



# ASSET ALLOCATION OF PENSION FUNDS

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The primary objective of funded pension arrangements is to provide adequate incomes for retirement. Pension contributions and investment return on accumulated funds during an individual’s working life and retirement years are the key factors that affect retirement incomes. Long-term pension investment returns are driven by asset allocation of pension plans.

As asset allocation of pension funds around the world is so diverse, the Australian Centre for Financial Studies (ACFS) dedicated a special report to the topic of “asset allocation of pension funds” based on the data collected by the Melbourne Mercer Global Pension Index (MMGPI) project from 2009 to 2018<sup>1</sup>.

The main objective of the report is to understand this diversity, its drivers and its implications.

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## REPORT HIGHLIGHTS

- From 2010 to 2018, on average, pension funds in our surveyed pension systems allocated 38.7% of their assets to growth assets. The level of growth assets in pension portfolios was stable over time.
- Pension systems differed significantly in their level of investment in growth assets, due to differences in the management approaches, market conditions and institutional constraints. The top five pension systems, including Argentina, Peru, South Africa, Australia and Saudi Arabia, allocated more than 60% to growth assets. Singapore, Korea and India have less than 10% in growth assets.
- Large pension markets, P7 as classified by Willis Towers Watson, namely Australia, Canada, the Netherlands, Japan, Switzerland, the US and the UK, had higher allocation to growth assets.
- There are fewer restrictions on investing in growth asset classes for pension funds in large pension markets, especially P7.
- Pension funds in private systems (countries with mandatory occupational savings managed by private institutions) tend to have higher allocation to growth assets than those in public systems.
- No clear difference in asset allocation pattern was observed among defined contribution (DC) and defined benefit (DB) systems.
- Overall, considering the total household wealth portfolio including both pension investment as well as other activities related to non-pension assets and liabilities, we observe that pension systems with high level of growth assets tend to have high household debt, low savings and low home ownership, and vice versa.

## OVERVIEW OF ASSET ALLOCATION FOR PENSION FUNDS

Asset allocation has always been at the centre of investment decision making. When it comes to retirement investment with a long-term horizon, asset allocation decision becomes even more important as it affects lives of millions of people.

Asset allocation decisions involve planning asset classes for investment and their weights to meet the return objective of fund members and control the overall risk level of the fund. Depending on each system and its approach, pension funds adopting a pure asset-liability management framework tend to invest in conservative asset classes to generate returns sufficient to cover anticipated future pension liabilities. Alternatively, other pension funds, typically the ones without defined pension liabilities, focus on growing the value of assets for members to provide for retirement income.

Depending on management style, funds may strategically deviate away from the overall allocation plan to capture returns from expected short-term movements of certain asset classes. Within each asset class, funds may develop expertise to select individual securities with expected superior returns relative to that asset class; adopt a passive strategy that

gives them the desired exposure to broad movement of the asset class or implement a combination of them.

While pension funds typically employ multiple investment strategies to exploit short-term fluctuation of markets, their asset allocation investment policy stays true to the core long-term expectations of the economic performance of the asset classes.

The asset allocation decision of pension funds depends on the risk appetite of the ultimate risk bearer that determines their approach, the market conditions for different asset classes and other institutional constraints, all of which will be examined in this paper.

*Brinson, Hood & Beebower (1986):*

*A pension fund's policy explains on average 93.6% of the total variation in actual fund returns.*

*Strategy implementation, including timing and security selection, added modestly to the explained variation.*

In the context of large U.S. pension funds, the seminal paper by Brinson, Hood and Beebower published in 1986 finds that asset allocation policy drives portfolio's return variability<sup>ii</sup>.

In a more recent context and with a larger sample spanning across major markets including the United States, the United Kingdom, Australia, Canada, and Japan, Vanguard's research on returns of pension and non-pension balanced funds during the period from 1990 to 2015 reveals the same evidence.

These studies inspire us to examine asset allocation of pension funds across pension markets in the world. Although the discussion of the level of growth assets held by pension funds would be more relevant to pension systems following a total-return approach, we include in our analysis pension systems that adopt asset-liability management approach. Our data was collected from 2009 - 2018 on pensions systems included in the Melbourne Mercer Global Pension Index (MMGPI) project<sup>1</sup>. We examine the following key questions:

- (1) How does asset allocation of pension funds vary over time and across different pension markets?
- (2) What are some institutional and economic characteristics of pension markets that have high allocation to growth assets? Are they different from those of markets with a more conservative allocation to growth assets?

## GROWTH ASSETS IN PENSION FUNDS

There are three major sources of growth of retirement savings over an individual's working and retirement years. They are (1) contributions (taking into consideration all relevant tax support from the government) made during employment, (2) growth of pension savings before retirement

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<sup>1</sup> The Melbourne Mercer Global Pension Index reviews and ranks international pension systems in terms of their adequacy, sustainability and integrity. Since its inception in 2009, the index has grown from 11 to 34 systems in 2018. The MMGPI project is jointly conducted by the Australian Centre for Financial Studies (Monash Business School) and Mercer and funded by the Victoria Government of Australia. Annual MMGPI reports are available at: <https://australiancentre.com.au/projects/melbourne-mercator-global-pension-index/>

and (3) post-retirement earnings generated by accumulated pension assets. It has been argued that among the three, post-retirement earnings contribute most significantly to the total value of pension assets<sup>iii</sup>. As prior studies have shown, asset allocation policy is the key factor that explains portfolio earnings.

Pension funds around the world invest in a diverse range of assets. According to the annual series on *Pension Markets in Focus* by the OECD, major asset classes include equities, bills and bonds, cash and deposit and other (property, infrastructure, loans, lands and buildings, unallocated insurance contract, private investment funds, other mutual funds that are not invested in cash, bills and bonds or equities). However, OECD data often result in large value of the “Other” category in some countries.

Alternatively, the approach adopted by MMGPI considers a split between “growth” and “defensive” assets<sup>2</sup>. Growth assets typically include equities, property and some alternative assets such as private equities and infrastructure. Whilst some of them may have lower liquidity than listed asset classes, these assets provide good opportunity for long-term growth in income and capital, which fits well with the investment objectives and horizons of pension funds. Defensive assets include fixed interest securities (bills and bonds), cash and deposit. These assets tend to offer stable income at a lower risk level, which may suit the risk appetite of pension funds. However, in the long term, especially in low interest environment as we are experiencing now, defensive assets have limited potential to contribute to the growth of retirement savings in real terms. The consideration between growth asset versus defensive assets for pension funds, therefore, is always challenging.

