupational pensions encourages greater risk-taking in voluntary household savings, adding another layer of amplification.**

We document a positive relation between (i) the stock of risk capital accumulated per worker in public and occupational pension systems and (ii) the households' propensity to invest voluntary savings in risky financial assets. Evidence from Denmark, Sweden and the United States further shows that enrollment in defined-contribution occupational pension plans increases household stock market participation and risk-taking, thereby enhancing retirement wealth accumulation.

**TAKEAWAY 5:**

**There are multiple pathways to risk capital accumulation.**

Reformed countries have pursued different strategies across the pillars of the pension ecosystem. Canada has built a professionally governed public pension reserve, achieving equity exposure through strong governance and skilled investment management, while also offering tax incentives to encourage household investment in risky assets. By contrast, Australia has built a robust occupational pension system by combining mandatory defined contributions with default portfolio design and market consolidation. "Salary sacrifice" schemes further promote voluntary pension contributions through the occupational system. Sweden has scaled up equity participation broadly by funding the public pension system, expanding quasi-mandatory occupational coverage, and fostering voluntary equity market participation through tax incentives and financial education. Together, these case studies show that there is no single path to building risk capital.

**TAKEAWAY 6:**

**The common drivers of risk capital accumulation are scale, cost-efficient investment vehicles, strong governance, broad coverage, portability and carefully designed financial incentives.**

Despite differences in reform designs, clear commonalities emerge from the case studies. Scale lowers costs and broadens access to asset classes such as private infrastructure, resulting in more cost-efficient investment options. Strong governance and clear fiduciary mandates support risk tolerance, long-term horizon investment horizons, and professional asset management. Broad coverage ensures widespread participation. Portability helps achieve scale and reduces the risk of sudden withdrawals. Fiscal incentives further boost voluntary participation.

**LESSONS FOR EUROPE.**

Europe shares similar political and geographical fragmentation challenges as the countries in our case studies. The experiences of those countries therefore offer useful lessons for designing pathways for Europe to unlock risk capital through retirement savings. We discuss two such pathways. The first is the creation of a pan-European "super-default" fund, modeled on Sweden's AP7 or the UK's NEST, in which employers could voluntarily participate. The second is the establishment of opt-in employer gateway platforms that pool contributions across regions and firms to increase bargaining power and expand investment choice. Both pathways give all European workers access to cost-efficient, equity-heavy default options. Risk capital can be further scaled by opening employer-based investment options to voluntary contributions, like Australia's "salary sacrifice" scheme. This would provide households with institutional access to diversified, long-horizon portfolios that are otherwise beyond the reach of small savers.

We emphasise that this is not a policy paper. We do not make normative claims or policy recommendations on optimal pension design, risk allocation for workers, or retiree wealth management strategies, nor do we model the distribution of total wealth, which lies outside the scope of our analysis. Instead, our goal is to learn from countries that have pursued capitalisation policies over the past thirty years and explore pathways for efficiently scaling up risk capital via pension and household savings.

# 2. Methodology and Data

This section describes how we categorise pension systems into three tiers, construct the sample, define variables, and collect data.

## 2.1 Retirement Tiers

Modern pension systems typically consist of several pension pillars that differ in funding mode, decision authority, and target population (*World Bank 2008*). Definitions of the pillars can vary across organisations and jurisdictions. For example, in Canada the national CPP plan is sometimes classified as Pillar 1 because it is administered by the government and other times as Pillar 2 because it is an earnings-related program.

To remain consistent with existing approaches, we adopt a multi-pillar framework that organises pension systems by the level of administrative authority over retirement income. Specifically, we define three pension tiers that link the source of retirement income to the corresponding administrative authority: the state, the employer, or the household.[1]

**TIER 1**

is the state-administered pension tier. It typically takes the form of a public, mandatory, contributory system linked to payroll earnings. In this tier, the state (or its designated agent) not only administers the system but also sets the level of risk tolerance and investment strategy.

**TIER 2**

corresponds to the (typically private) occupational pension system, which is linked to employment and earnings.1F These programs are administered by the employer and may take the form of either Defined Benefit (DB) or Defined Contribution (DC) schemes. In DB plans, retirement benefits are guaranteed at a predetermined level, with the employer assuming and managing the associated risk. In DC plans, benefits are based on contributions from the employer and employee, while investment and pension payment risks are borne by the employee, either directly or through decisions delegated to the employer or a plan administrator.

**TIER 3**

consists of household financial savings accumulated during individuals' working years. These savings are typically voluntary and can take diverse forms, such as personal retirement accounts, individual savings plans, or other financial assets earmarked for retirement.

[1] *See* ***Appendix 2*** *for an overview of the tier classification by country.*

We emphasise that the classification of tiers is not mutually exclusive. For example, Australia's superannuation system is classified as Tier 2 because industry super funds are governed by employers and employee representatives, and employee participation is mandatory. At the same time, this system also exhibits Tier 3 features: employees may select a fund outside their industry, make additional contributions, and design their own portfolios. In our quantitative analysis, we assign each system to a single tier to avoid double counting[2]. In the case study section that follows, however, we explore the interdependencies across pension tiers in greater depth.

## 2.2 Countries

Our sample covers nine countries. We first select four European countries—Denmark, Finland, Sweden, and the Netherlands—that are characterised by strong capitalisation in both public and private pension tiers. In Finland and the Netherlands, capitalisation is mostly concentrated in Tier 2. Finland's system is anchored by the earnings-related TyEL pension, while in the Netherlands quasi-mandatory funded occupational schemes provide the main source of retirement income. By contrast, Denmark and Sweden have strengthened capitalisation in both Tier 1 and Tier 2. In Denmark, the mandatory funded and universal ATP scheme supplements the basic PAYG pension, while defined-contribution occupational plans further expand retirement benefits. In Sweden, pension reforms in the 1990s introduced the fully funded defined contribution 'premium' system to supplement the partly funded universal pension. As in Denmark, this Tier 1 scheme complements quasi-mandatory funded occupational schemes.

We also include two non-European countries known for their efficient DB and DC funded pension schemes: Canada and Australia. Canada relies on two main Tier 1 components: the unfunded PAYG Old Age Security system and the partly funded defined-benefit plan: the Canada Pension Plan (CPP) and its Quebec counterpart, the Quebec Pension Plan (QPP), both of which actively invest in capital markets. Australia's system is anchored in Tier 2 superannuation funds, a mandatory occupational defined-contribution program.

To compare capitalised pension systems with traditional PAYG systems, we include three countries – France, Germany, and Luxembourg – that continue to rely primarily on PAYG schemes. France's system is centered on a public PAYG pension, supplemented by the funded AGIRC-ARRCO component. Germany also relies heavily on its PAYG system, with only a small reserve to smooth fluctuations in contributions and payouts. Luxembourg operates a comparatively generous public PAYG pension system, the Caisse Nationale d'Assurance Pension (CNAP), funded through contributions from the state, employers, and employees.

[2] *In situations where the primary pension program is facilitated by both the state and employer, we classify funds based on the degree of discretion employers and employees have over managing retirement savings. In Canada, contributions are centrally managed by the Canada Pension Plan Investment Board (CPPIB), so we categorise this plan as Tier 1. Conversely, Australia allows workers to choose among 93 APRA regulated funds to invest both their personal and employer matched contributions for their superannuation account, leading us to classify the superannuation system as Tier 2. Similarly, in Finland, public and private sector employers decide where employee's earnings-based pension contributions are invested, so we also categorise this system as Tier 2.*

## 2.3 A Preliminary Look at Expenditures and Benefits

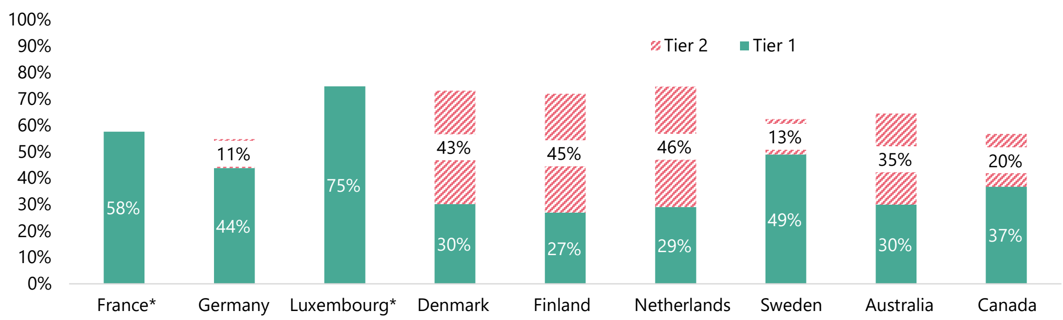
This section reviews summary statistics on expenditures, benefits and coverage rates across pension systems. We primarily focus on Tier 1 and Tier 2 but also report selected statistics on savings and stock market participation for Tier 3.
Data sources are listed in ***Appendix 3.***

STUDY HIGHLIGHT

**INCOME REPLACEMENT RATE.**

Figure 1 reports the income replacement rate from Tier 1 and Tier 2 as a percentage of pre-retirement earnings for each of the nine countries in our sample. The income replacement rate is calculated as the ratio of individual net pension entitlements to net pre-retirement earnings. The data are drawn from the OECD (***2023***), the Economic Policy Committee (***2024***) and the Australian Treasury (***2021***).

FIGURE 1 INCOME REPLACEMENT RATE AS A PERCENTAGE OF PRE-RETIREMENT EARNINGS BY TIER



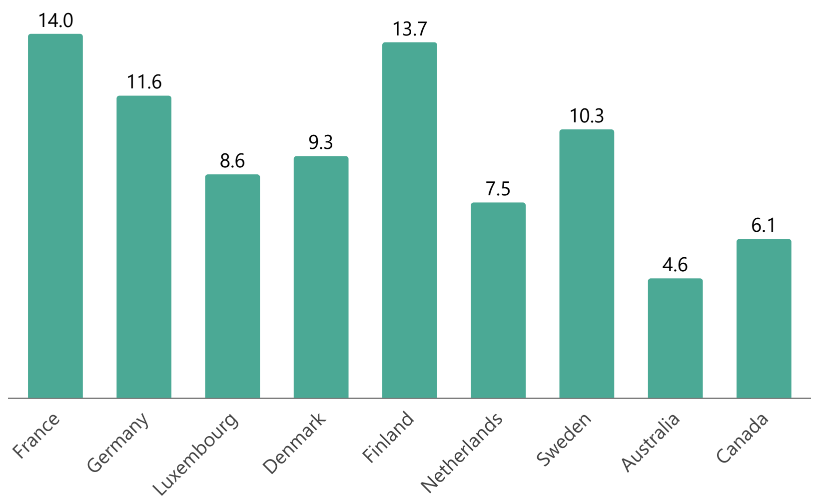

Each bar shows a country's income replacement rate coming from public and occupational pensions, with stacked segments indicating contributions from Tier 1 (solid green) and Tier 2 (striped pink) systems. The dotted horizontal line marks the cross-country average replacement rate. The * in the country legend indicates that Luxembourg and France are excluded from Tier 2 earnings due to a lack of precise data. Tier 1 and Tier 2 rates are drawn from the OECD (***2023***) and supplemented with data from the Economic Policy Committee (***2024***) and the Australian Treasury (***2021***). Additional information is provided in ***Appendix 3.***

All nine countries have well-established pension systems that deliver broadly similar total income replacement rates. The average is 66%, ranging from 52% in Germany to 75% in Luxembourg and the Netherlands, with a standard deviation of 8.7%. However, the composition of revenue sources differs markedly across countries. PAYG regimes such as Luxembourg and France rely heavily on Tier 1 to supplement pre-retirement income. By contrast, the Netherlands, Denmark, Finland, and Australia depend more on occupational pensions in Tier 2.

## PUBLIC EXPENDITURES.

Sustaining high income replacement rates can be costly for governments, particularly for those that rely heavily on PAYG Tier 1 pensions Figure 2 illustrates cross-country variation in annual public spending on Tier 1 and Tier 2 programs as a proportion of GDP, based on ***OECD*** data. France and Germany, both reliant on PAYG Tier 1 systems, record some of the highest expenditure ratios at 14% and 11.6%, respectively. Luxembourg also leans on PAYG but benefits from a high GDP, which lowers its expenditure ratio. Sweden and Denmark, with partially capitalised Tier 1 systems, spend about 9-10% of GDP. Finland records significant Tier 2 expenditures through its TyEL program, at 12-13% of GDP. By contrast, the Netherlands (7.5%), Australia (4.6%) and Canada (6.1%) show lower public expenditure ratios, reflecting more balanced or occupationally focused systems.

FIGURE 2 ANNUAL PUBLIC EXPENDITURES OF TIER 1 AND TIER 2 PROGRAMS AS A % OF GDP

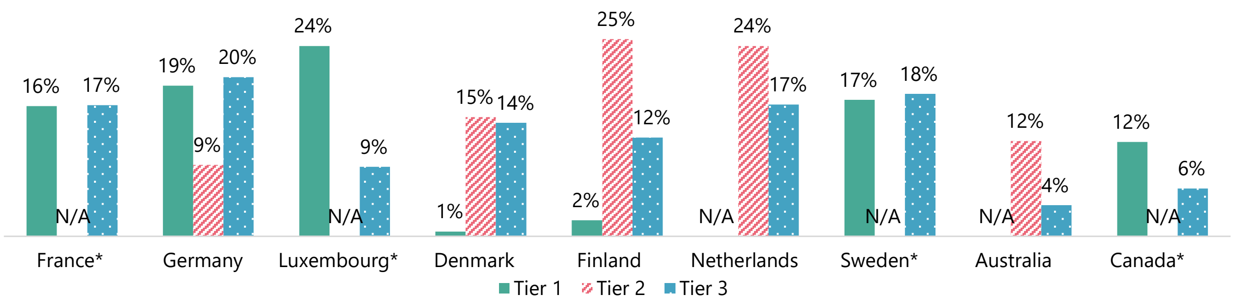



Each bar shows the total public expenditures on Tier 1 and Tier 2 programs as a share of GDP for each country. Data are sourced from the **OECD**.

