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Research Report

Pension wealth returns in Danish households

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Pension Wealth Returns in Danish Households

We have estimated a new measure of pension wealth gains, covering the working-age population in Denmark during 2015-2022, in collaboration with Statistics Denmark. By linking this new data to the existing income and tax registers at the individual level, we provide a full picture of net financial wealth gains across the age distribution. This lays out the basis for further analysis, e.g., of the impact of monetary policy on net capital gains in Danish households. The data can be accessed through Statistics Denmark's research data portal.

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New micro data allows for studying pension wealth returns in Denmark

Based on flow and stock information, Danmarks Nationalbank and Statistics Denmark have produced a new micro-level dataset with estimates of pension wealth returns for the working-age population in Denmark. The data is available through Statistics Denmark's research data portal.



This new measure ensures more complete data coverage of Danish households' capital gains

The new data can be linked to a range of existing administrative records, allowing measurement of both capital returns and interest expenses for a large part of the Danish population. This provides a comprehensive picture of net financial wealth returns for Danish households. This is a key data innovation as pensions constitute a large part of Danish households' financial wealth.



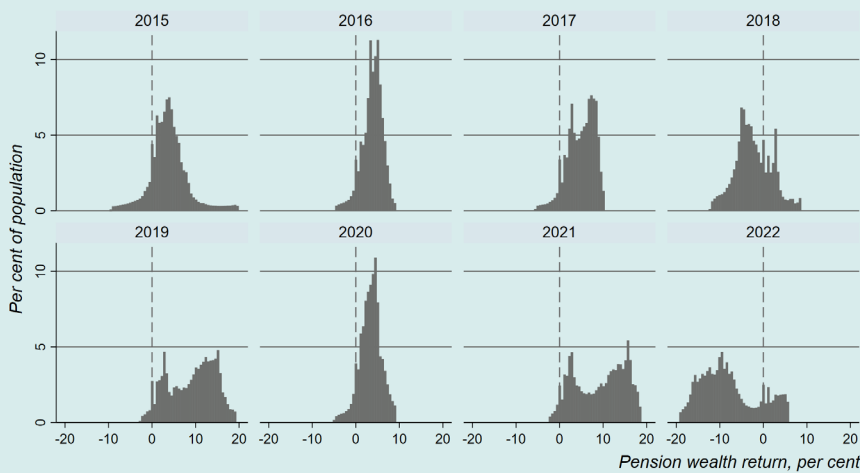
Net financial wealth returns are positive for most Danish households when including the return on pension wealth

Over the period covered by our data, Danish households' return on wealth, including pension wealth, exceeded their interest expenses. Future research should aim to uncover the role of pension wealth returns in the transmission of monetary policy shocks to households' spending and savings decisions.

Why is it important?

Danmarks Nationalbank collects and produces a wide range of data, including individual level information about the capital return of pension wealth. Data coverage of capital returns on all financial assets as well as expenses on liabilities in Danish households is key when analysing the impact of e.g. monetary policy shocks on household consumption and spending decisions.

Pension wealth returns vary substantially over time and across individuals



Note: The graph shows the distribution of estimated pension wealth gross returns for all working-age individuals in Denmark who do not switch between pension funds nor switch products within a fund in a given year.

Source: Danmarks Nationalbank and Statistics Denmark

Key words

Savings

Insurance and pension

Interest rates

Households and corporations

Danish economy

Introduction

Denmark has a large funded pension system and consequently, Danish households' capital returns on pension wealth is substantial compared to their income. Wealth and debt are, however, unevenly distributed, e.g., across age and income groups. Younger households typically have more debt, while older households own more financial assets and pension wealth. As changes in interest rates affect both assets and liabilities, net interest rate changes affect households with very different intensity across a range of household characteristics.

This paper presents a novel dataset on pension wealth returns at the level of each pension contract in Denmark, covering 2015-2022, and combines it with individual-level income and wealth records from the Danish tax authorities to show how capital gains and interest payments are distributed across households. We construct a measure of returns on pension wealth as seen from the savers' point of view. Being able to consider the quantitative importance of capital returns on financial assets, including pensions, is an important innovation in obtaining a full-mirror perspective of how net interest rate changes may impact Danish households.