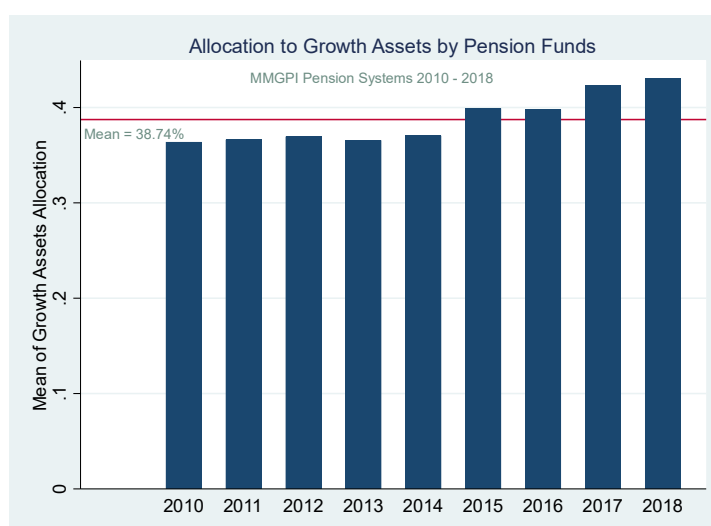


Figure 1: Allocation to Growth Assets - Overall mean values

<sup>2</sup> See annual MMGPI Reports: Data collected from Question A10 of MMGPI annual's index survey: *What is the proportion of total pension assets invested in growth assets?* The answer to this question was sourced from Mercer consultants in each country/region.

Figure 1 presented all 14 MMGPI pension systems<sup>3</sup> with full data available from 2010 to 2018. The level of growth assets held by pension funds remained stable during the last 8 years. On an equal-weighted basis, pension funds, on average, allocate 38.74% of their total assets to growth assets.

### Diverse asset allocation around the world

However, when we expanded the sample to all 34 MMGPI systems<sup>4</sup>, the level of growth assets held by all pension funds differ vastly across pension systems, as highlighted in Figure 2.

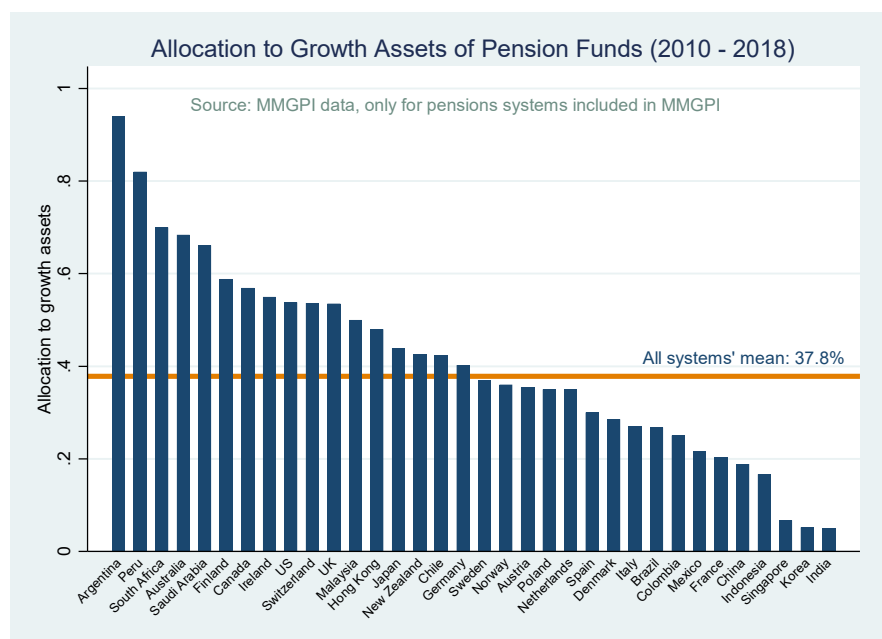


Figure 2: Mean Allocation to Growth Assets of Pension Funds 2010 - 2018

The top five include Argentina, Peru, South Africa, Australia and Saudi Arabia, with more than 60% of the total pension assets held as growth assets. The focus is more on growing asset side of the pension funds' balance sheet. At the other end of the spectrum, Singapore, Korea and India have less than 10% in growth assets. Pension funds in these systems adopt a liability-driven approach with asset allocation decision made to achieve possible returns consistent with the expected liabilities and liquidity needs of the pension plan. When investments are strongly driven by actual and anticipated pension liabilities, the tendency is to have high

<sup>3</sup> The 14 MMGPI pension systems with full growth asset allocation data for the 2010 – 2018 period include Australia, Brazil, Canada, Chile, China, France, Germany, Japan, the Netherlands, Singapore, Sweden, Switzerland, UK and USA.

<sup>4</sup> Please note that this is an unbalanced panel of data because for some countries, data was not available for all years during the period 2010 – 2018.

allocation to fixed interest securities, particularly in indexed linked bonds, rather than growth assets.

## P7 markets

Another observation is that large pension markets tend to have higher allocation to growth assets. The seven largest pension markets in the world (P7), namely US, UK, Australia, Canada, Japan, Switzerland and the Netherlands, as reported by Willis Towers Watson<sup>iv</sup>, hold USD37.8 trillion of assets and represent 84% of the top 195 pension markets.

On average, over the period 2010 – 2018, the P7 pension funds allocate 51.5% of their portfolios to growth assets whereas non-P7 pension funds only hold 34% in growth assets.

This difference in the holding patterns between P7 and non-P7 markets and suggests that if we aggregate all pension funds on the world on an asset-weighted basis, allocation to growth assets would be even much higher than the overall mean of 37.8% reported in Figure 2.

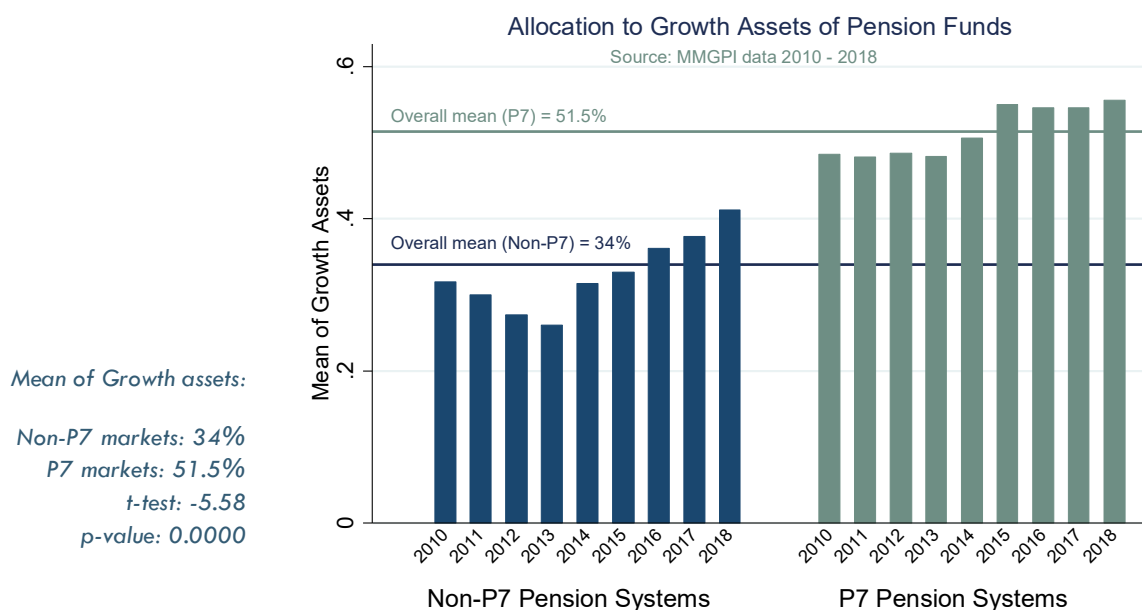


Figure 3: Allocation to Growth Assets of Pension Funds and P7 markets

## Institutional constraints

There are different institutional constraints in allocating to growth assets in some of these countries. Korea and Germany, for instance, set a limit of 30% and 35% respectively for maximum investment in shares and various other restrictions for investing in other growth assets.