## CONTRIBUTION AND SAVINGS RATES.

Figure 3 shows wide cross-country variation in contribution and savings rates across tiers. Contribution rates refer to the share of a worker's gross income paid into Tier 1 and Tier 2 pension schemes, including employee, employer, and state contributions. Savings rates refer to the percentage of disposable income that individuals put into savings voluntarily. France, Germany, and Luxembourg stand out with high Tier 1 contribution rates – 16%, 19%, and 24% respectively, compared to the average of 13% – driven by heavy reliance on the Tier 1 PAYG system. Tier 2 contributions to occupational plans vary significantly by income and scheme, resulting in limited comparable data for France, Luxembourg, Sweden, and Canada. In contrast, Denmark, Finland, and the Netherlands allocate standardised, sizable shares to Tier 2 schemes, with contributions exceeding 20-25%, particularly under Finland's TyEL and Dutch occupational funds. Non-European peers Canada and Australia maintain the lowest overall contribution levels, under 20% (although Canada's calculation excludes occupational contributions). Overall, the data highlight the heterogeneity of contribution strategies across countries, from high mandatory payroll deductions in PAYG systems to more moderate, savings-oriented approaches in capitalised regimes.

FIGURE 3 CONTRIBUTION RATES (TIERS 1 AND 2) AND SAVINGS RATES (TIER 3)

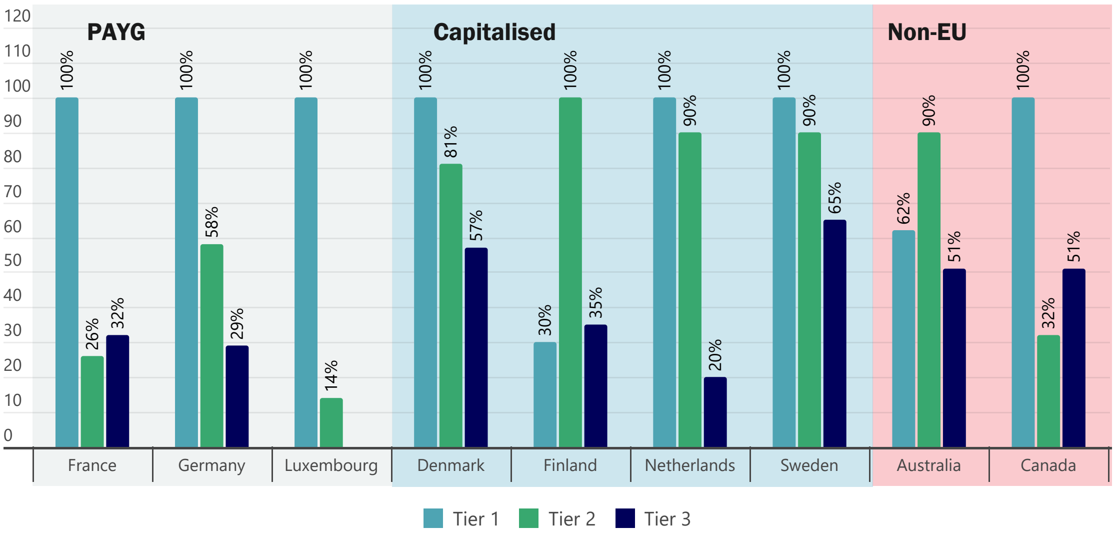



Each bar represents a country's contribution (Tier 1 and Tier 2) and savings (Tier 3) rates, separated into proportions coming from Tier 1 (solid green), Tier 2 (striped pink), and Tier 3 (dotted blue) systems. Tier 1 and Tier 2 are expressed as a percentage of gross income while Tier 3 is expressed as a percentage of disposable income. These rates include employee, employer, and state contributions. Australia and the Netherlands fund their Tier 1 system through general tax and insurance revenues, thus not requiring a specific Tier 1 contribution rate. Precise Tier 2 contribution rates are unavailable for France, Luxembourg, Sweden, and Canada due to variation in contributions based on income and scheme. Sources are available in *Appendix 3*.

## COVERAGE AND INVESTMENT PARTICIPATION.

In Figure 4 we compare coverage and stock market participation rates across the nine countries. The coverage rate refers to the share of the working-age population covered by Tier 1 or Tier 2 schemes, while stock market participation measures the percentage of households which directly or indirectly invest in voluntary savings in Tier 3 stock market accounts.[3]

FIGURE 4 COVERAGE RATES (TIERS 1 AND 2) AND HOUSEHOLD INVESTMENT PARTICIPATION (TIER 3)




Each bar shows the fraction of the working-age population covered by Tier 1 (solid green) or Tier 2 (striped pink) schemes as well as the share of households investing in voluntary savings (dotted blue). The household investment participation rate is unavailable for Luxembourg due to a lack of data. Data sources are listed in ***Appendix 3***.

Unlike the broadly similar overall income replacement rates, coverage rates vary widely across pension tiers. Tier 1 coverage is nearly universal, except Finland and Australia where benefits are means-tested to guarantee a minimum retirement income - an approach enabled by strong Tier 2 schemes. In PAYG regimes such as France, Germany, and Luxembourg, participation in occupational pensions (Tier 2) and household savings (Tier 3) remains modest. By contrast, capitalised regimes like Denmark, the Netherlands, and Sweden combine universal Tier 1 coverage with high Tier 2 participation, alongside stronger household engagement in Tier 3. Sweden stands out, with 65% of households investing in the stock market.

[3] *Canada and Australia's household participation rates include all voluntary investments (non-risk capital and risk capital).*

## 2.4 Calculation of Risk Capital

For each country we quantify the stock of risk capital accumulated across the different tiers using multiple data sources. Tier 1 reserve assets, managed centrally by state-affiliated investing authorities, are taken from fund annual reports. Tier 2 assets are obtained from consolidated datasets produced by national statistical agencies and central banks. Tier 3 assets reflect household financial savings as reported in national balance sheets (see *Appendix 2* for a specific break-down). For European countries, Tier 3 asset values are drawn from Eurostat. Additional data on exchange rates, workforce, and nominal GDP are sourced from various international institutions and listed in *Appendix 1*.

We classify financial assets into two categories: risk capital and non-risk capital. In Tier 1 and Tier 2, risk capital includes listed and unlisted equities, hedge funds, property and infrastructure, while non-risk capital consists of fixed income products such as government bonds, corporate bonds, and deposits. Our classification of risky vs. non-risky assets is coarse but allows for a consistent cross-country measurement of risk capital.

For Tier 3, risk capital is defined as the sum of household financial assets invested in equity and investment fund shares, financial derivatives and employee options. Non-risk capital includes currency and deposits, debt securities and loans. We exclude assets invested in life insurance products due to a lack of available information on their asset allocation. We also exclude assets invested in public and private pensions to avoid double counting Tier 1 and Tier 2 assets, as well as non-financial assets.

To facilitate cross-country comparisons, we normalise risk capital by the number of active workers, defined as the labor force aged 15 to 64. For completeness, we also normalise risk capital by GDP in *Appendix 4*.

Beyond risk capital, we also refer to the risky share, both in aggregate and within each tier. The risky share is defined as the ratio of risk capital to the total of risk and non-risk capital.

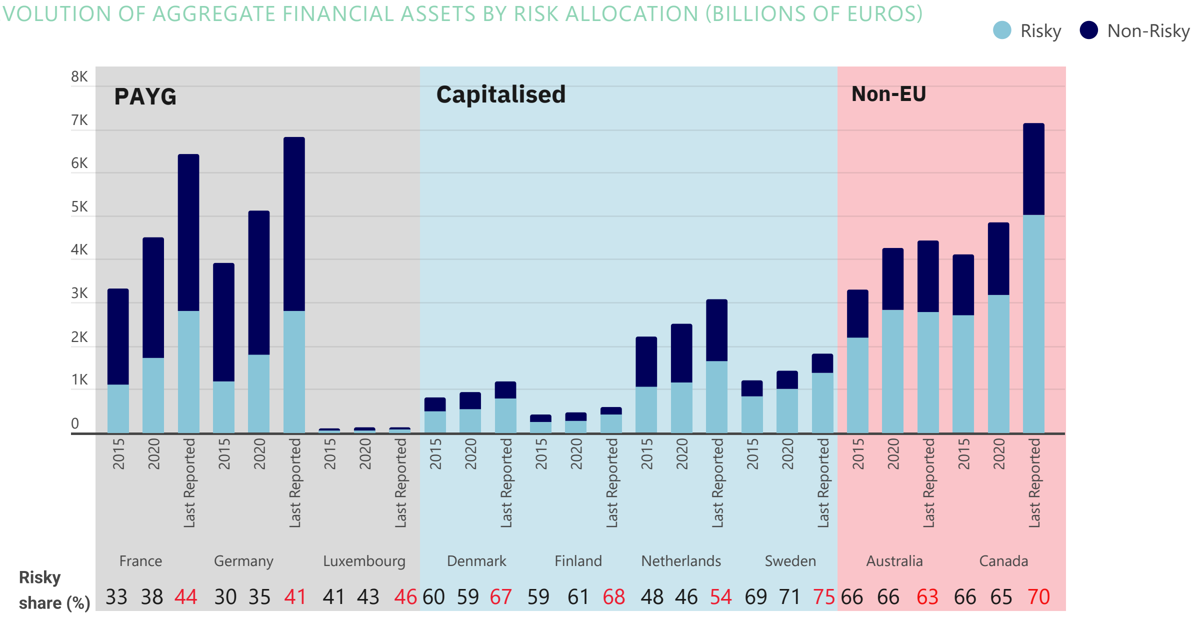
A key finding from our data collection exercise is the absence of a consistent and reliable dataset of pension assets across European countries and tiers. Improving the accessibility and consistency of such data would enable regulators, practitioners, policymakers, and academics to engage more fully with this topic and provide better-informed guidance for reform.

# 3. Cross-Country Risk Capital Accumulation: A Bird's Eye View

We highlight Europe's productive capital gap by contrasting the stock of risk capital in traditional PAYG pension systems with that in capitalised regimes, both within and outside Europe. Figure 5 reports total retirement assets in each country and their growth from 2015 to the most recently reported year. Asset levels vary widely, from about €200 billion in Luxembourg to more than €7 trillion in Canada, reflecting differences in country size.

Beyond overall system size, the allocation of financial assets between risky and non-risky assets also varies widely across countries. Since 2015, all systems have grown, but both the pace of expansion and the share invested in risky capital differ substantially. Funded systems such as Canada, Australia, Sweden and the Netherlands have built large and growing asset pools with significant risky allocations ranging from 54% in the Netherlands to 75% in Sweden, reflecting their market-oriented structures. By contrast, France, Germany and Luxembourg allocate less than half of retirement assets to risk capital (41% in Germany and 47% in Luxembourg). Figure 5 underscores both the scale differences across systems and the heterogeneity in investment strategies.

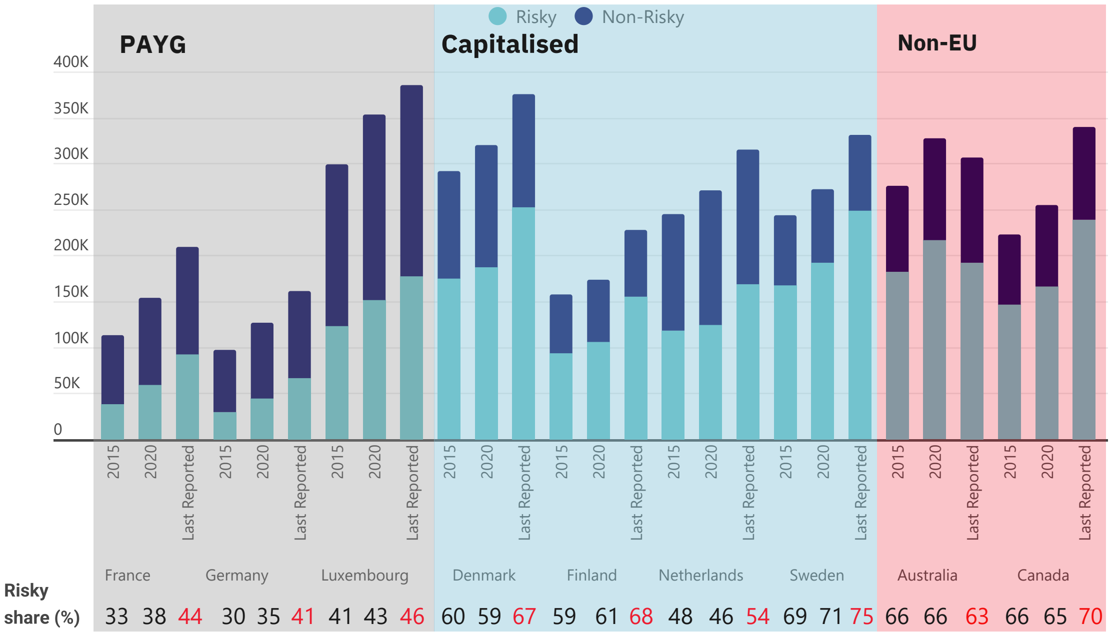
FIGURE 5 EVOLUTION OF AGGREGATE FINANCIAL ASSETS BY RISK ALLOCATION (BILLIONS OF EUROS)




Bars represent total financial assets in billions of euros in 2015, 2020, and in the last reported year, divided into risky (dark blue) and non-risky (grey patterned) asset classes, with the risky asset share (%) indicated below each bar. We group countries by predominantly PAYG (France, Germany, Luxembourg) and capitalised (Denmark, Finland, Netherlands, Sweden) pension systems, and non-EU countries. Tier 2 data are missing for France in 2015 and 2020 due to data unavailability. Data sources are discussed in ***Appendix 2***.