Our data shows that individuals in Denmark between 20 and 59 years of age earned DKK 19,000 per year, on average, on their pension savings during the period that our data spans. This is a large amount considering that the average return on free stock market wealth was around DKK 6,000, the interest earned on bank deposits averaged DKK 1,100, and interest expenses incurred averaged DKK 10,000. All amounts are measured before taxes. It is important to note that the number we refer to as pension wealth returns in this Economic Memo is essentially the year-to-year change in the stock of pension wealth minus transactions in and out of the accounts. In other words, we do not refer to the return earned by pension funds but rather the returns visible to savers. Another important consideration is that the data spans a perhaps unusual period where returns were generally high in a historical context, and where a full business cycle is not covered. The results presented here can therefore not necessarily be interpreted as the average return to pension wealth in the long term.

We show that net financial wealth returns in Danish households increase from 0 to 5 per cent of income annually from age 21 to 59. This includes returns on all financial assets, including pensions, minus interest expenses paid on all liabilities. The age gradient tends to be even steeper when considering only homeowners, who are typically highly leveraged. Although this insight is not new conceptually, the new data allow us to document the quantitative importance of the distribution of all financial assets and liabilities on households' budgets.

The important lesson learned from our exercise is that, despite being a less liquid type of asset, pensions may play an important role in households' long-term spending decisions as they constitute the main share of households' capital return. The expected longer-run capital return is an important factor in evaluating the incentive to save out of disposable income. The implication of pension wealth returns on the transmission of monetary policy is for the same reason an important and understudied area of research.

Future research should aim at identifying the elasticity of intertemporal substitution when including not only financial asset price changes but also, and in particular for Denmark, sizeable capital returns generated in funded pension schemes. There is also clearly scope for further research into questions related to monetary transmission.

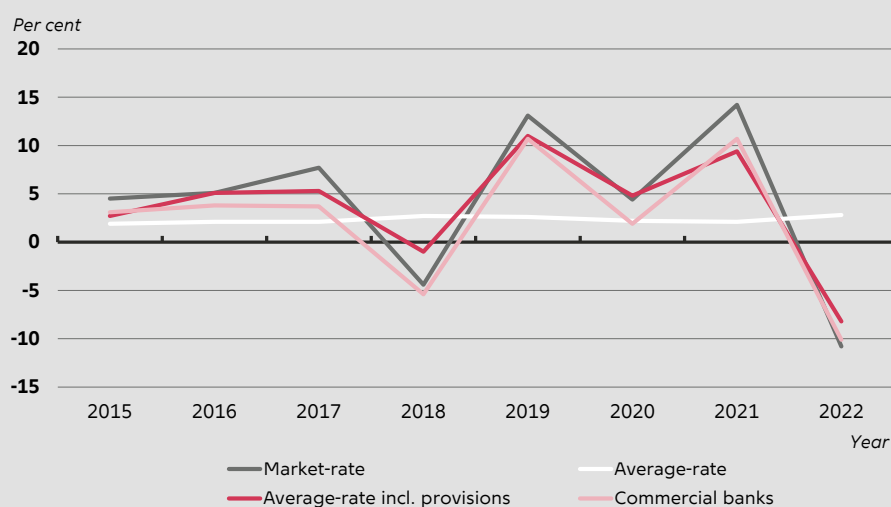
The composition of household balance sheets could play a large role for the transmission of e.g. interest rate changes to the real economy, in particular in a country like Denmark, where households have large balance sheets. Researchers interested in such questions can access our dataset through Statistics Denmark's Researcher Services.

Pension wealth returns depend on contract type

Figure 1 shows the median gross return on pension wealth from 2015 to 2022 using our dataset described in Box 1¹. The return is split by product type. The dark grey line corresponds to market-rate products in pension companies, while the white and dark pink lines show returns for average-rate products (excluding and including collective reserves). The white line depicts the return of average-rate deposits where only deposits and special bonus provisions are considered. The dark pink line shows the return of average-rate products containing all collective provisions; refer to Box 1 for further details. While the average-rate products shield pension savers from market volatility, market-rate products mimic the stock market returns in Denmark more closely. The light pink line shows the median return in commercial banks.

FIGURE 1

Pension wealth returns



Notes: The figure shows the median gross returns to pension wealth split by product type. For average-rate products, we calculate two return measures. One measure that includes the return on pension deposit and special bonus provision (white line), and another measure that accounts for all collective provision in the computation (dark pink line).

Source: Danmarks Nationalbank and Statistics Denmark.