## Asset allocation of pension funds

The P7 markets, except for Switzerland's 50% limit for equity and some restrictions on real estates for Japanese pension funds, have no limit on investing in shares and no restrictions on other type of investments, as illustrated in Table 1.

However, it is worth noting that pension funds in the Anglo-Saxon countries are generally required to follow "prudent man rules"<sup>v</sup>. In Australia, the UK and the US, for example, while there are no prescribed portfolio limits for certain asset classes, pension fund trustees are required to invest pension assets on a diversified basis.

	Portfolio limit on shares*	Restrictions on real estate <sup>+</sup>	Restrictions on retail investment <sup>+</sup>	Restrictions on private investment <sup>+</sup>	Notes* (Investment limit on shares are reported as at end of 2013)
Malaysia	25	Yes	Yes	Yes	Max. 25% in domestic equities, Min 70% in fixed income low risk instrument.
Korea	30	Yes	Yes	Yes	Investment limit refers to corporate DB plans only.
Singapore	35	Yes	Yes	Yes	A 35% limit applies to shares, property, and corporate bonds for CPF Investment Scheme Ordinary Account
Germany	35	Yes	Yes	Yes	Investment limit refers to Pensionskassen.
Mexico	40	Yes	Yes	Yes	Investment limit refers to Basic Fund 5.
Poland	48	Yes	Yes	Yes	Maximum allowed allocation in listed equities set up for open pension funds.
Switzerland	50	Yes	No	No	
Austria	70	No	No	No	
Denmark	70	Yes	Yes	Yes	
Spain	100	Yes	Yes	Yes	
Sweden	100	No	No	No	
Japan	100	Yes	No	No	
Netherlands	100	No	No	No	
Italy	100	Yes	No	Yes	
Norway	100	No	No	Yes	Shares issued by listed companies in OECD/EU countries.
United Kingdom	100	No	No	No	Information refers to 2012.
Canada	100	No	No	No	
United States	100	No	No	No	
Finland	100	No	No	Yes	Investment limit refers to the limit set up on listed equity for statutory pension plans.
Australia	100	No	No	No	
Hong Kong (China)	n/a	Yes	Yes	Yes	n/a: not available from source
Peru	n/a	Yes	Yes	Yes	n/a: not available from source
Brazil	n/a	Yes	No	No	n/a: not available from source
Columbia	n/a	Yes	Yes	Yes	n/a: not available from source
South Africa <sup>vi</sup>	75	Yes	Yes	Yes	75% in ordinary and preference shares, 25% in property, property shares and property trusts, 90% in shares and property combined

Source: \* OECD Pension Markets in Focus 2014; <sup>+</sup> OECD Pension Markets in Focus 2015 with data collected from OECD Global Pension Statistics and OECD Annual Survey of Investment Regulation of Pension Funds.

Table 1: Investment constraints for pension funds around the world

Apart from the institutional constraints, the level of development of other asset classes such as the government and corporate bond markets, private equity and infrastructure and country/region-specific different tax treatments for different assets are also relevant considerations to the asset allocation decision.

## CHARACTERISTICS OF PENSION SYSTEMS WITH HIGH GROWTH ASSET INVESTMENT

### Public vs. Private system

Apart from the different investment regulatory environment among pension systems, there are a range of factors that need to be considered in understanding the diverse asset allocation around the world.

The first factor that could differ significantly from one pension system to another is whether the mandatory retirement savings are managed by a public institution or by the private sector.

According to the OECD, retirement income systems are diverse but common elements could be found in their design in terms of mandatory and voluntary tiers, as explained in OECD's taxonomy in Figure 4 below.

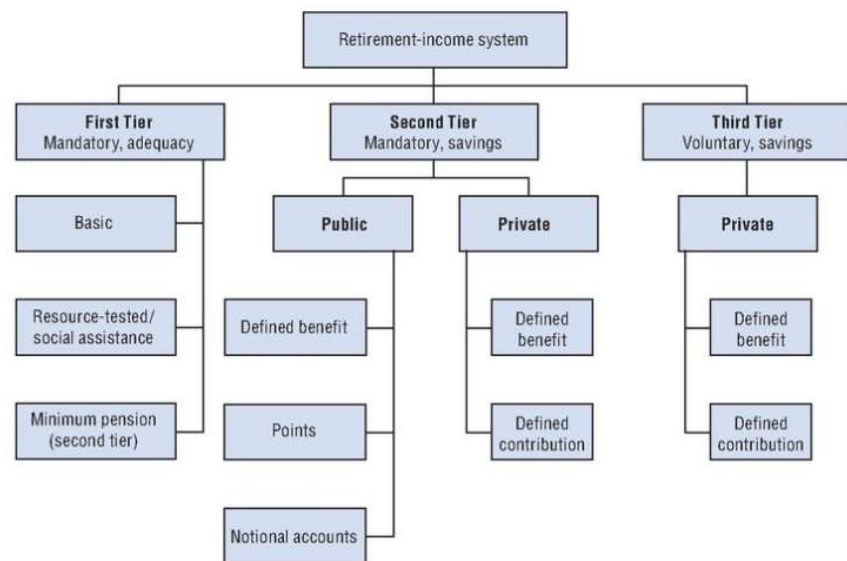


Figure 4: Taxonomy: Different types of retirement-income provision (Image from Pensions at a Glance 2017: OECD and G20 Indicators)

The first tier comprises programmes designed to provide pensioners with minimum standard of living. The second-tier can be a public mandatory and contributory system, typically related to earnings and/or a private mandatory and fully funded system. Further classification can be based on the way benefits are determined (defined contribution (DC) or defined benefit (DB)). The third tier in most systems is voluntary private savings. Most pension systems need to rely on a sizable second and/or third tier.



Countries like Australia and Denmark have a strong private system for the second tier whereas other mature pension markets such as the United States, the Netherlands and the United Kingdom have a public system supported by large voluntary savings in the third tier.

For this analysis, we based on the OECD's classification of *Public vs. Private* in OECD's *Pensions at a Glance 2018*. As Ireland, New Zealand and South Africa do not have a mandatory occupational saving system, in these countries, voluntary private pension investments become a key tier. These countries are, therefore, treated as "private system" in our analysis. Further details can be found in Appendix 2.