To enable cross-country comparison, we scale total retirement assets by the size of the active workforce. Figure 6 highlights the stark gap between capitalised and uncapitalised regimes. Germany and France hold only €65,969 and €91,564 of risk capital per active worker, respectively, while Denmark (€260,033) and Canada (€242,031) reach more than double those levels.

FIGURE 6 EVOLUTION OF FINANCIAL ASSETS PER ACTIVE WORKER BY RISK ALLOCATION (EUROS)




Bars represent total financial assets (in EUR) **per active worker** in 2015, 2020, and in the last reported year, divided into risky (dark blue) and non-risky (grey patterned) asset classes, with the risky asset share (%) indicated below each bar. We group countries by predominantly PAYG (France, Germany, Luxembourg) and capitalised (Denmark, Finland, Netherlands, Sweden) pension systems, and non-EU countries. Tier 2 data are missing for France in 2015 and 2020 due to data unavailability. Data sources are discussed in ***Appendix 2***.

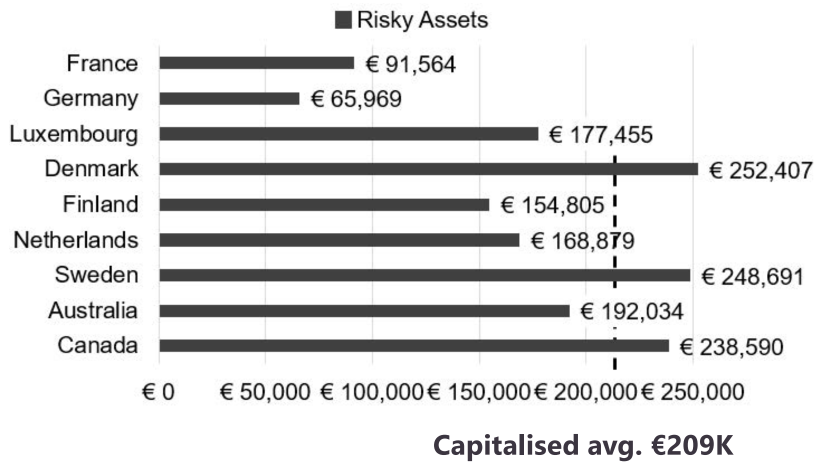
## 3.1 The Risk Capital Gap, Thirty Years Later

Figure 7 provides another visualization of cross-country differences in the accumulation of risk capital per active worker, by isolating the solid blue segment in Figure 6. The average of the six capitalised systems in the sample (Australia, Canada, Denmark, Finland, the Netherlands, and Sweden) amounts to €209,234 per worker.[4]

We then zoom in on Germany's and France's risk capital per worker and compare it to the capitalised average of €209,234. Figure 8 shows that the average risk capital in capitalised regimes is 3.2 times higher than in Germany and 2.3 times higher than in France. This gap implies more than €100,000 in "foregone" risk capital accumulation per worker in both countries.

We perform a simple back-of-the-envelope calculation to quantify the aggregate risk capital gap in France and Germany. In the most recent year, the accumulated risk capital across all pension tiers amounts to €2.797 trillion in Germany and €2.807 trillion in France. Applying the gap ratios from Figure 8 (3.2 times higher for Germany and 2.3 times higher for France) suggests that potential risk capital could have reached €8.950 trillion in Germany and €6.456 trillion in France.

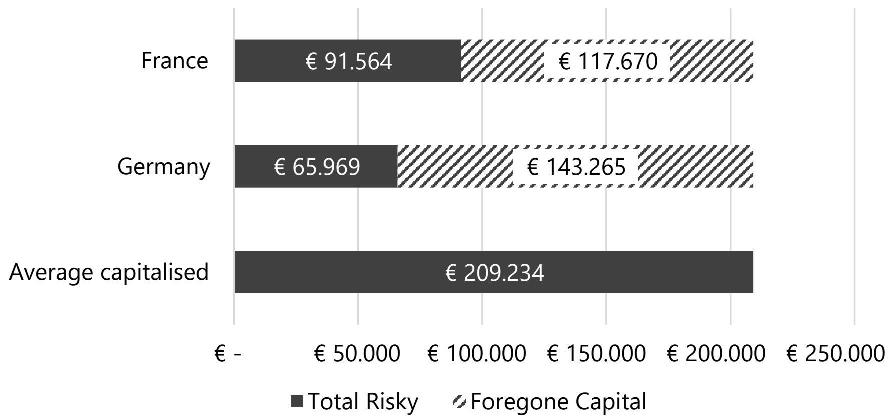
FIGURE 7 TOTAL RISKY FINANCIAL ASSETS PER WORKER (EUROS)




The bars compare the accumulated risk capital (in EUR) per active worker across sample countries, with the average of the six capitalised systems in our sample (Australia, Canada, Denmark, Finland, the Netherlands, and Sweden) displayed across the bars. Data sources are discussed in *Appendix 2*.

4. *We classify Luxembourg as a PAYG system due to its predominant reliance on Tier 1, and, therefore, do not include it in the average risk capital across capitalised systems. Including Luxembourg would give an average risk capital of €204,694 and does not change the main takeaway of the analysis.*

FIGURE 8 RISK CAPITAL GAP PER ACTIVE WORKER (EUROS)




The bars compare the accumulated risk capital (in EUR) and the estimated gap in foregone risk capital for France and Germany to the average risk capital in the six capitalised systems in our sample (Australia, Canada, Denmark, Finland, the Netherlands, and Sweden). This risk capital gap is calculated as the difference between the average of the seven capitalised systems in our sample and the amount of existing accumulated risky financial assets in Germany and France. Data sources are discussed in ***Appendix 2***.

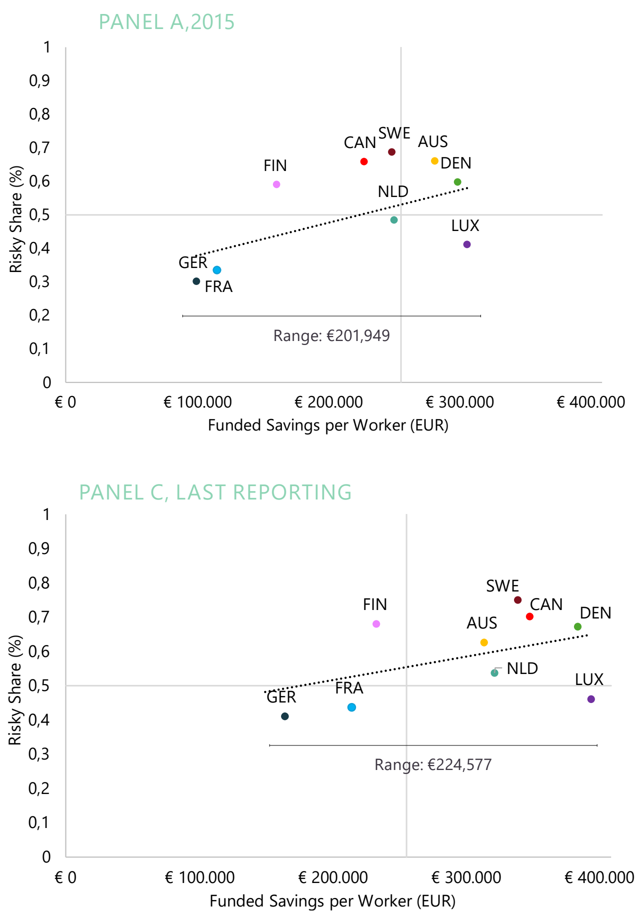
Importantly, per-worker risk capital in Germany and France remains lower despite a significantly higher share of gross income being directed to retirement savings. Workers in Germany contribute about 28% of gross income across Tier 1 and Tier 2, compared with an average of 18% in the six capitalised economies (Figure 3). This highlights that uncapitalised systems accumulate less risk capital than their capitalised peers while imposing a higher cost on public and private schemes to maintain adequate retirement income.

At the individual level, the absence of capitalised savings translates into lower retirement wealth. Retirees in Germany and France depend more heavily on PAYG transfers, creating structural reliance on future taxpayers rather than on their own accumulated assets. This amplifies intergenerational transfers, as younger workers shoulder the burden of supporting a growing retiree population. At the macroeconomic level, the missing risk capital is material: the approximately €10 trillion gap we estimate for France and Germany could otherwise be mobilised to finance productive investments and innovation.

## 3.2 Unpacking the Risk Capital Gap

How have some of the world's largest economies, with some of the highest contribution rates to pensions, accumulated so little risk capital over the past 30 years? Our analysis highlights two reinforcing forces. Capitalised pension regimes are not only better funded, but each euro contributed is also invested more aggressively. In other words, higher funding levels go hand in hand with greater risk-taking. Over time, this combination of larger contributions and riskier allocations has compounded, producing far stronger risk capital formation in capitalised regimes.

FIGURE 9 TIME SERIES OF TOTAL FINANCIAL ASSETS PER WORKER (EUROS) BY RISKY SHARE (%)




This figure illustrates the relation between total financial assets per active worker (in EUR) on the x-axis and the proportion of those assets allocated to risky investments across all pension tiers on the y-axis. The panels show three snapshots of annual data: 2015 (Panel A), 2020 (Panel B), and the latest reported date (Panel C). The range between the largest amount of financial assets per worker and the smallest is displayed on the graph. Data sources are discussed in ***Appendix 2***.

Figure 9 plots total financial assets per active worker (including both risk and non-risk capital) on the x-axis against the aggregate risky asset share on the y-axis for each country, using three snapshots of annual data: 2015, 2020, and the latest reported year.

The positive relation in each panel suggests that countries with higher financial assets per worker, such as Sweden, Canada, and Denmark, also take on more portfolio risk. Cross-country differences are striking. For example, in the most recent year, Swedes not only saved more per worker (€331,567 versus an average of €294,630) but also allocated a larger share of those savings to risky assets, with 75% invested in risk capital compared to a 59% cross-country average.

This positive relation indicates that the productive capital gap in uncapitalised economies stems from two reinforcing factors: lower funding levels and smaller allocations to risky assets. Together, these forces amplify each other, widening cross-country differences in aggregate retirement wealth over time.

Consistent with this intuition, Figure 9 shows increasing dispersion along the x-axis when moving from the left panel (2015) to the right panel (latest reported date). In 2015, Germany and Denmark held the lowest and second highest risky assets per active worker, at €29,353 and €181,623, respectively, a gap of €152,270. Today, Germany stands at €63,590, while Denmark has reached €260,033, widening the gap to €196,443 per worker. These figures highlight the compounding effect of higher funding levels combined with larger risky allocations.

Figure 10 shows that the average risky shares are broadly similar across tiers: 53.3% in Tier 1, 56.2% in Tier 2, and 58.5% in Tier 3. However, the variation differs markedly across tiers: the standard deviation is highest in Tier 1 (27.6 percentage points) and lowest in Tier 3 (13.2 percentage points). This reflects wider differences in risk attitudes and allocation strategies in Tier 1, where weakly funded PAYG systems typically hold low risky shares, while capitalised regimes such as Sweden allocate far more aggressively. Across all tiers, the correlation between funded savings per worker and the risky share is positive, reinforcing the finding that higher funding levels are consistently associated with greater allocations to productive assets. In the next section, we study the drivers of risk capital accumulation across countries, examining the dynamics on a tier-by-tier basis.

FIGURE 10 RISKY SHARE OF FINANCIAL ASSETS ACROSS TIERS

| % RISKY SHARE | Average | Standard Deviation | Correlation with Total Financial Assets per Worker |
|---|---|---|---|
| Tier 1 | 0.53 | 0.28 | 0.67 |
| Tier 2 | 0.57 | 0.18 | 0.51 |
| Tier 3 | 0.58 | 0.13 | 0.17 |
| Overall | 0.59 | 0.12 | 0.46 |

The figure reports the average risky share of financial assets across Tier 1, Tier 2, and Tier 3, as well as for all tiers combined, together with their standard deviations and correlations with their respective total financial assets per worker. Data sources are discussed in *Appendix 2*.

# 4. Tier-Level Drivers of Risk Capital Accumulation

We examine the institutional, structural, and behavioral drivers of risk capital accumulation across all three pension tiers. We first categorise the drivers based on first principles and then illustrate them with examples from each pension tier.

## 4.1 Architectural Typology

**We classify the drivers of risk capital accumulation into six broad and inter-related categories.**

### POLICY AND REGULATION

Policy and regulation encompass the legislative and supervisory frameworks that govern pension reserves, including whether participation is **voluntary** or **mandatory**. These frameworks also define **risk and geographic allocation limits** that shape the level of risk-taking and the balance between domestic and international exposure. In addition, **solvency requirements** determine funding adequacy while **performance assessments** benchmark returns against defined metrics.

### SCHEME DESIGN

Scheme design refers to the organizational features of a pension scheme that determine its capacity to channel capital into risky assets. Key elements include **scale**, which supports diversification, efficiency, and the development of investment expertise; the **fund type** (defined contribution versus defined benefit), which shapes liability management and risk-sharing; and the **delegation structure**, which affects decision-making. **Risk pooling** across workers and retirees, closely linked to both scale and fee structures, further influences outcomes. Design choices also shape the liquidity profile f a fund, as withdrawal policies determine its ability to commit to long-term investments with extended payoff horizons. Finally, the **governance framework** plays a critical role in ensuring that investment decisions are made efficiently and independently, and in the long-term interest of future retirees.

### ACCESSIBILITY

Accessibility captures the extent to which households can participate in and benefit from long-term savings schemes. Key dimensions include **eligibility**, which ensures broad coverage across income groups and employment types; **portability**, which allows individuals to maintain and consolidate entitlements as they change jobs or move across borders; the **distribution channel**, which shapes how savings products are delivered and accessed; and the presence of a **competitive, transparent market** with cost-efficient investment options, which maximizes value for members.