Mandatory occupational savings		No mandatory occupational savings		Notes	
<i>Public system</i>		<i>Private system</i>			
Argentina	Italy	Australia	Mexico	Ireland	*Colombia and Peru: Individuals can choose to join the public DB or private DC system. DC is more popular.  +Sweden and Switzerland: Both public and private systems exist.
Austria	Japan	Chile	Norway	New Zealand	
Brazil	Korea	Colombia*	Peru*	South Africa	
Canada	Malaysia	Denmark	Sweden <sup>+</sup>		
China	Netherlands		Switzerland <sup>+</sup>		
Finland	Poland				
France	Saudi				
Germany	Arabia				
Hong Kong	Singapore				
India	Spain				
Indonesia	UK				
	US				

Table 2: Classification of public versus private pension system

Our data presented in Figure 5 shows a lower level of growth assets held by pension funds in public systems compared to private systems. The mean allocation to growth assets of pension funds in public systems was 35.6%, significantly lower than that of those in private systems, 45.6% (t-test = -3.74 and p-value=0.0002).

There are key regulatory differences between a public and a private pension system that could lead to the different asset allocation patterns among these systems.

In a public system, mandatory retirement savings are publicly managed, for example, by a Central Provident Fund (CPF) in Singapore, India, Malaysia and Hong Kong SAR (China) while in a private system, these savings are managed by private pension funds.

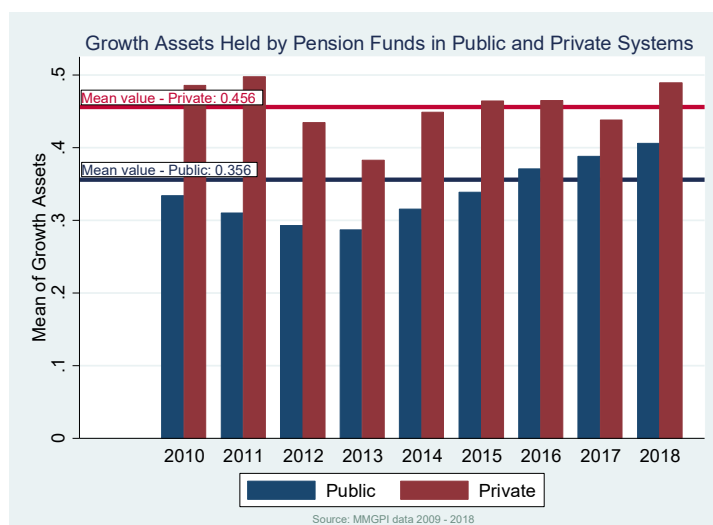


Figure 5: Growth assets held by pension funds in public and private systems

It is common that in a public system, members have DB, earnings related and point-based or notional DC accounts with an administered rate or a minimum rate of returns on accumulated savings. Examples are the point-based pension in Germany and France and notional DC plans offered by CFP Singapore, Employee Provident Funds (EPF) in Malaysia and the Provident Funds in India<sup>vii</sup>. These funds, therefore, are constrained in their exposure to growth assets due to the risk of providing a “guaranteed” return. The vast majority of assets held in Singapore’s CPF guaranteed accounts, for instance, must be invested in non-marketable government floating rate bonds, issued primarily to the CPF. While there are options for members of these provident funds who wish to enhance their savings and returns, say the Singaporean CPF Investment Scheme (CPFIS) and Malaysian EPF’s option to use external fund managers, the assets under these schemes are insignificant to that of the main schemes. In addition, there are investment restrictions with regard to growth assets within these options. For Singapore’s CPFIS, a limit of 35% applies to asset classes including shares, property funds and corporate bonds and for Malaysia’s EPF, maximum domestic equity holding is 25% of total asset and low-risk fixed income instruments must occupy at least 70%. EPF’s overseas investments need to be approved by the Ministry of Finance.

In a private system, say in Australia, individuals invest their retirement savings via pension funds with different investment strategies for various risk appetites. There are often less or no restrictions on exposure to growth asset classes as the consideration of risk and returns typically rests with the individual.

## DC vs. DB type of funds

Another factor that may affect asset allocation of pension funds is the type of pension funds that dominate the market. Pension funds, in both private and public systems, can operate based on a defined contribution or defined benefit basis, or in a hybrid arrangement.

	DC environment	DB environment
<i>Key characteristic</i>	Regular contributions made at a prescribed minimum level of contribution.	Future retirement benefits promised by plan sponsors
<i>Investment decision maker</i>	Each individual (although a default investment strategy could be available in case of no decisions)	The plan sponsor
<i>Key considerations</i>	The individual personal circumstances, including age, health, family, home ownership	Circumstances of fund members The funding status of the plan
<i>Key risk to retirement income</i>	Future benefits fluctuate depending on contribution rates and investment earnings.	No significant risk for investment earnings for members The only risk is <i>sponsor risk</i> . (Poor investment returns may cause the plan underfunded. Plan sponsor bankruptcy risk, however, is low as pension plan's assets are protected by law in most pension systems.)
<i>Risk bearer</i>	The individual	The plan sponsor
<i>DB or DC system (See Appendix 2 for detailed explanations)</i>	Australia, Chile, Colombia, Denmark, France, Hong Kong SAR, Indonesia, Italy, Malaysia, Mexico, New Zealand, Peru, Poland, Singapore, South Africa, Spain and the United States	Argentina, Austria, Brazil, China, Finland, Germany, India, Ireland, Korea, Malaysia, Netherlands, Norway, Saudi Arabia, Sweden, Switzerland, and the United Kingdom.

Table 3: DB and DC pension environment

In a DC-environment, employees and employers make regular contributions to the fund, at least satisfying a prescribed minimum level of contribution. Future retirement benefits an individual will receive depend on the accumulated value of the contributed funds during the working and retirement years, which will fluctuate based on rate of returns earned on the investment.

In a DB-environment, the member of a pension plan is typically guaranteed a rate of future retirement benefits. It is, therefore, the employer or the plan sponsor, other than the individual member, that bears the risk of fluctuation of investment returns.

In some countries like Colombia and Peru, an employee elects to join either a pay-as-you-go DB plan or a funded DC individual account offered through qualified financial institutions, with restricted options to change at a later date<sup>viii</sup>.

In all countries, both of these two types of DC and DB funds exist, just to different extents. Australia, for example, DC-based assets occupied 87% of total pension assets where as in Canada, the Netherlands and Japan, DB funds dominated the market<sup>ix</sup>. DC plans are becoming more popular even in DB-dominant systems.

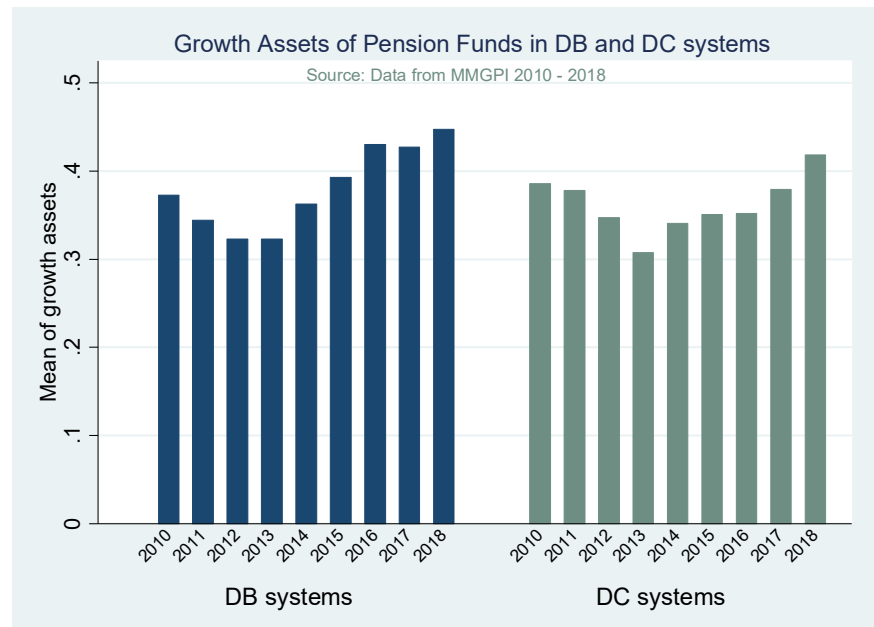


Figure 6: Growth assets of pension funds in DB and DC systems

Despite the differences in key characteristics between a DB and DC system, from 2010 to 2018, we find that pension funds in DB and DC systems followed the same investment pattern in growth assets. No significant difference was observed among the two subsamples. As many countries are transitioning from a DB into a DC system, the DB/DC dichotomy may no longer hold.

## Non-pension assets and liabilities: Household saving, household debt and home ownership

According to the World Bank<sup>x</sup> (2005), personal savings, home ownership and other assets/liabilities held outside the pension system, the so-called 'fourth pillar', play an important role in providing financial support to individuals or households during retirement. Therefore, in this paper, we examine how these non-pension variables interact with the way the pension portfolio is managed, at the aggregated system level.

### Household savings

A person's retirement income could be financed by pension assets as well as their savings outside the pension system. In some countries, these savings

are considered by the government in determining the financial support available to the aged.

For a country/region, the net household saving rate is the difference between personal disposable income (PDIN) and private consumption (PCRD), expressed as a percentage of personal disposable income (PDIN)<sup>xi</sup>.

The level of household savings provides some indication of the level of current income that is voluntarily being set aside from current consumption, either for future consumption or retirement. A high tendency to save reflects a culture of high level of risk aversion toward future uncertainty.

Household saving rate	Observations	Value	Std. err.
Overall mean	282	0.0648	0.0574
Quartile 1 – mean	71	-0.0029	0.0030
Quartile 2 – mean	70	0.0433	0.0013
Quartile 3 – mean	71	0.0789	0.0010
Quartile 4 – mean	70	0.1407	0.0043
Max		0.31	
Min		-0.125	

In terms of asset allocation and household savings, our analysis in Figure 7 shows that the allocation to growth asset classes in pension systems belonging to the top quartile of household saving rate is significantly lower than that of the bottom quartile. Overall, this suggests that top savers save more and hold less growth assets in pensions. They are more conservative both with their pension and non-pension assets. In our sample, countries that are consistently in the top saver group over the years are China, Indonesia, France, Singapore, Sweden and Switzerland.

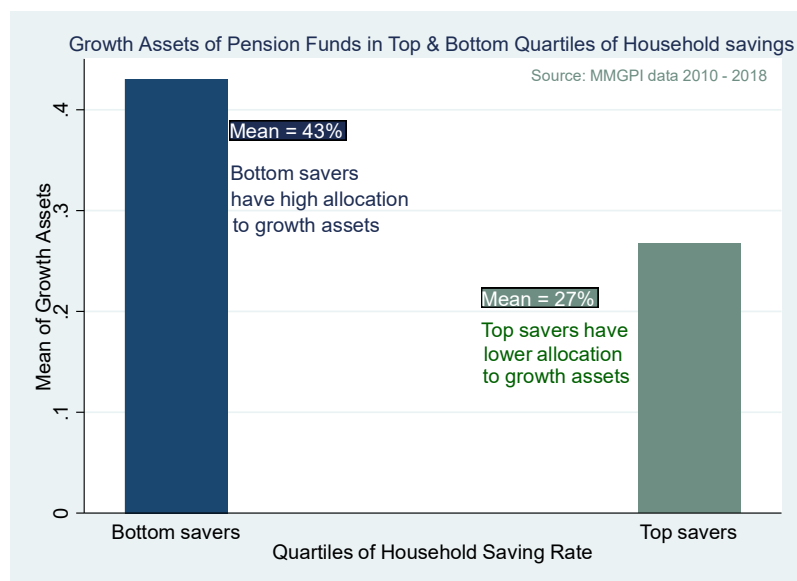


Figure 7: Growth Assets of Pension Funds and Household Savings

## Household debt

The level of household debt, total household debt expressed as a percentage of GDP, was added to the MMGPI set of indicators in 2018 to as part of the consideration of the role of non-pension assets and liabilities in retirement adequacy. The level of household debt represents the financial liabilities that must be paid by households in the future. In many cases, these liabilities will be repaid by accumulated benefits from the pension system, thereby reducing the adequacy of the remaining pension benefits.

As reported in MMGPI 2018 Report<sup>xii</sup>, the level of household debt ranged from 7% of GDP in Argentina to 126% in Australia and 128% in Switzerland.

A logical relationship between household saving rate and household debt is showed in Figure 8. Countries with low household saving rate exhibit high level of household debt while top savers have significantly lower household debt.

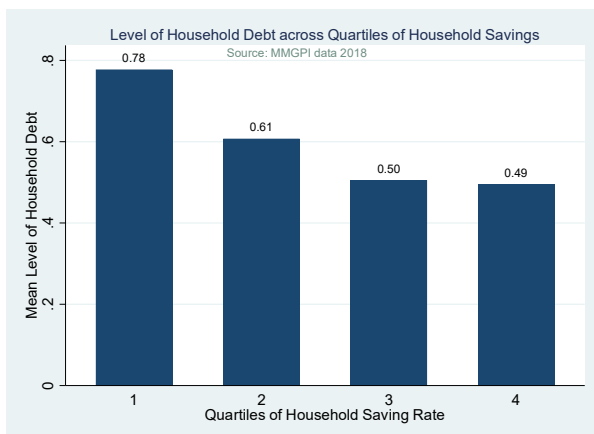


Figure 8: Household Debt and household saving rate

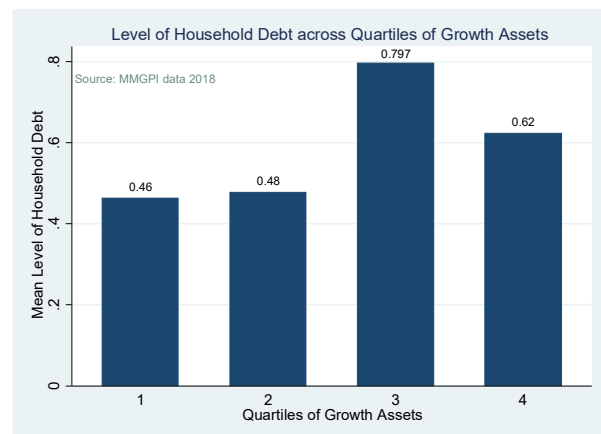


Figure 9: Household debt and Growth Assets

It appears that countries with high level of growth assets (Quartiles 3 and 4 of Figure 9) have higher level of household debt than those with lower growth assets (Quartiles 1 and 2).