## FINANCIAL EDUCATION

**Financial education** shapes the level of individual sophistication in engaging with long-term savings and investment schemes. Exposure to financial media has become an increasingly important channel of financial education and information (Hermansson et al., *2022*). **Financial literacy** captures awareness of core personal finance concepts that guide consumption and savings decisions (Van Rooij, Lusardi, & Alessie, *2011*). **Financial engagement** reflects the extent to which beneficiaries take ownership of and participate in managing their retirement savings. **Institutional trust** measures perceptions of financial institution's integrity, transparency, and competence, which influence individuals' willingness to commit to long-term savings vehicles (Guiso et al., *2008*). **Peer effects**—observing friends, colleagues, or neighbours investing in equities—increase the likelihood of participation (Brown et al., *2008*; Kaustia & Knüpfer, *2012*).

## FINANCIAL AND TAX INCENTIVES

Financial and tax incentives encompass the monetary benefits associated with contributing to, investing, and withdrawing from a pension scheme. **Tax rebates** encourage contributions by reducing current tax liabilities. **Tax deferrals** increase portfolio tax efficiency by postponing capital gains recognition, allowing for more flexible rebalancing. **Matching contributions**, provided by employers or governments, further incentivize participation by directly augmenting individual savings.

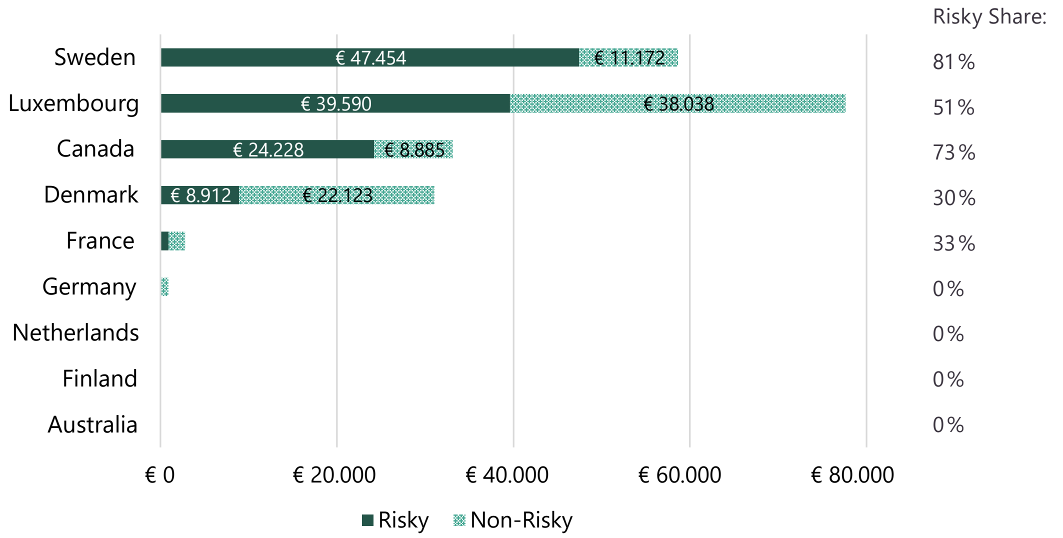
## CHOICE ARCHITECTURE

The pension scheme choice architecture includes the design features that determine how individuals participate in pension risks and benefits. **Opt-in vs. opt-out structures** influence participation in voluntary schemes. **Default investment options** set the baseline fund and risk profile unless workers actively select an alternative. Emerging tools such as **digital twins** can model an individual's financial journey to illustrate how different pension choices unfold over time, helping people understand trade-offs, build trust, and make more informed decisions.

## 4.2 Tier 1: Public Systems

Figure 11 shows Tier 1 assets per active worker, divided into risky (dark green solid) and non-risky (light green patterned) allocations. We order countries by their absolute level of accumulated risk capital per worker and report the Tier 1 risky share on the right-hand side.

FIGURE 11 TOTAL TIER 1 ASSETS PER ACTIVE WORKER (EUROS, YEAR LAST REPORTED)




The figure shows Tier 1 assets per active worker (in EUR), divided into risky (dark green solid) and non-risky (light green patterned) allocations. Countries are ordered by the absolute level of accumulated risk capital, with the proportion invested in risky assets reported on the right-hand axis. Data sources are provided in *Appendix 2*.

Variations in the level of accumulated reserves and the degree of risk-taking within Tier 1 portfolios are largely explained by differences in **policy, regulation, and scheme design.**

Sweden, Canada and Denmark have introduced partially funded public systems, enabling the accumulation of reserves that can be invested in capital markets. Over time, Sweden and Canada have accumulated large Tier 1 assets per worker and allocated a large share to risky assets (81% and 73% respectively). For example, Sweden's default Tier 1 defined contribution fund, AP7, follows an equity-heavy strategy, investing nearly 100% in global equities with minimal currency hedging.

In comparison, France, Germany, the Netherlands, Finland, and Australia, operate Tier 1 public pensions almost entirely as PAYG schemes without funded assets. For example, Germany holds just €39 billion in reserves, covering about 1.57 months of aggregate pension benefits, all invested in non-risky assets (Carvill, *2025*). Legally and operationally, this reserve serves as a short-term liquidity buffer rather than a long-term fund, requiring capital to remain readily available (SGB VI, *1989*).

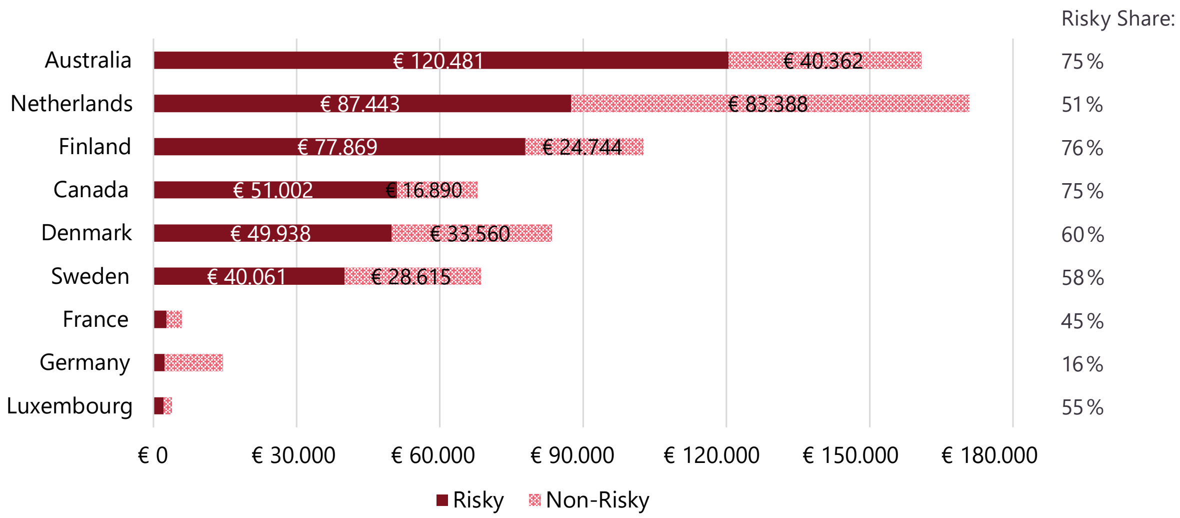
We note that higher capitalisation does not always translate into higher risk-taking. Denmark's ATP scheme illustrates this point. Despite being well funded, national policy prioritizes capital preservation in Tier 1 to protect the least wealthy retirees, resulting in a more conservative portfolio with limited risk assets. Similarly, Luxembourg's Fonds de Compensation manages €26 billion in reserves (2023), equivalent to about €77,628 per worker, with only a 51% risky share. The fund is subject to legal constraints that restrict investment scope, leading to lower risky asset exposure regardless of fund size.

## 4.3 Tier 2: Occupational Systems

Figure 12 displays Tier 2 assets per active worker, divided into risky (dark red, solid) and non-risky (light red, patterned) allocations. We again sort countries by the absolute level of accumulated risk capital per worker in Tier 2 assets, with the Tier 2 risky share shown on the right-hand side.

The wide variation in savings levels and risk allocations across occupational pension regimes reflects fundamental differences in **policy and regulation, scheme design, and accessibility**. Unlike Tier 1, the accessibility and coverage of occupational plans vary widely across countries, depending on whether participation is mandated by law or embedded in workforce standards.

FIGURE 12 TOTAL TIER 2 ASSETS PER ACTIVE WORKER (EUROS, YEAR LAST REPORTED)




The figure shows Tier 2 assets per active worker (in EUR), divided into risky (dark pink solid) and non-risky (light pink patterned) allocations. Countries are ordered by the absolute level of accumulated risk capital, with the proportion invested in risky assets reported on the right-hand axis. Sources are provided in ***Appendix 2***.

Countries with the highest per-worker Tier 2 risk capital generally have mandatory or quasi-mandatory coverage. In Australia, Denmark, Finland and the Netherlands, employer participation is either fully mandatory or enforced through industry-wide collective agreements, producing very large asset pools. Australia's superannuation program holds assets exceeding €2 trillion, while Dutch assets approach €1.7 trillion, resulting in a per worker average of about €160,000 and €170,000, respectively. Such capital pooling generates economies of scale, broader diversification, and greater capacity to invest in higher-return, riskier assets.

By contrast, Canada's occupational pension landscape is highly polarized. Around 87% of public-sector workers are covered by a registered pension plan, compared with only about 20% in the private sector (Palacios, Li, and Eisen, ***2023***). While registered retirement plans collectively manage €1.4 trillion, these assets are concentrated in the public sector and a few legacy private-sector plans. Most private-sector workers without occupational pensions rely on Tier 1 provisions and, in some cases, on voluntary Tier 3 tax-deferred savings accounts (RRSP), which can be invested in a wide range of market-listed products.

Germany offers another example of limited Tier 2 risk capital accumulation and coverage, with only €14,565 per active worker, on average, and fewer than 60% of employees enrolled in a workplace pension (Pension Funds Online, *2018*).

Across the sample, **scheme design** strongly shapes liability management and scale. European countries with occupational defined-benefit (DB) systems are generally subject to stricter **policy and regulatory** requirements. In DB-heavy systems such as the Netherlands, investment and longevity risk are borne by the sponsor and managed under stringent solvency and liability-matching rules, which constrain risk-taking. Specifically, Solvency II regulation treats pension funds much like insurers, requiring conservative asset allocations and high solvency buffers. These constraints reduce equity exposure. By contrast, defined-contribution (DC)-heavy systems such as Australia transfer market risk to members, typically resulting in higher equity exposure.

Some regulatory requirements directly constrain portfolio construction. In Germany, about 40% of benefits are provided through unfunded book reserves retained on employer balance sheets, outside financial-sector oversight. Of the remaining funded assets, only around 10% of assets are invested in equities, primarily through externally managed funds (European Pensions, *2025*). This conservative allocation reflects regulatory caps, including a 35% equity limit for Pensionskassen and a 15% ceiling for unlisted equities (OECD, *2025*). As a result, average real returns are just about 1.8% annually, well below outcomes of systems with greater capitalisation and investment flexibility (OECD, *2025*, p. 33).

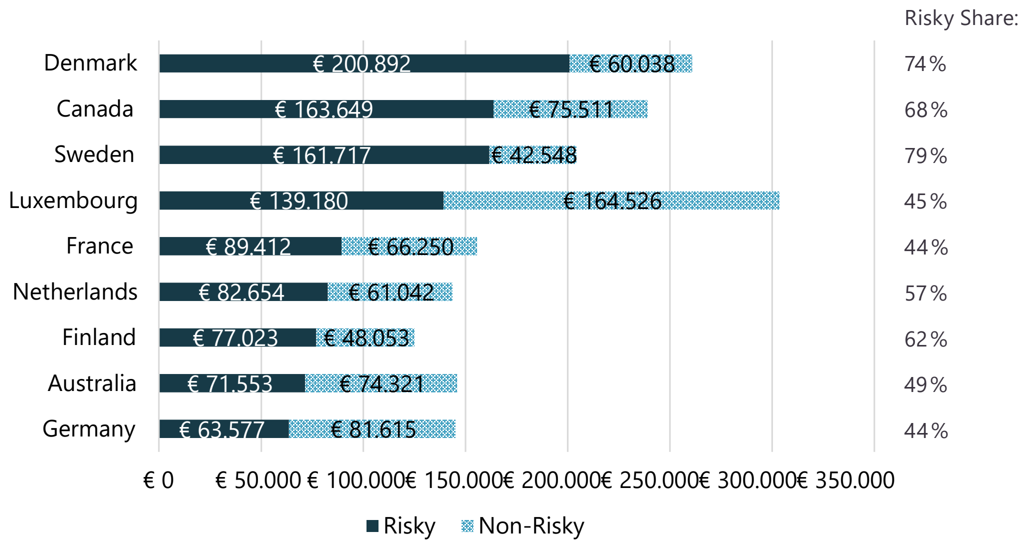
The **choice architecture** of DC systems makes default plan design and opt-in/opt-out mechanisms especially influential. In Australia, about 65% of superannuation members remain in the default super fund selected by their employer (APRA, *2025*). Of these, only around 20% actively confirm the default option, while the rest make no active choice (Gruen and Wong, *2010*). This evidence highlights how default options shape risk-taking in retirement savings, particularly among low-engagement members.

## 4.4 Tier 3: Household/ Voluntary Savings

Figure 13 reports the aggregate amount of Tier 3 savings sorted by the absolute level of accumulated risk capital per worker, together with the Tier 3 risky share reported on the right-hand side.

**Financial and tax Incentives** directly shape Tier 3 outcomes. Countries with well-designed tax-advantaged vehicles, such as Canada's TFSA, Sweden's ISK, and Denmark's ASK, have seen substantial household engagement in equity markets. By contrast, Finland lacked such vehicles until 2020, when trading listed securities triggered immediate capital gains taxation, creating strong lock-in effects and discouraging participation (Riihimäki, *2019*). The introduction of Finland's Equity Savings Account (OST) deferred taxation until withdrawal, enabling more frequent rebalancing and lowering the present value of tax liabilities. The delay of capital gain taxation encourages households to take more risk and improves trading efficiency (Kantomaa, *2023*).