When the pension systems are classified into either a *high* growth asset system (those with level of growth assets higher than mean) or *low* (lower than mean), the mean household debt of the former is 0.71, significantly higher than that of the latter group, which is 0.47 (t-test statistic = 2.01).

The evidence suggests that pension systems with more aggressive allocation to growth assets have higher level of household debt, representing a culture of low aversion toward risk.

Home ownership

A home is an important asset providing financial security during retirement. In many countries, the government encourages saving toward a home and provides financial support for home buyers. In a number of countries, such as Australia, Malaysia and Singapore, residents are allowed to access a part of their pension savings to purchase a home.

We view a home as a part of the retirement wealth portfolio. In our sample, the level of home ownership ranged from less than 40% to 50% for Switzerland, Hong Kong and Spain to around 90% for countries like China, India and Singapore. As the level of home ownership varies across countries and pension systems, it may lead to different levels of risk taking in allocating money to other financial assets.

Examining the level of home ownership across pension systems with high and low holdings of growth assets, we find the highest level of home ownership among the bottom quartile of growth assets. While the mean level of home ownership differs only slightly across the second, third and top quartiles, the difference between home ownership level between the bottom and the top quarter is statistically significant (t-test = 6.07, p-value=0.0000).

This suggested the people in certain culture find more security in owning a home and less in owning pension assets in grown asset classes.

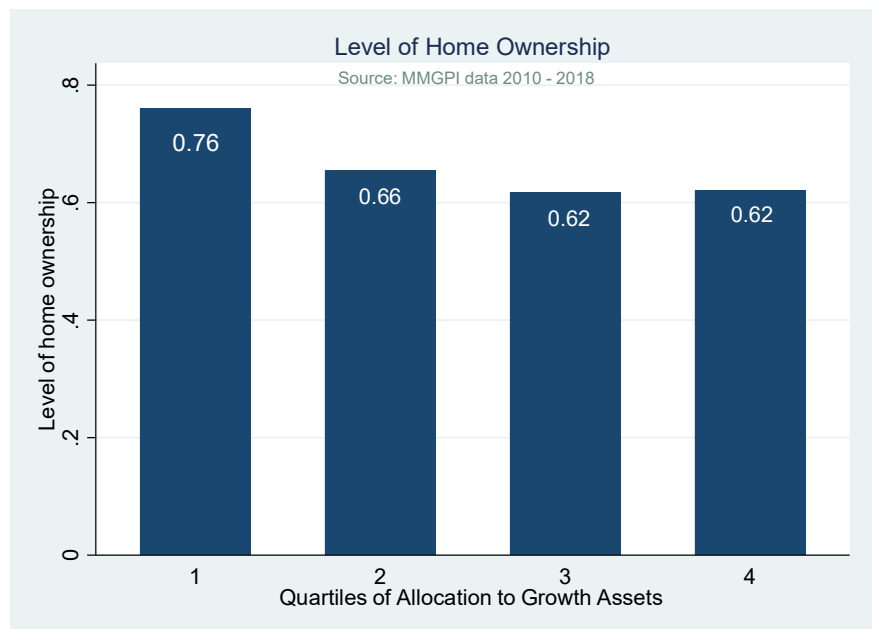


Figure 10: Level of home ownership across quartiles of growth assets

Putting it altogether, the data shows us a rather comprehensive picture, at the aggregated level, of the association among the key aspects of a

person's retirement wealth package comprising of investment assets, home ownership, household savings and household debt.

If we consider each country/region as an aggregated investor, then we can see that some of these investors are willing to take more risk than others. And their risk strategy is adopted consistently across various decisions regarding investing their retirement assets, buying a home, saving or borrowing.

Key variables	Level of growth assets		Mean difference (Q1-Q4)	Significance (t-test & p.value)
	Bottom Quartile (GA-Q1)	Top Quartile (GA-Q4)		
Household saving rate	0.1056	0.0562	0.0494	t-test = 4.17*** (p.value = 0.0001)
Home ownership	0.7608	0.6211	0.1397	t-test = 6.07*** (p.value = 0.0000)

\*\*\* denotes significance at 1% level<sup>xiii</sup>

Table 4: Household saving rates and home ownership across Quartiles of Growth Assets

Our analysis shows that pension systems with high level of growth assets, such as Australia, Canada, Saudi Arabia and Switzerland, tend to have high level of household debt, low household saving rates and low home ownership. One plausible explanation is that members in pension systems with high accumulation of pension assets may have a tendency to borrow more with an expectation that they will be able to access pension to pay off their debt in the future.

For these countries, especially those with more DB-based pension arrangements, a prudent glide-path based asset allocation scheme determined by cohort could be considered. Pension funds can invest in growth assets initially, which then glides into a prudent asset-liability management scheme eventually.

On the contrary, those with low allocation to growth assets like China, India and Singapore tend to have low household debt, high savings and high home ownership, representing a culture of low-risk. In other words, a low level of risk tolerance systematically guides portfolio of pension assets and non-pension assets and liabilities in these countries.

Looking holistically at pension and non-pension wealth portfolio, we see possibilities for countries like China, India and Singapore to be more growth-oriented with their pension assets. Low household debt, high savings and high home ownership can offer buffer for short-term equity market risk and therefore improve the long-term benefit of equity and other growth assets. Residents of these countries should have more confidence to adopt a more long-term growth-oriented investment strategy with their pension assets. The regulator of these countries should



relax investment constraints of pension assets of pension funds and encourage the offering of more vehicles and choice for pension investment for residents.

## CONCLUSION

When it comes to asset allocation, there can be significant diversity in terms of investment policies of pension funds in around the world. Diving into this holding diversity, we see that large pension systems, particularly the P7 pension markets, have a strong preference of growth assets for pension investment and they have fewer investment restrictions regarding growth asset classes. Pension funds in a private system tend to allocate more to growth assets than their counterparts in a public pension system.

Our observation that countries that have strong preference of defensive pension assets also have high household saving rates, high home ownership and low household debt. While there is not a single asset allocation that is correct for all countries, such risk profile of non-pension household savings, home and debt could provide good buffer for these countries to take on more growth assets within their pension investment. On the other hand, countries with high level of growth assets tend to have low household savings, low home ownership and high household debt. To manage income risk for retirement, a glide-path based allocation approach which reduces the exposure to growth assets in later years toward retirement could offer some protection.

In the long run, the pursue of assets that well correlate with economic growth in pension funds' portfolios improves investment return and enhances the adequacy and sustainability of the overall retirement income system.

## APPENDIX 1: STATISTICAL TEST RESULTS

### Mean difference test: Household Savings and Growth Assets Q1 and Q4

```
. ttest hhsavings if inlist(quartGA, 1, 4), by(quartGA)
```

Two-sample t test with equal variances

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf. Interval]	
1	56	.1056	.0094977	.0710741	.0865662	.1246338
4	49	.0562	.0065201	.045641	.0430904	.0693096
combined	105	.0825467	.0063592	.0651623	.0699362	.0951572
diff		.0494	.0118475		.0259032	.0728968

diff = mean(1) - mean(4) t = 4.1696  
 Ho: diff = 0 degrees of freedom = 103

Ha: diff < 0 Ha: diff != 0 Ha: diff > 0  
 Pr(T < t) = 1.0000 Pr(|T| > |t|) = 0.0001 Pr(T > t) = 0.0000

### Mean difference test: Household Debt and High and Low Growth Assets

```
. ttest hhdebt, by(highGA)
```

Two-sample t test with equal variances

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf. Interval]	
0	14	.4722143	.0782951	.2929534	.303068	.6413606
1	20	.71005	.0825427	.369142	.5372862	.8828138
combined	34	.6121176	.0609679	.3555009	.4880775	.7361578
diff		-.2378357	.118567		-.4793488	.0036774

diff = mean(0) - mean(1) t = -2.0059  
 Ho: diff = 0 degrees of freedom = 32

Ha: diff < 0 Ha: diff != 0 Ha: diff > 0  
 Pr(T < t) = 0.0267 Pr(|T| > |t|) = 0.0534 Pr(T > t) = 0.9733

### Mean difference test: Homeownership and Growth Assets Q1 and Q4

```
. ttest homeownership if inlist(quartGA, 1, 4), by(quartGA)
```

Two-sample t test with equal variances

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf. Interval]	
1	56	.7607857	.0169291	.1266861	.726859	.7947125
4	49	.621102	.0151781	.1062466	.5905845	.6516196
combined	105	.6956	.0133097	.1363838	.6692064	.7219936
diff		.1396837	.0230051		.0940585	.1853088

diff = mean(1) - mean(4) t = 6.0719  
 Ho: diff = 0 degrees of freedom = 103

Ha: diff < 0 Ha: diff != 0 Ha: diff > 0  
 Pr(T < t) = 1.0000 Pr(|T| > |t|) = 0.0000 Pr(T > t) = 0.0000

## APPENDIX 2: CLASSIFICATION OF PENSION SYSTEMS

Our key basis to classify a pension system into a DC or DB-dominant system is the OECD's classification of retirement income system, published in *Pensions at a Glance 2017: OECD and G20 Indicators* (OECD, 2017).

Country/Region	OECD's classification of retirement income system OECD's Pensions at a Glance 2018, & Pensions at A Glance: Asia/Pacific Edition			Actual DB/DC split of pension assets (OECD's Pension Markets in Focus 2018) & OECD Stats			Our classification
	First tier (Public Pension)	Public Type	Private Type	Occupational DB (%)	Occupational DC (%)	Personal (%)	
Argentina	●	DB					DB
Australia	●		DC	9.6	30.5	59.8	DC
Austria		DB					DB
Brazil	●	DB		43.0	6.8	50.2	DB
Canada	●	DB		60.1	3.7	36.2	DB
Chile	●		DC	...	...	100.0	DC
China	●	NDC+DC					DB (1)
Colombia			DB/DC*	...	...	100.0	DC
Denmark	●		DC	1.3	69.1	29.7	DC
Finland	●	DB		89.4	0.6	10.0	DB
France	●	DB+Points		23.5	66.5	10.0	DC (2)
Germany		Points		n/a	n/a	n/a	DB
Hong Kong		DC		n/a	n/a	n/a	DC
India	●	DB+DC		n/a	n/a	n/a	DB (3)
Indonesia		DC		n/a	n/a	n/a	DC
Ireland	●	n/a	n/a	64.7	35.3	...	DB (4)
Italy	●	NDC		4.7	64.2	31.1	DC (5)
Japan	●	DB		71.3	28.7	...	DB
Korea	●	DB		66	34	...	DB
Malaysia		DC		n/a	n/a	n/a	DC
Mexico	●		DC	13.3	0.9	85.8	DC
Netherlands	●	DB		n/a	n/a	n/a	DB
New Zealand	●	n/a	n/a	17.6	25.5	57.0	DC (6)
Norway	●	NDC	DC	100.0	...	...	DB (7)
Peru			DB/DC*	...	...	100.0	DC
Poland	●	NDC		..	6.3	93.7	DC (8)
Saudi Arabia	●	DB		n/a	n/a	n/a	DB
Singapore		DC		n/a	n/a	n/a	DC
South Africa	●	n/a	n/a	n/a	n/a	n/a	DC (9)
Spain	●	DB		24	76.0	...	DC (10)
Sweden	●	NDC	DC	n/a	n/a	n/a	DB (11)
Switzerland	●	DB	DB	100.0	...	...	DB
UK	●	DB		n/a	n/a	n/a	DB
US	●	DB		32.1	25.7	42.1	DC (12)

### General rules:

- If a country/region retirement system is designed as a Pay-as-you-go basis in which Current contributions are used for financing the pension benefits of current pensioners, aka., an unfunded system, it is classified as DB-dominant system.
- NDC are notional defined contribution accounts, typically with set contribution rates, minimum or administered rate of returns and annuity rate at which the accumulation is converted into a pension for mandatory occupation plans. These schemes are therefore implicitly defined benefit.
- In a **Point** scheme, workers earn pension points based on their earnings each year. At retirements, accumulated points are converted into a regular pension payment, based on a known pension-point value. These schemes are implicitly defined benefit.
- For those countries/regions for which the classification is not available or those that both DB and DC funds exist in the second-tier retirement income (mandatory savings), we base on the actual DB/DC split of pension assets by type of plan reported by OECD in *Pension Markets in Focus 2018*.

### Other notes:

1. China: China's retirement income system comprises an urban system and a rural social system as well as systems for rural migrants and public sector workers. The urban and rural systems have a pay-as-you-go basic pension consisting of a pooled account (from employer contributions or fiscal expenditure) and funded individual accounts (from employee contributions) earning a notional interest rate and to be converted into annuities for retirement. Supplementary plans are also provided by some employers, more so in urban areas. Although DC funds are offered, DB assets dominate the system.
2. France: Although OECD classifies France's mandatory saving as "DB+Points", the actual DB/DC split of pension assets shows that France has 66.5% of assets in occupational DC plans and 10% in personal plans. Therefore, we classify the pension system of France as a DC dominant system.
3. India<sup>xiv</sup>: India's retirement income system is complex with an earnings-related employee pension scheme, a defined contribution employee provident fund, a defined benefit lump sum gratuity benefit and voluntary employer managed funds. The majority of the assets out of the New Pension System is DB based or DC with administrative returns. Asset in the New Pension System is DC based. Although the National Pension System is gradually gaining popularity, at this stage, DB is still the dominant pension fund structure of India. Details are provided below.