FIGURE 13 TOTAL TIER 3 ASSETS PER ACTIVE WORKER (EUROS, YEAR LAST REPORTED)



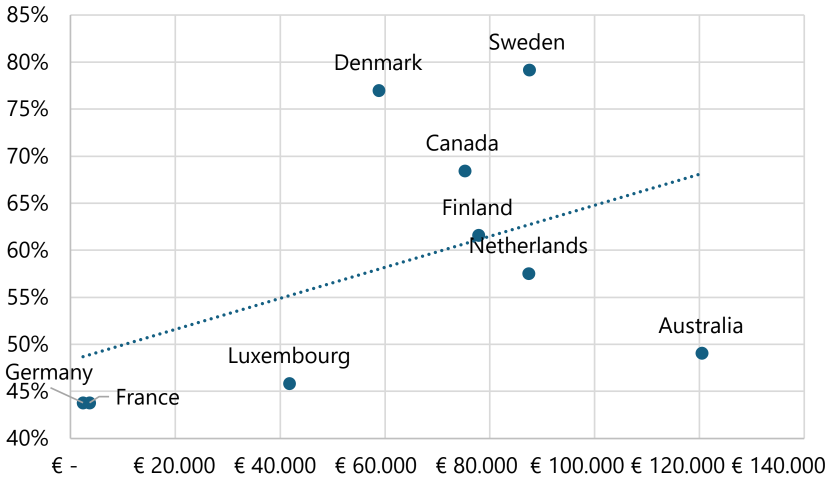

The figure shows Tier 3 assets per active worker (in EUR), divided into risky (dark blue solid) and non-risky (light blue patterned) allocations. Countries are ordered by the absolute level of accumulated risk capital, with the proportion invested in risky assets reported on the right-hand axis. Sources are provided in *Appendix 2*.

Because Tier 3 savings are administered directly by individuals, they are particularly sensitive to the population's level of **financial education**. Among EU member states, the Netherlands, Denmark, Finland and Sweden rank in the top quartile for financial knowledge, reflecting broad awareness of core concepts such as diversification, risk-return trade-offs, compound interest, and inflation (Flash Eurobarometer 525, *2023*). Finally, the structure of Tier 1 and Tier 2 also shapes household stock market participation in Tier 3. We examine these effects in the next section.

## 4.5 Cross-Tier Effects

To explore interdependencies among risk factors across pension tiers, Figure 14 plots risky assets per worker in Tier 1 and Tier 2 against the risky share of household savings in Tier 3. The positive trendline indicates that countries with larger public and occupational pension tiers also tend to have households taking more risk in voluntary savings. However, the small sample of nine countries limits statistical power, and excluding just a few observations could reverse this relation. A more cautious interpretation of this figure is therefore warranted.

FIGURE 14 RISKY SHARE IN TIER 3 VS. TIER 1 AND TIER 2 RISKY ASSETS PER WORKER




The figure plots the risky share of Tier 3 savings (%) on the y-axis against the amount of risky assets per worker in Tier 1 and Tier 2 (Euros) on the x-axis. Each data point represents a country and the dotted line indicates the trend between the two variables. Data sources are provided in ***Appendix 2***.

Countries with the lowest Tier 1 and Tier 2 risky assets per worker (France, Germany, Luxembourg) exhibit the lowest risk exposure inside Tier 3 portfolios. By contrast, countries with well-established Tier 1 and Tier 2 systems allocate more of their household savings to risky assets. Two interpretations are possible. First, strong state and occupational pension systems may foster greater individual risk tolerance by increasing financial literacy and exposure to capital markets. Second, the absence of strong state or employer reserves may heighten risk aversion in long-term savings, leading households to hold a larger share of deposits.

Evidence from Sweden and Denmark supports a causal link between greater risk exposure in occupational pension plans and the degree of households' risk taking in personal savings. Smirnova (***2024***), for example, shows that enrollment in DC occupational pensions in Sweden significantly increases stock market engagement. Stock market entry rises by 4% initially and up to 63.5% within six years, while existing investors raise their risky asset allocation by about 8%. The conclusion from that study is that occupational pensions function as a form of financial education, lowering informational barriers and encouraging households to extend risk-taking beyond pension accounts.

Nielsson, Press, Rangvid, and Setty (*2025*) provide similar supporting evidence from the Danish reform that allowed households to switch into high-equity pension products. They find that affected households became 7% more likely to invest in equities with their non-pension wealth within seven years – a 20% increase relative to baseline participation. The mechanism is not simply attributed to risk substitution. Instead, learning effects and reduced participation costs, supported by persistent behavioral change and peer effects within households, drive the positive spillover effect between risk taking in Tier 2 and Tier 3.[6] Weisbenner (*2002*) documents similar evidence in the United States following the introduction of 401K pension plans.

These studies help explain interdependencies across pension tiers. More specifically, increased equity exposure through occupational pensions can generate positive spillover effects by increasing financial market participation and risk-taking in personal household savings, thereby contributing to greater retirement wealth accumulation.

We caution, however, that positive cross-tier spillover effects depend heavily on the pension system architecture. While Sweden and Denmark illustrate *crowding-in*, where a culture of risk-taking in Tier 2 encourages additional risk-taking in Tier 3, other systems may produce the opposite. For example, in Australia households can increase contributions to their tax-advantageous superannuation funds through "salary sacrifice" schemes. These incentives channel additional risk-taking into occupational pension plans rather than personal savings.

In the Netherlands, the strength of collective occupational schemes has been shown to create a displacement effect: each additional euro of mandatory pension contributions reduces voluntary savings, limiting Tier 3 engagement (Li et al., *2022*). This underscores the importance of pension design: reforms may either *crowd in or crowd out* risky investment depending on the institutional context.

Overall, the evidence on risk capital accumulation across pension tiers and countries shows that the drivers of risk capital accumulation differ by tier. No single tier dominates, and multiple pathways can raise risk capital per worker. To fully understand these differences, in-depth case studies are needed.

# 5. Case Studies

We present three case studies that illustrate how different countries have built more resilient pension systems through risk capital accumulation. These examples enable us to draw parallels between past and present challenges, learn from experience, and identify best practices to inform ongoing pension reform debates.

We focus on Canada, Australia and Sweden, each highlighting distinctive design features: Canada's Tier 1 with its professionally managed public reserve; Australia's Tier 2 for its universal and equity-heavy superannuation system; and Sweden's multi-tier model, reflecting its transition from PAYG to hybrid funding and broad equity participation.

## 5.1 Canada: Scaling a Professionally Managed Public Pension Reserve

Starting in 1996, Canadian policy makers introduced a series of governance and regulatory reforms to the Tier 1 public pension in response to demographic pressures and projected insolvency. Since then, the Canada Pension Plan (CPP) has built a professionally managed reserve fund and is now considered fully sustainable for the next 75 years (CPPIB, *2025a*).

### REFORM CONTEXT

The CPP reform was prompted by mounting liquidity and solvency concerns in the mid-1990s. In 1996, the plan collected $11 billion in contributions but paid out $17 billion in benefits (CPPIB, *2004*). Actuarial reports projected that the PAYG structure would become insolvent within decades without reform. Lipshitz and Walter (2020) identify several structural weaknesses in the legacy system: (1) retroactive benefit increases were not matched by higher contribution rates; (2) contributions were commingled with general government funds rather than placed in segregated accounts; (3) no professional portfolio management was in place; (4) contribution rates were set by statute, making changes politically difficult and leaving them vulnerable to delay; and (5) the government was the sole plan sponsor, giving beneficiaries no role in plan design or responsibility for solvency.

Policymakers at both federal and provincial levels recognized the need to move away from a 100% PAYG model relying on current contributions and toward partial capitalisation through a professionally managed reserve. The 1996 federal-provincial review of the CPP resulted in a reform package that increased contribution rates, restrained benefit growth, and established the CPP Investment Board (CPPIB) to invest surpluses in capital markets.

### ARCHITECTURAL FACTORS OF REFORM

- **Independent Governance:**

  A defining feature of the reform was the creation of an independent governance framework. The Canada Pension Plan Investment Board Act (1997) established CPPIB as a professional asset manager operating at arm's length from the government. By statute, CPPIB is "not an agent of Her Majesty" and excluded from "federal public administration," insulating it from political interference (Canada Pension Plan Investment Board Act, 1997, s.3(2)(3)). Its Board of Directors is jointly appointed by federal and provincial finance ministers for three-year terms, based on recommendations from a nominating committee to ensure competence and independence (World Bank, *2017*). The Board sets the fund's risk tolerance while CPPIB retains full fiduciary independence over investment decisions and day-to-day operations.

- **Direct Investing and Sophistication:**

  Independent governance allows CPPIB to recruit global, private-sector talent and build internal teams capable of executing direct and co-investment strategies, reducing reliance on costly external managers. This in-house model characterizes the broader Canadian pension landscape: funds with more than $10 billion in assets manage, on average, 52% of their portfolios internally, compared with about 23% for similarly sized global peers (Beath et al., *2021*). Among Canadian funds with more than $50 billion in assets under management, the share of in-house assets exceeds 80%.

- **Cost-Efficient Investment Model:**

  This model of direct investing enables the largest Canadian funds, including CPPIB, to allocate more capital to strategic assets such as infrastructure while spending less than their peers. According to Beath et al. (*2021*), on average, "Canadian funds spend 57 basis points (bps) of their AUM each year to run their fund, whereas non-Canadian funds spend 62 bps. These savings are then reinvested across the broader fund, creating efficiencies across many asset classes."

- **Mandatory Savings:**

  The CPP provides a monthly, taxable benefit that replaces up to one third of a beneficiary's retirement income. The system is funded through equal employer and employee contributions, currently set at about 11.9% of earnings (5.95% each for employer and employee) up to an annual earnings ceiling of $71,300 (Government of Canada, *2025*). Contributions collected nationwide (excluding Quebec, which operates the Quebec Pension Plan) are pooled, with any surplus invested by CPPIB. This consolidation generates significant economies of scale. In 2019, contributions increased by an additional 4% of income as part of a reform to strengthen funding. These additional contributions were phased in over a seven-year period to allow time for adjustments by workers and employers.

- **Portability:**

  An additional advantage of the CPP is its portability across provinces and sectors. Unlike employer-based or region-specific pension plans, Canadian workers contribute to the CPP throughout their careers, preserving entitlements regardless of job changes or interprovincial mobility. This portability reduces frictions in labor and capital allocation while mitigating the risk of contribution "leakage" when workers relocate (World Bank, *2017*).

- **Member Choice and Distribution Channel:**

  CPP benefits are calculated as a percentage of average earnings during the contributory period. This means that more years of contributions (especially at higher earnings) raise the monthly benefit, while gaps or lower-earning years reduce it. CPP participants can choose when to begin receiving their CPP benefits, with options to retire early at a reduced rate or defer benefits up to age 70 for higher payouts, providing flexibility in retirement planning. Notwithstanding these customizations, the standard CPP eligibility age remains 65. These benefits are automatically distributed through the tax system.

## REFORM OUTCOMES

By combining sophisticated asset management with scale and independent governance, the CPP has achieved strong growth in risky assets, making it a model for sustainability and capitalisation in a Tier 1 pension regime. In 1999, the CPPIB managed about CAD $36 billion, primarily invested in government bonds. By 2025, assets under management (AUM) had grown to more than CAD $730 billion, with approximately 73% of its portfolio allocated to risky assets (CPPIB, *2025*). This expansion reflects both higher contribution rates (7% in 1999 versus 11.9% in 2025) and strong investment performance, with a 10-year annualized net return of 8.3% (Government of Canada, *2025*; CPPIB, *2025*).

## 5.2 Australia: Scaling Retirement Savings through Occupational Pension Plans

Like Canada, Australia faced demographic pressures and sustainability concerns in its means-tested PAYG Age Pension. In response, the country introduced the superannuation system to reduce reliance on the public pension and ensure adequate retirement savings. Today, Australia's retirement system relies heavily on its Tier 2 universal superannuation scheme, a mandatory occupational defined contribution plan. Beyond improving retirement adequacy, this system has also become a major source of long-term capital for the Australian economy.

### REFORM CONTEXT

Australia's universal Tier 2 superannuation system was established in 1992 through an agreement between government, unions, and employers. Prior to this reform, superannuation coverage was fragmented and largely limited to white-collar professionals and public-sector employees. In the 1970s, most Australians relied solely on the Tier 1 PAYG Age pension, with only 32% of the workforce enrolled in the so-called super pension schemes (SMC Australia, *2025*). These early schemes had significant limitations: savings were not portable across jobs, and payments were paid only to workers retiring with the same employer that sponsored the fund (SMC Australia, *2025*). In the 1980s, the Australian Council of Trade Unions proposed to extend the superannuation benefits to blue collar workers (SMC Australia, *2025*). This was achieved in 1992 with the passage of the Superannuation Guarantee, under which unions agreed to forgo a 3% wage increase in exchange for a mandate requiring employers to contribute 3% of wages into superannuation funds on behalf of workers. Unions agreed to the trade-off because it ensured universal retirement savings and structural gains for workers that exceeded the value of a one-off wage increase

### ARCHITECTURAL FACTORS OF REFORM

- **Mandatory Savings:**

  Participation in the superannuation system is mandatory. Introduced at 3% in 1992, the contribution rate has gradually risen to 12% of wages in 2025 (Australian Taxation Office, *2025*). This mandate has driven coverage to about 90% of the workforce and resulted in a substantial asset pool, totaling €2.3 trillion as of March 2025.

- **Profit-for-Member Structure:**

  A distinctive feature of the Australian system is its governance structure. Superannuation contributions are primarily invested through industry funds operating under a profit-to-member model, whereby all net returns flow back to members rather than shareholders. Combined with mandatory coverage, this structure has enabled super funds to achieve significant economies of scale.