Sector	Fund type	Description
Civil servants (most developed part of the system)	The Central Civil Service Pension Scheme	Unfunded defined benefit, pay-as-you-go scheme
	The Civil Service Provident Fund (employees of the Central Government)	Designed as a provident fund on a defined contribution basis but actually operates on a pay-as-you-go basis Contribution rate between 6% and 100% Benefits paid as a lump sum after at least 20 years of service Interest rate earned determined each year; currently 8.5%
	New Pension System (started in 2004)	A defined contribution scheme, Contributions are held by the government and awarded a rate of return of 8%
Private sector (of the organised section)	Three schemes run by the Employees' Provident Fund Organisation (EPFO)	Employee Provident Fund system

(1) Employees' Deposit Linked Insurance Scheme	
(2) Employees' Pension Scheme	Defined-benefit plan
(3) Employees' Provident Fund Scheme.	A defined contribution scheme with an administered rate of return that provides lump-sum benefits at the time of retirement
Exempted funds	Exempted Funds can be established as a substitute for the EPFO plans, provided that benefits at least match the ones of the EPFO plans and that the EPFO agrees.
Voluntary occupational schemes	Called superannuation funds, Provide additional pension benefits, mainly in the form of defined contribution plans.

4. Ireland: data is for 2017, OECD Stats: <https://stats.oecd.org/index.aspx?queryid=594>
5. Italy: As the occupational DC assets occupied 64.2% of total pension asset in 2017, Italy is classified as DC-dominant system.
6. New Zealand: New Zealand does not have a mandatory, second tier provision. More than 50% of pension assets in New Zealand is voluntary personal plans, KiwiSavers, which are DC.
7. Norway: NDC = Notional defined contributions, which are DB plans in nature, consistent with OECD data of DB as 100% of pension assets.
8. Poland<sup>xv</sup>: The mandatory individual accounts in Poland are open pension funds (OPF) and are of the DC type. Voluntary occupational pension plans (PPE) are DC plans. Therefore, the 93% of total pension assets in personal plans are DC based.
9. South Africa<sup>xvi</sup>: South Africa's retirement income system comprises a means-tested public pension and tax-supported voluntary occupational schemes. The majority of employees in the private sector are covered by defined contribution schemes while those in the public sector largely enjoy coverage under defined benefit arrangements. The South African environment has also seen considerable growth of multi-employer or —umbrella funds, which are DC in nature. Most of the large trade unions have established national defined contribution funds. Therefore, in the absence of data on specific split between DC and DB assets, we assume that DC assets are more popular in South Africa.
10. Spain: Although OECD classifies Spain's mandatory retirement saving system as public system with DB fund type, OECD's data of DB/DC asset split shows that 76% of total pension assets were DC. We classify Spain as a DC-dominant system based on actual asset structure.
11. Sweden<sup>xvii</sup>: DB schemes are also predominant particularly in Sweden. The main collectively bargained pension plan for white-collar employees, ITP, is defined benefit in nature for employees born before 1979, and defined contribution in nature for those born in 1979 and after. In some cases, there are also long transition periods in the transfer from DB to DC. DB schemes will thus remain for the foreseeable future in Sweden.
12. The United State: Although OECD classifies the US mandatory retirement saving system as a DB based public system, its actual DC/DB split shows that DC assets occupied 25.7% and personal assets 42.1%, which are also typically DC. Therefore, we classify the US as a DC-dominant system.

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<sup>i</sup> MMGPI data was provided by Mercer. Data may involve estimates provided by international consultants of Mercer. ACFS provides no guarantee on the accuracy of the data contained in this report. This report should not be relied upon as financial advice for investment.

<sup>ii</sup> Brinson, Gary P., Hood, Randolph L. and Beebower, Gilbert L., 1986. Determinants of Portfolio Performance. *Financial Analysts Journal* 42(4): 39 – 48; reprinted 1995 in *Financial Analysts Journal* 51(1): 133-38 (50<sup>th</sup> Anniversary Issue).

<sup>iii</sup> The 10/30/60 rule widely discussed in the superannuation industry: <https://www.theaustralian.com.au/business/wealth/the-103060-rule-of-superannuation-value/news-story/34493a37f1445bcf4470dee687d4dbac> and <https://cuffelinks.com.au/10-30-60-no-longer-rule/>

<sup>iv</sup> Thinking Ahead Institute (2018), *Global Pension Assets Study 2018*, Willis Towers Watson.

<sup>v</sup> Tapia, W. (2008), “Comparing Aggregate Investment Returns in Privately Managed Pension Funds: An Initial Assessment”, *OECD Working Papers on Insurance and Private Pensions*, No. 21, OECD Publishing, Paris.

<sup>vi</sup> <https://www.pensionfundsonline.co.uk/content/country-profiles/south-africa> and <https://euracs.eu/summaries/south-africa-pension-summary/>

<sup>vii</sup> <https://www.pensionfundsonline.co.uk/content/country-profiles/>

<sup>viii</sup> In Colombia, there are two parallel and mutually exclusive pension systems. The first of these two systems is a pay-as-you-go defined benefit plan and the second is a system of funded individual accounts offered through qualified financial institutions. An employee elects to join one system although there is the option to change later, up until 10 years before retirement, within certain restrictions. The employer and employee contribution rates are the same for both systems.

Similarly, Peru's retirement income system comprises a means-tested pension paid to the needy and two parallel and mutually exclusive pension systems. People are able to choose between a pay-as-you-go defined benefit public system and a fully funded defined contribution system managed by the private sector. Only people under the defined benefit scheme can change, and it is an irreversible decision.

<sup>ix</sup> Thinking Ahead Institute (2018), *Global Pension Assets Study 2018*, Willis Towers Watson.

<sup>x</sup> Holzmann, R. and Hinz, R (2005) *Old-Age Income Support in the 21<sup>st</sup> Century: An International Perspective on Pension Systems and Reform*, The International Bank for Reconstruction and Development / THE WORLD BANK, Washington, D.C, USA

<sup>xi</sup> Mercer used data from the Economist Intelligence Unit to calculate the annual saving rates for the annual MMGPI reports.

<sup>xii</sup> For the level of household debt, MMGPI used an average of data taken from Trading Economics (2018) and CEIC (2017).

<sup>xiii</sup> As the level of household debt was added to MMGPI data in 2018, there have been only 34 cross-section observations and the t-test value is not statistically significant.

<sup>xiv</sup> OECD (2017) Pensions at a Glance: Country Profiles – India: <http://www.oecd.org/els/public-pensions/PAG2017-country-profile-india.pdf>, and Pension Funds Online: Pension System in India: <https://www.pensionfundsonline.co.uk/content/country-profiles/india>

<sup>xv</sup> <https://www.pensionfundsonline.co.uk/content/country-profiles/poland>

<sup>xvi</sup> <https://www.pensionfundsonline.co.uk/content/country-profiles/south-africa>

<sup>xvii</sup> OECD Pension Country Profile – Sweden: <https://www.oecd.org/finance/private-pensions/42575076.pdf> and PensionsEurope: Pension Fund Statistics 2017: <https://www.pensionseurope.eu/system/files/PensionsEurope%20statistics%202017%20-%20Explanatory%20note.pdf>

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