- **Delegation and Default Option:**

  Superannuation is a defined-contribution system, giving individuals the flexibility to select among different strategies such as high-growth, conservative and sustainable options. In practice, however, 64.2% of members remain in the default MySuper product: an in-house, cost-efficient, balanced portfolio of equities, bonds, and alternative assets (APRA, *2025*). The widespread use of default funds has allowed funds to build scale and expertise, supporting investment in a range of alternative asset classes (APRA, *2023*).

- **Tax Incentives:**

  Superannuation contributions are paid entirely by employers, creating the perception of a generous employer benefit, even though they effectively substitute for wage increases. Contributions are taxed upfront at a concessional 15% rate, well below most workers' marginal income tax rates. Withdrawals in retirement are tax-free. This structure ensures that compound returns are untaxed, providing a powerful incentive to save.

- **Incentivized Voluntary Savings:**

  Individuals can boost their superannuation savings through "salary sacrifice" arrangements, benefiting from the concessional tax rate of 15%. To support low-income earners, the government introduced the Low Income Super Tax Offset and a co-contribution scheme that matches voluntary contributions up to a capped amount (Australian Taxation Office, *2023*).

- **Member Choice and Portability:**

  Subsequent reforms strengthened member choice and portability. In 2005, employees earned the right to select their preferred superannuation fund, requiring employers to direct contributions accordingly. This reform enhanced portability, which was further reinforced in 2021, when workers were allowed to carry their existing fund with them when switching jobs, reducing duplicate accounts and fees (Australian Treasury, *2023*).

- **Cost-Efficient Investment Options:**

  Australia's superannuation defaults are designed and regulated to keep investment options cost-efficient. Since the 2021 reform, the government has aimed to reduce fees and hold trustees accountable, with Australia's Prudential Regulation Authority's (APRA) tests and heatmaps pressuring expensive or underperforming products. Between 2021 to 2023, median administration fees in default super funds fell by about 20 basis points in (Australian Treasury, 2024). The average super fund investment cost was 43.6 bps, well below the global average of 71.0 bps (Heale and Saaim, *2024*).

- **Market Consolidation:**

  APRA, which oversees Australia's superannuation industry, has promoted consolidation by encouraging underperforming or subscale funds to merge. As a result, resulting in the top five APRA-regulated funds accounting for 40% of total super assets under management (Reserve Bank of Australia, *2024*). This has produced larger funds with stronger in-house investment capabilities, enabling sophisticated allocations to complex asset classes that smaller funds could not achieve independently (APRA, *2019*).

- **Private Asset Pooling:**

  Australia's super funds have been pioneers in investing in unlisted assets (Inderst, *2014*). By pooling resources through IFM Investors, a joint venture of industry funds, they gained access to large-scale infrastructure such as airports, toll roads, and utilities. This development coincided with the government's privatization of major public assets in the 1990s, creating productive capital investment opportunities for the rapidly expanding pool of superannuation savings.

## REFORM OUTCOMES

Today, with assets exceeding 145% of GDP, Australia's superannuation system ranks among the largest funded pension systems in the world and is notable for its strong role in productive capital investment (Thinking Ahead Institute, *2024*). Super funds allocate an average of 75% of assets to risky investments, with nearly 54% in public equities (APRA, *2025*). Among the sampled countries, Australia records the highest level of Tier 2 risk capital per worker, at €120,481. The reform has reduced pressure on the public pension system, spread risk across pillars, and made the overall retirement system more resilient.

## 5.3 Sweden: Scaling Equity Market Participation Across Tiers

Sweden is another example of a country that revamped its pension system in the 1990s because the PAYG system had become financially unsustainable against the backdrop of demographic and fiscal pressures as well as intergenerational imbalances. Today, Sweden operates an innovative multi-tier pension system. By combining a hybrid national scheme with mandatory funding and automatic stabilizers, near-universal occupational pension coverage and exceptionally high voluntary stock market participation, Sweden has embedded a strong equity culture across all tiers to support long-term sustainability of the pension system.

### REFORM OUTCOMES

Introduced in 1959, Sweden's Tier 1 "ATP" pension system was a defined benefit, PAYG scheme (Lundberg, *2020*). Surpluses were accumulated in several "AP" funds, initially invested in fixed income and later also in equities. However, during the 1992 economic crisis, Sweden's worst recession since the Great Depression, the ATP pension system faced serious financial instability. Longer life expectancy and slower wage indexation placed increasing strain on the reserves (Lundberg, *2020*), which could only cover about five years of benefit payments (Pensjons Forum, *2025*). In response, the Pensions Working Group (Pensionsarbetsgruppen) presented a reform proposal in 1994, and on June 8 of that year, parliament adopted the guidelines of a new system (Lundberg, *2020*).

### ARCHITECTURAL FACTORS OF TIER 1 REFORM

- **Hybrid System with Automatic Rebalancing Mechanisms:**

  The reform shifted Sweden from a 100% PAYG, defined benefit model to a partly funded hybrid system. At its core, a mandatory notional defined contribution (NDC) scheme was introduced, funded by contributions totalling 16% of annual pensionable income. In this new scheme, benefits are based on lifetime contributions and converted into an annuity at retirement using a divisor linked to the retirement cohort's average life expectancy. The system's financial health is safeguarded by an automatic balancing mechanism: if the ratio of fund assets to fund liabilities falls below one, pension indexation and notional interest rates are temporarily reduced until balance is restored, without requiring political intervention (Economic Policy Committee, *2024*). In addition to the NDC system, a fully funded, defined contribution premium pension scheme was launched, with contributions equal to 2.5% of annual pensionable income (Economic Policy Committee, *2024*)

- **High-risk Default Option:**

  The new premium pension scheme introduced individual choice, allowing participants to select up to five funds from a menu of more than 650 domestic and international mutual funds, which all are subject to reporting, fee, and suitability requirements. Participants who do not make an active choice are defaulted to the state-managed fund, AP7, which is specifically designed to promote risk capital accumulation. AP7 invests the contributions of participants under age 55 in a globally diversified 100% equity portfolio with approximately 25% leverage, giving each krona an effective exposure of 1.25 krona in the stock market (AP7, *2024*). Starting at age 55 the portfolio gradually shifts from equities to fixed income, resulting in 100% investment in fixed income at ages 75+. This strategy has delivered strong results, with average annual returns exceeding 11.6% between 2000 and 2021 (AP7, *2021*). Today, more than 5.9 million Swedes are invested in AP7, which manages about €130 billion in assets (AP7, *2024*).

- **Modernised Governance:**

  Before the reform, the AP surplus funds were constrained by strict investment rules. The reform modernized their governance framework and expanded their flexibility to invest in equities and international assets. Subsequently, AP1-AP4 gradually increased their risky asset allocation, reaching 65% of total assets in 2005 and 75% in 2024.

## TIER 2: NEAR-UNIVERSAL OCCUPATIONAL PENSIONS

- **Mandatory Coverage:**

  Occupational pensions in Sweden are organised across four main sectors: central government, local government, private sector white collar, and private sector blue collar workers (Anderson, *2015*). Established through collective agreements, these schemes obligate employers to contribute automatically, elevating occupational pensions from voluntary supplements to a quasi-mandatory tier that complements Tier 1 retirement income. Coverage is extensive - about 88% overall - with universal coverage in the public sector and about 83% coverage in the private sector (Swedish National Mediation Office, *2024*). Employer contributions range from 4.5-30% of income, depending on scheme and earnings level (OECD, *2023*).

- **Switch to Defined-Contribution Plans:**

  In the 1990s, most Swedish occupational schemes switched to a DC structure, often with individual choice of investment vehicles (Anderson, *2015*). These schemes typically maintain a strong equity orientation, with risky financial assets accounting for about 58% of portfolios.

- **Centralized Clearinghouses:**

  A distinctive feature of Sweden's occupational pension system is the use of centralized sector-specific platforms, such as Collectum for white-collar workers and Fora for blue-collar workers, which act as clearinghouses between employers, employees, and pension providers. These platforms ensure that contributions are automatically directed into the occupational scheme, help negotiate lower investment fees on behalf of employers, and provide employees with a menu of pre-approved funds, though most remain in the sector's cost-efficient default option. Approximately every five years, sectoral clearinghouses run competitive tenders to appoint managers to the ITP fund, requiring bidders to compete on fees and services offered. Since introducing the tender process in 2007, the ITP platform has reduced average fees by about 78% while maintaining robust lifecycle defaults (Collectum, *2025*). Alecta, the default fund within ITP for those who do not make an active choice, has a notably low fee of 9 bps of assets under management (Alecta, *2025*).

## TIER 3: HIGH INDIVIDUAL STOCKHOLDING PARTICIPATION

Tier 3 in Sweden plays a complementary role to Tier 1 and Tier 2 and is notable for fostering some of the highest levels of household equity participation in the world, with 65% of the population investing in stocks or mutual funds (Kaustia et al., *2023*). This reflects an institutional and cultural environment that actively encourages voluntary equity investment among households.

- **Tax Incentives:**

  Sweden has a long tradition of encouraging stock market participation through tax incentives. In the 1980s, Sweden introduced a tax-advantaged account designed to favour equity investments, granting preferential tax treatment for contributions and returns placed in listed shares or equity funds. This policy both incentivized households to invest in the stock market and advanced the government's goal of broadening equity ownership and strengthening domestic capital markets. As a result, the number of Swedes directly invested in the stock market rose from about 500,000 in the early 1980s to 1.7 million by 1990 (Government Offices of Sweden, *2025*). In 2012, the government launched the investment savings account (ISK) which allowed individuals to invest after-tax income in equities without paying taxes on capital gains or dividends. Within five years, nearly 2.2 million Swedes had opened an ISK, building a capital base of about €73.4 billion (Swedish National Audit Office, *2018*).

- **Financial Education:**

  Sweden integrates financial education into its school curriculum from the first grade onwards, supported by organised activities that help build young people's knowledge of personal finance (AFG and OEE, *2025*). These efforts have paid off. In a financial literacy survey conducted by the European Commission, Sweden ranked among the top three countries worldwide for financial literacy (European Union, *2023*).

- **Stock Market Engagement:**

  Mandatory defined contribution accounts in Tier 1 and Tier 2 have helped normalise stock market exposure across the workforce. As discussed earlier, Smirnova (*2024*) shows that enrollment in Swedish occupational DC plans increases stock market participation in voluntary savings accounts. These spillover effects demonstrate how occupational pensions reinforce Sweden's strong equity culture by lowering informational barriers and integrating households more deeply into capital markets beyond their retirement savings.

## REFORM OUTCOMES

Sweden's pension reform of the 1990s replaced an unsustainable PAYG defined benefit system with a hybrid model that combined a notional defined contribution (NDC) scheme with automatic stabilizers, a funded premium pension, and near-universal occupational coverage. The reform diversified retirement income sources, depoliticized system sustainability through automatic balancing, and embedded a strong equity component via both occupational pensions and voluntary savings incentives. Today, Sweden's pension system is regarded as one of the most resilient globally: it achieves broad coverage, high financial literacy, and deep household participation in equity markets.

## 5.4 Taking Stock

We distill several key insights from the case study analysis.

### MULTIPLE PATHWAYS TO RISK CAPITAL ACCUMULATION.

Canada relies primarily on a professionally governed Tier 1 pension reserve, where equity exposure is achieved through professional governance and high-skill investment design. Australia achieves similar depth in Tier 2 by combining mandatory defined contributions with default portfolio design and market consolidation. Sweden uses a hybrid configuration that involves prefunding with automatic balancing in Tier 1, quasi-mandatory occupational coverage supported by centralized procurement in Tier 2, and broad household equity participation encouraged by tax-advantaged accounts and financial education in Tier 3. The overarching implication is that there is no single "correct" approach to risk capital accumulation.

### COMMON DRIVERS.

Despite the different designs, clear commonalities emerge from the case studies. Strong risk capital accumulation depends on scale, cost-efficient investment vehicles, strong governance, professional asset management, broad coverage, portability and fiscal incentives. Scale is engineered via national savings pooling in Canada, consolidation, asset pooling and the use of default fund options in Australia, and sectoral clearinghouses and public funds in Sweden. Scale opens access to a broader range of asset classes and lowers costs, as larger plans possess greater bargaining power (Pool et al., *2024*, de Vries et al., *2025*). In comparison, global data on equity mutual funds show that expense ratios of mutual funds sold to the retail sector can reach as high as 2.56% in Canada and over 1.9% in several European markets (Khorana et al., *2008*). In the European Union, the average fee for UCITS equity funds was 1.17 percent in 2023 (ICI, *2025*).

Among other common drivers, governance and clear fiduciary mandates anchor a tolerance for risk-taking and long-horizon investing and enable professional asset management. Broad coverage ensures universal participation. Additionally, as seen through Canada's CPP and Australia's superannuation funds, portability mitigates the risk of contribution "leakage" when workers relocate (World Bank, *2017*). This helps achieve scale and reduce duplicate accounts. Fiscal incentives further boost voluntary participation (e.g. concessional taxation in Australia, ISK accounts in Sweden, or TSFA accounts in Canada). Multi-tier reliance diversifies retirement income sources, broadens coverage, and eases pressure on the unfunded social security scheme.

## INCREMENTAL APPROACH.

The case studies share another commonality: all three countries undertook an incremental approach to pension reform. In Canada, CPP contribution rates increased by 4% of income as part of the 2019 CPP Enhancement Program, with increased contribution rates phased in over a period of seven years. In Australia, mandatory contributions slowly increased from 3% to 12% of wages from 1992 to 2025. In Sweden, the transition to the new NDC system was gradually implemented over a transition period until 2020. Across countries, adopting an incremental approach has helped build political consensus and minimize the transition costs associated with the reform.

## HOLISTIC REFORMS.

Pension reforms in Australia and Sweden are holistic pension system designs that do not target a single tier. Australia's architecture spans Tier 2 and Tier 3, where voluntary contributions to super funds via salary-sacrifice schemes broaden household equity exposure. In Sweden, enrollment in occupational DC plans has resulted in higher stock market participation in voluntary savings accounts through enhanced financial literacy and engagement.

# 6. Possible Pathways for Europe

We now circle back to Europe's productive capital gap and the question of how to mobilize pension and household savings and scale up risk capital. Implementing pension reform across Europe is challenging for several reasons. For one, Europe faces a coordination issue. Each country has its own pension system and a distinct legal, regulatory environment and industry structure, making it difficult to implement an EU-wide approach that involves mandatory participation. Moreover, the fragmentation of the labour force across countries and industries makes it challenging to build scalable and cost-efficient pension plans.

The heavy reliance on PAYG systems in aging societies presents another challenge. By definition, a PAYG system requires the current generation of active workers to finance the pensions of existing pensioners. Over the past three decades, the decline in fertility rates and the increase in longevity have resulted in active workers contributing significantly more to sustain the same pension benefits. Introducing a new capitalisation scheme in this environment requires convincing active workers to contribute for themselves too.

Taken together, these challenges point to the need for carefully designed and pragmatic levers that encourage long-term saving, expose active workers to stock markets, and offer cost-efficient scalable investment solutions without disrupting the existing legal and industry structures across the continent. We present two possible pathways that draw insights from the case studies above and other international examples.

### PATHWAY 1: A PUBLIC "SUPER-DEFAULT" OPTION

The first pathway is to introduce a voluntary pan-European default DC fund. Employers could opt into a public, cost-efficient, equity-heavy default option that mirrors Sweden's AP7 fund structure. A useful precedent is the United Kingdom's National Employment Savings Trust (NEST), a government-backed DC scheme offered to all employers. NEST achieves scale through pooled contributions and provides a cost-efficient default option for workers. Offering NEST has allowed the UK to require all employers to automatically enroll eligible employees into a workplace pension scheme, rather than waiting for workers to opt in (U.K. Department for Work & Pensions, *2014*). Importantly, while NEST is a public, not-for-profit option, employers can also select qualifying private provider plans. Such a public default does not replace private providers but guarantees at least one high-quality, cost-efficient option and sets a competitive benchmark for the private industry. As a DC system, NEST offers portability across employers and regions, supporting worker mobility.

## PATHWAY 2: EMPLOYER GATEWAY PLATFORMS

A second pathway is to create several sectoral or regional clearinghouse platforms that create economies of scale on the administration side. Modeled on Sweden's Collectum, these platforms would collect contributions, pool capital, channel savings into a curated menu of cost-efficient, institutionally-run funds, and rely on competitive tenders to drive fees down. This approach creates scale by pooling contributions across many companies, which increases the employers' bargaining power. This approach addresses fragmentation by centralizing scale-sensitive functions while preserving employer choice.

## OPENING EMPLOYER-BASED INVESTMENT OPTIONS TO VOLUNTARY SAVINGS

Across either pathway, risk capital can be further scaled by opening employer-based investment options to voluntary savings. Governments and employers can encourage participation through payroll matches, targeted tax credits, and state co-contributions. Australia's salary sacrifice scheme shows that voluntary contributions can be commingled into the same professionally governed, cost-efficient default funds. Households thus gain institutional access to diversified, long-horizon portfolios that would otherwise be out of reach for small savers, while preserving portability, standardised transfers, and clear disclosure.

# 7. Broader Considerations

Our study has a narrow purpose: to quantify Europe's productive capital gap and learn from countries that have successfully undertaken capitalisation pension reforms. While we discuss possible pathways for Europe, we do not intend to make specific policy prescriptions on pension design, funding or investment strategy. Such guidance would require a deeper country-by-country assessment, along with a careful analysis of broader considerations and the potential unintended consequences of scaling and pooling pension and household savings into risky financial assets. In this section, we briefly outline some of these considerations.

### BOND YIELDS AND SAFE-ASSET BENCHMARKS.

Channeling savings into risky assets may divert demand away from sovereign bonds, raising concerns about increasing sovereign borrowing costs. Evidence shows that pension funds' bond demand directly affects yields (Greenwood and Vissing-Jorgensen, *2018*; Jansen, *2025*). Reduced demand can also diminish sovereign bond market liquidity, complicate the use of government securities as liquid safe-asset benchmarks and exacerbate challenges tied to global safe-asset scarcity.

### INSURANCE MARKET.

Defined-benefit pension funds subject to solvency regulation often use insurance buy-in and buy-out contracts to de-risk their portfolios. Policies that encourage greater risk-taking could dampen demand for such products and, in turn, raise hedging costs for life insurers and pension providers that supply them.

### RETURN COMPRESSION.

Stronger demand for risky assets can inflate valuations and reduce future expected returns. Academic evidence supports this mechanism. For example, a recent study by Coimbra et al. (*2025*) shows that the transition to DC schemes can lead to higher interest rates and lower stock market risk premia. Another study by Sabbatucci et al. (*2025*) finds that rising passive-investment flows from U.S. 401(k) plans have raised the valuations of stocks held in those plans by 20–30%. The extent of return compression depends on both the volume of additional capital entering the market and the propensity of firms to expand operations in response to a lower cost of capital.

### CAPITAL OUTFLOWS AND MISSING INVESTMENT OPPORTUNITIES.

Greater demand for risk capital could also channel savings abroad. In seeking diversification, investors may tilt portfolios toward global markets offering more attractive opportunities. Evidence shows that institutional investors' equity portfolios are typically more internationally diversified than their bond portfolios (Ambachtsheer and Betermier, *2024*). Against this backdrop, any pooling of capital for infrastructure, innovation, and green technologies in Europe must be matched by a robust pipeline of investable projects, ensuring that mobilized savings are deployed productively at home rather than flowing overseas.

### PENSION LIABILITY RISK.

Policies that encourage higher allocations to equities and other growth assets inevitably increase portfolio risk-taking. At the same time, heavier reliance on DC schemes, whether through occupational plans or household savings, shifts more retirement income risk onto individuals. This raises the danger that employees approaching retirement may be exposed to market downturns at precisely the wrong time. Any reform should therefore assess the system's risk-bearing capacity and consider risk-sharing mechanisms that help shelter individuals from downside risk at retirement.

# 8. Conclusion

Our study aims to learn from countries such as Australia, Canada and Sweden, which, in the 1990s, successfully transitioned their pension systems from PAYG to partly capitalised regimes. Three decades later, these countries have accumulated substantially higher levels of risk capital than economies that continue to rely heavily on PAYG models. In France and Germany alone, the risk capital gap with transitioned economies amounts to roughly €10 trillion. The large accumulation of risk capital in capitalised systems is the outcome of (i) gradual pension reforms that raised funded contributions, (ii) the power of compound interest over multiple decades, and (iii) greater tolerance for risky investments in funded accounts.

It is clear from the different pension reforms we studied that there is no single approach to risk capital accumulation. However, all successful approaches share common features: scale, cost-efficient investment vehicles, strong governance, professional asset management, broad coverage, portability and fiscal incentives. Any future pension reform in Europe should consider incorporating these factors. The pathways we highlight do so while preserving the employers' administrative independence and the members' choice. Future research is needed to assess the feasibility of such pathways and their capacity to scale up Europe's supply of risk capital.

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# Appendix

## I. Data Sources

**COUNTRY LABOUR FORCE, AGES 15-64 (#)[5]**

| | 2010 | 2015 | 2020 | 2024 |
|---|---|---|---|---|
| Australia | 11,235,910 | 11,976,280 | 13,040,330 | 14,422,310 |
| Canada | 17,978,820 | 18,474,340 | 19,092,480 | 21,010,110 |
| Denmark | 2,821,500 | 2,803,500 | 2,922,000 | 3,116,825 |
| Finland | 2,600,000 | 2,583,500 | 2,627,750 | 2,627,750 |
| France | 29,040,000 | 29,414,250 | 29,200,000 | 30,653,530 |
| Germany | 39,483,000 | 40,266,250 | 40,611,750 | 42,391,750 |
| Luxembourg | 228,500 | 275,600 | 307,000 | 338,100 |
| Netherlands | 8,854,250 | 8,995,000 | 9,306,000 | 9,773,100 |
| Sweden | 4,759,987 | 4,999,733 | 5,273,256 | 5,509,016 |

**EURO REFERENCE EXCHANGE RATE[6]**

| Home to EUR | 2010 | 2015 | 2020 | 2025 (YTD) |
|---|---|---|---|---|
| AUD | 0.6933 | 0.6767 | 0.6043 | 0.5827 |
| CAD | 0.7325 | 0.7049 | 0.6536 | 0.6515 |
| DKK | 0.1343 | 0.1341 | 0.1342 | 0.1340 |
| SEK | 0.1049 | 0.1069 | 0.0954 | 0.0901 |
| USD | 0.7543 | 0.9013 | 0.8755 | 0.9215 |

[5] *FRED, Infra-Annual Labor Statistics: Labor Force Total: From 15 to 64 Years, 2025.*
[6] *ECB, Reference Rates, 2025.*

| COUNTRY NOMINAL GDP (BILLIONS OF EUROS)[7] | | | | |
|---|---|---|---|---|
| | 2010 | 2015 | 2020 | 2024 |
| Australia | € 711.63 | € 1,013.70 | € 1,275.98 | € 1,802.77 |
| Canada | € 1,028.55 | € 1,437.48 | € 1,617.78 | € 2,381.06 |
| Denmark | € 180.12 | € 250.54 | € 320.02 | € 404.09 |
| Finland | € 157.58 | € 208.75 | € 258.02 | € 317.14 |
| France | € 1,761.44 | € 2,454.15 | € 2,928.57 | € 3,675.08 |
| Germany | € 2,450.72 | € 3,575.07 | € 4,272.76 | € 5,311.04 |
| Luxembourg | € 34.55 | € 55.39 | € 67.37 | € 87.47 |
| Netherlands | € 567.82 | € 778.21 | € 955.85 | € 1,289.98 |
| Sweden | € 296.79 | € 430.79 | € 520.26 | € 645.80 |

Note: While pension assets can be expressed as a percentage of GDP, we use active workers as the more accurate unit since pensions are typically funded by income taxes. Furthermore, in countries such as Luxembourg, with high levels of non-resident workers, GDP is a less reliable proxy for the benefit liability of its retirees.

[7] *OECD, Nominal gross domestic product (GDP), 2024.*

## II. Overview of Country Data Sources

| COUNTRY | TIER 1 | TIER 2 | TIER 3 | SOURCES USED |
|---|---|---|---|---|
| Australia | N/A | Superannuation Funds | Personal household savings as reported by governments | T2: Australian Prudential Regulation Authority, T3: Australia Bureau of Statistics |
| Canada | Canada/Quebec Pension Plan (C/QPP) | Registered Retirement Pensions (RPPs) | | T1: CPP and CDPQ Annual Reports, T2 and T3: Statistics Canada |
| Denmark | ATP Fund | Occupational Pensions (as reported) | | T1: ATP Annual Reports, T2: Denmark National Bank, T3: Eurostat |
| Finland | N/A | Earnings-related pension providers | | T2: Finnish Pension Alliance TELA, T3: Eurostat |
| France | AGIRC-ARRCO | Occupational Pensions as reported | | T1: AGIRC-ARRCO Annual Reports, T2: European Insurance and Occupational Pensions Authority, T3: Eurostat |
| Germany | Old Age Pension Reserve | | | T1: Deutsche Rentenversicherung Annual Reports, T2: Deutsche Bundesbank, T3: Eurostat |
| Luxembourg | Pension Reserve Managed by FDC | | | T1: FDC Annual Reports, T2: European Insurance and Occupational Pensions Authority, T3: Eurostat |
| Netherlands | N/A | | | T2: De Nederlandsche Bank (DNB), T3: Eurostat |
| Sweden | AP Funds | | | T1: AP Funds 1-4, 6, 7, Annual Reports, T2: Insurance Sweden, T3: Eurostat |

### II.A TIER 1 RISK CAPITAL CALCULATIONS

Tier 1 reserve assets, managed centrally by state-affiliated investing authorities, are drawn directly from fund annual reports. We classify financial assets into two categories: risk capital and non-risk capital. Risk capital includes listed and unlisted equities, hedge funds, property and infrastructure. Non-risk capital includes fixed income products, including government bonds, corporate bonds, and deposits. Finland, the Netherlands, and Australia operate entirely PAYG Tier 1 systems and therefore do not have Tier 1 asset breakdowns. All reports are linked using hyper-references in the table below, with the Asset Classification column showing how financial assets were categorised for each country based on reported data.

| | 2015 | 2020 | Last Reported | Asset Classification | Notes |
|---|---|---|---|---|---|
| France | Data not available | Data not available | AGIRC-ARRCO, *2024* | **Risky:** Equities<br>**Non-Risky:** Bonds | Unable to find asset breakdown for 2024, therefore used same ratio as *2020* |
| Germany | Sozialpolitik, *2023* | Deutsche Rentenver-sicherung, *2020* | Deutsche Rentenversicherung *2025* | **Non-Risky:** Low-risk assets | According to *SGB VI 217*, all investments in the sustainability reserve must be considered liquid (non-risky). |
| Luxembourg | Fonds de Compensation, *2015* | Fonds de Compensation, *2020* | Fonds de Compensation, *2024* | **Risky:** Equities, Real estate, Infrastructure, Other<br>**Non-Risky:** Bonds and Loans, Liquidities | |
| Denmark | ATP, *2015* | ATP, *2020* | ATP, *2024* | **Risky:** Public equities, Private equities, Real estate and infrastruc-ture, Other<br>**Non-Risky:** Credit, Bonds | |
| Finland | N/A | N/A | N/A | | |
| Netherlands | N/A | N/A | N/A | | |
| Sweden | AP1, *2015*;<br>AP2, *2015*;<br>AP3, *2015*;<br>AP4, *2015*;<br>AP6, *2015*;<br>AP7, *2015* | AP1, *2020*;<br>AP2, *2020*;<br>AP3, *2020*;<br>AP4, *2020*;<br>AP6, *2020*;<br>AP7, *2024* | AP1, *2024*;<br>AP2, *2024*;<br>AP3, *2024*;<br>AP4, *2024*;<br>AP6, *2024*;<br>AP7, *2024* | **AP1-4:**<br>**Risky:** Equities, Private Equities, Real estate and infrastructure, Other<br>**Non-Risky:** Fixed in-come<br>**AP6:**<br>**Risky:** Funds, Co-invest-ments/companies<br>**Non-Risky:** Liquidity<br>**AP7:**<br>**Risky:** Equities<br>**Non-Risky:** Fixed in-come | |
| Australia | N/A | N/A | N/A | | |
| Canada | CPP, *2015*;<br>La Caisse, *2015*, *2015b* | CPP, *2020*;<br>La Caisse, *2020*;<br>Retraite Quebec, *2020* | CPP, *2025*; La Caisse, *2024* | **CPP**<br>**Risky:** Public equities, Private equities, Infra-structure/real estate<br>**Non-Risky:** Fixed in-come, Credit<br>**QPP**<br>**Risky:** Equities, Real assets<br>**Non-Risky:** Fixed in-come, Credit | La Caisse does not provide an asset breakdown for QPP specif-ically, however QPP makes up its largest fund, thus we have assumed that QPP's asset breakdown resem-bles that of the Caisse de dépôt et placement du Québec (CDPQ) |

## II.B TIER 2 RISK CAPITAL CALCULATIONS

Tier 2 assets are sourced from consolidated datasets produced by national statistical agencies and central banks. We classify financial assets into two categories: risk capital and non-risk capital. Risk capital includes listed and unlisted equities, hedge funds, property and infrastructure. Non-risk capital includes fixed income products, including government bonds, corporate bonds, and deposits. All reports and databases are linked in the table below using hyper-references, with the Asset Classification column showing how financial assets were categorised for each country based on reported data.

| | Source | Asset Classification | Notes |
|---|---|---|---|
| France | *European Insurance and Occupational Pensions Authority* | **Risky:** Equity, Property, Other<br>**Non-Risky:** Government bonds, Corporate bonds, Cash and deposits | Download "Balance Sheet, Annual" dataset and filter for France. Data only available for 2024. "Other" includes collective investment undertakings and other investments. |
| Germany | *Deutsche Bundesbank* | **Risky:** Shares and other equity, Risky fund shares, Financial derivatives<br>**Non-Risky:** Currency and deposits, Debt securities, Loans, Non-risky fund shares, Reserves | Breakdown of fund investments not provided for 2015, thus assumed average allocation from 2020-2025 |
| Luxembourg | *European Insurance and Occupational Pensions Authority* | **Risky:** Equity, Other<br>**Non-Risky:** Government bonds, Corporate bonds, Cash and deposits | Download "Balance Sheet, Annual" dataset and filter for Luxembourg.<br>"Other" includes collective investment undertakings, property and other investments |
| Denmark | *Denmark National Bank* | **Risky:** Shares and investment funds, Other assets<br>**Non-Risky:** Bonds | Navigate to "insurance and pension fund balances" and generate a table with the following filters:<br>Company type: Pensions funds<br>Values: Stock<br>Balance Sheet Item: Financial assets in total; Securities; Shares and investment funds; Bonds; Other Assets<br>Quarter: Q1 2025; Q1 2020; Q1 2015 |
| Finland | *Finnish Pension Alliance TELA* | **Risky:** Real-estate, Hedge funds, Other equity, Listed shares<br>**Non-Risky:** Money market, Investment loans, TyEL-loans | Select the following filters:<br>Quarter: 1<br>Year: 2025; 2020; 2015<br>Investment portfolio: Select all<br>Group: Total |
| Netherlands | *De Nederlandsche Bank* | **Risky:** Equities, Hedge funds, Real estate investments, Private equity, Infrastructure, Commodities, Other investments, Currency overlay<br>**Non-Risky:** Fixed yield securities | Gathered from "Assets invested at pension funds' own risk" table.<br>Q4 2024; Q1 2020; Q1 2015 |

| | | | |
|---|---|---|---|
| Sweden | *Insurance Sweden* | **Risky:** Equities and investment funds, Properties (Real Assets), Other<br>**Non-Risky:** Bonds and fixed income | Visual approximation based on provided figures |
| Australia | *Quarterly Superannuation Performance Statistics (APRA)* | **Risky:** Public equities, Private equities, Real equities/ Infrastructure, Other<br>**Non-Risky:** Fixed income | Q1 March 2025; Q1 March 2020; Q1 March 2015 |
| Canada | *Statistics Canada* | **Risky:** Equities, Real equities/ Infrastructure, Other<br>**Non-Risky:** Fixed income | Q4 December 2024; Q1 March 2020;<br>Q1 March 2015 |

## II.C TIER 3 RISK CAPITAL CALCULATIONS

Tier 3 assets reflect household financial savings as reported by governments and supranational entities. Data are sourced from the *Australian Bureau of Statistics* for Australia, *Statistics Canada* for Canada, and *Eurostat* for European countries.

When navigating Eurostat, follow the hyperlink to "Financial balance sheets – quarterly data" (nasa_10_f_bs). Click "Customize your dataset" and ensure the following criteria are selected:

**Time Frequency:** Quarterly

**Unit of Measure:** Million euro

**Sector:** Households

**Financial Position:** Assets

**Geopolitical entity (reporting):** Denmark; Finland; France; Germany; Luxembourg; Netherlands; Sweden

**National accounts indicators (ESA 2010):** Total financial assets/liabilities; Currency and deposits; Debt securities; Loans; Equity and investment fund shares; Investment fund shares/units; Financial derivatives and employee stock options; Other accounts receivable/payable; Financial net worth.

Generate the dataset and use Q1 2015, Q1 2020, and Q1 2025 to obtain Tier 3 asset allocations using the asset classification below.

**We classify financial assets into two categories:** risk capital and non-risk capital. Risk capital includes the sum of household financial assets invested in equity and investment fund shares, and financial derivatives and employee options. Non-risk capital includes currency and deposits, loans and debt securities. We exclude assets held in life insurance products due to the absence of asset allocation data, as well as assets in public and private pensions to avoid double counting Tier 1 and 2 assets, and all non-financial assets.

| | Source | Asset Classification |
|---|---|---|
| France<br>Germany<br>Luxembourg<br>Denmark<br>Finland<br>Netherlands<br>Sweden | ***Eurostat*** | **Risky:** Equity and investment fund shares, Financial derivatives and employee options, Other accounts receivable<br>**Non-Risky:** Currency and deposits, Debt securities, Loans |
| Australia | ***Australian Bureau of Statistics*** | **Risky**: Shares and other equity, Securities other than shares, Other accounts receivable<br>**Non-Risky:** Loans and placements, Currency and deposits |
| Canada | ***Statistics Canada*** | **Risky**: Equity and investment fund shares, Other accounts receivable<br>**Non-Risky:** Debt securities Loans, Total currency and deposits |

## III. Outcome Metrics Methodology

### FIGURE 1: INCOME REPLACEMENT RATE AS A PERCENTAGE OF PRE-RETIREMENT EARNINGS BY TIER

Data on income replacement rates are taken from Table 2 of the ***2023 OECD Pensions at a Glance Report***, with the exception of Australia and Finland. For Australia, the total income replacement rate remains at 65% as reported by the OECD, but the split between Tiers 1 and 2 was adjusted using Australian Treasury projections (***2021***) to better capture the Tier 1 contribution. For Finland, we adjusted the OECD figures because the report classified the TyEL pension as Tier 1 (mandatory public), whereas in our framework it falls under Tier 2 (***2024***).

### FIGURE 3: CONTRIBUTION RATES (TIERS 1 & 2) AND SAVINGS RATES (TIER 3)

Contribution rates are drawn from multiple sources and include employee, employer, and state contributions. In Australia, Tier 1 is funded through general tax revenues and in the Netherlands through insurance revenues, so neither country has a specific Tier 1 contribution rate. Precise Tier 2 contribution rates are unavailable for France, Luxembourg, Sweden, and Canada due to variation in contributions by income and scheme.

| COUNTRY | TIER 1 | TIER 2 | TIER 3 |
|---|---|---|---|
| France | CLEISS, 2025 | N/A | Eurostat, 2025 |
| Germany | Federal Ministry of Labour and Social Affairs, 2024 | Deloitte, 2025 | |
| Luxembourg | Fonds de Compensation, 2025 | N/A | |
| Denmark | ATP Livslang Pension, 2025 | Pension Funds Online, 2025 | |
| Finland | Ministry of Finance, 2024 | Finnish Centre for Pensions, 2025 | |
| Netherlands | N/A | European Commission, 2021 | |
| Sweden | Government of Sweden, 2020 | N/A | |
| Australia | N/A | Australian Taxation Office, 2025 | Australian Bureau of Statistics, 2025 |
| Canada | Government of Canada, 2025 | N/A | Statistics Canada, 2025 |

## FIGURE 4: COVERAGE RATES (TIERS 1 & 2) AND HOUSEHOLD INVESTMENT PARTICIPATION (TIER 3)

Coverage rates and household investment participation are drawn from multiple sources. Tier 1 coverage rates are universal in nearly all sample countries, except Finland and Australia, which operate means-tested Tier 1 systems. Household investment participation data (Tier 3) are unavailable for Luxembourg.

| COUNTRY | TIER 1[8] | TIER 2 | TIER 3 |
|---|---|---|---|
| France | Info Retraite, 2025 | Dares, 2021 | Kaustia et al., 2023 |
| Germany | European Commission, 2013 | Pension Funds Online, 2025 | Kaustia et al., 2023 |
| Luxembourg | Government of Luxembourg, 2025 | ACA, 2025 | N/A |
| Denmark | Life in Denmark, 2025 | Better Finance, 2022 | Kaustia et al., 2023 |
| Finland | Ministry of Finance, 2023 | Finnish Centre for Pensions, 2023 | Statistics Finland, 2023 |
| Netherlands | SVB, 2025 | Chen and Beetsma, 2015 | Kaustia et al., 2023 |
| Sweden | Sweden Pensions Agency, 2025 | Better Finance, 2020 | Kaustia et al., 2023 |
| Australia | Social Security Administration, 2023 | Chomik and Piggott, 2015 | ASX, 2023 |
| Canada | Government of Canada, 2025a, 2025b | Statistics Canada, 2023 | Statistics Canada, 2025 |

[8] *We assume a 100% coverage rate when the Tier 1 public pension is reported as "universal".*

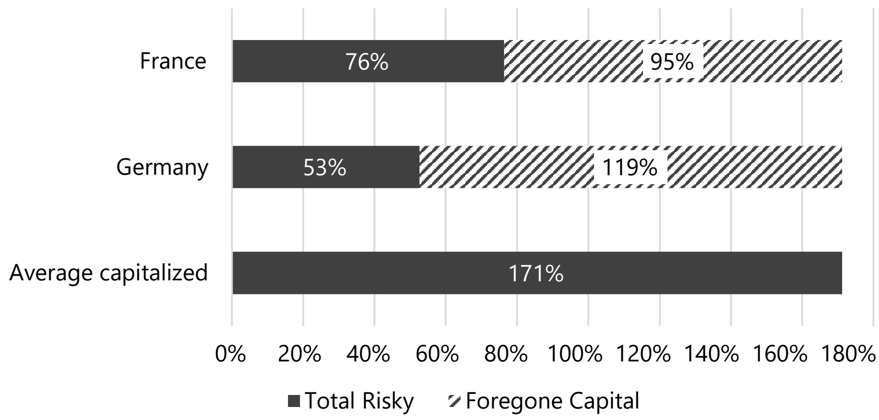
## IV. Risk Allocation as a Percentage of Nominal GDP

Figures 6 and 8 are expressed on a per worker basis. Figures 15 and 16 provide the same information with data expressed as a percentage of nominal GDP.

FIGURE 15 EVOLUTION OF AGGREGATE RETIREMENT ASSETS BY RISK ALLOCATION AS A PERCENTAGE OF NOMINAL GDP


Bars represent total pension assets **as a percentage of nominal GDP** in 2015, 2020, and in the last reported year, divided into risky (dark blue) and non-risky (grey patterned) asset classes, with the risky asset share (%) indicated below each bar. We group countries by predominantly PAYG (France, Germany, Luxembourg) and capitalised (Denmark, Finland, Netherlands, Sweden) pension systems, and non-EU countries. Tier 2 data are missing for France in 2015 and 2020 due to data unavailability. Data sources are discussed in *Appendix 2*.

FIGURE 16 TOTAL GROWTH CAPITAL AND PRODUCTIVE CAPITAL GAP AS A PERCENTAGE OF NOMINAL GDP




The bars compare the accumulated risk capital as a percentage of nominal GDP and the estimated gap in foregone risk capital for France and Germany to the average risk capital in the six capitalised systems in our sample (Australia, Canada, Denmark, Finland, the Netherlands, and Sweden). This risk capital gap is calculated as the difference between the average of the seven capitalised systems in our sample and the amount of existing accumulated risky assets in Germany and France. Data sources are discussed in ***Appendix 2***.

We thank the Luxembourg Fund Industry Association (ALFI) for its support.

We are grateful for valuable comments from Serge Weyland, Antoine Kremer, Corinne Lamesch, and David Zackenfels. The opinions expressed remain solely those of the authors and do not necessarily reflect those of ALFI. Augustin and Betermier are corresponding authors

association of the luxembourg fund industry

ALFI | Association of the Luxembourg fund industry

12, rue Erasme | L-1468 Luxembourg

Tel. +352 22 30 26 - 1

info@alfi.lu | www.alfi.lu