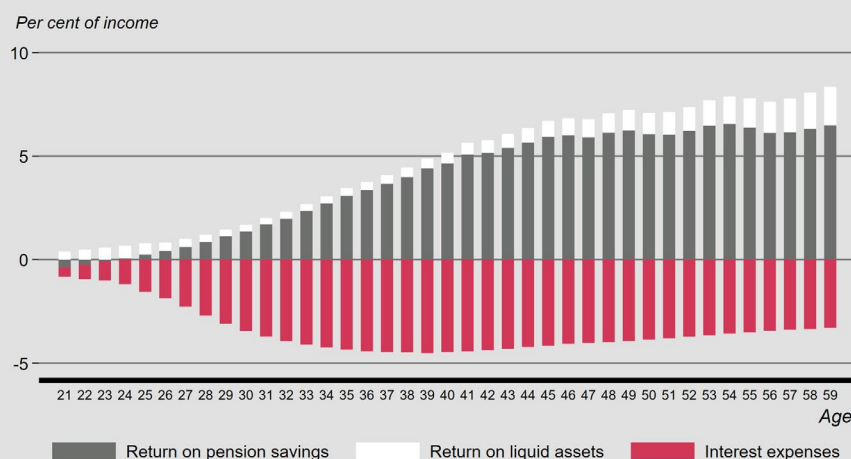
¹ Gross returns, where pension contributions are not corrected for administrative fees and risk deductions, are available for all products. Net returns are only available for products in pension companies. This is due to a reporting asymmetry, as administrative fees and risk deductions are reported solely by pension companies.

Pension wealth returns increase with age

Funded pension schemes in Denmark have substantial coverage and contribution rates, meaning that pension wealth correlates with age. For this reason, measured in nominal terms, pension wealth returns also increase with age. Figure 2 shows that over the period covered by our data, individual pension wealth returns measured as share of income increased from 0 per cent on average for 21-year-olds to 6 per cent on average for 59-year-olds. The figure also clearly demonstrates that pension wealth returns made up most of all capital gains earned by Danish households. Returns on savings in non-retirement accounts made up less than 2 per cent of the income for 59-year-olds on average.

FIGURE 2

Pension wealth returns increase with age, amounting to 6 per cent of total pre-tax income at age 59



Notes: All values are measured pre-tax. Income is measured for each individual as average income in the sample period, excluding interest income. Return on liquid assets is the sum of interest income and an estimated return on stocks (the growth in the C20 index multiplied by the value of stocks at the end of the previous year). All variables have been truncated at the 99th percentile in each year to reduce the impact of extreme values. Variables that can take on negative values (such as return on liquid assets) have also been truncated at the 1st percentile in each year. The figure shows averages over the sample period, 2015-2022.

Source: Danmarks Nationalbank and Statistics Denmark.

Interest expenses, on the other hand, tend to be hump-shaped, being largest for individuals in the middle of the working age. This is also illustrated in Figure 2, in which the red, negative bars show the average interest expenses within each age bin.

All numbers presented in Figure 2 are measured before taxes. The taxation of each component is based on different principles, as shown in Table 1. While interest expenses are subsidised by the predominant tax rate of 33.7 per cent each year,

returns on pension wealth and returns on assets in the so-called Aktiesparekonto² are taxed each year by 15.3 and 17 per cent, respectively. Other assets are taxed when realised by a higher tax rate of minimum 27 per cent. Finally, pension payouts are taxed by the personal income tax rate, meaning that the returns on pension wealth will be taxed additionally by a 37-52 per cent tax rate in retirement. This implies that the after-tax net return on pension wealth is considerably lower than illustrated in Figure 2.

TABLE 1
Net financial wealth returns are subject to various tax rates in Denmark

	Capital return tax rate		Personal income tax rate
	Each year	When realised	When realised
Return on liquid assets	17 ¹⁾	27/42 ²⁾	
Return on pension savings	15.3		37-52 ³⁾
Interest expenses	33.7/25.7 ⁴⁾		

Notes: ¹⁾ Applies only to assets in "Aktiesparekontoen", which has an annual deposit limit of DKK 106,600 (2023).
²⁾ The low rate applies up to DKK 58,900 per individual.
³⁾ Varies across municipality of residence and income level. "Aldersopsparing" is not taxed when realised.
⁴⁾ The low rate applies up to DKK 50,000 per individual.
Source: The Danish Ministry of Taxation.

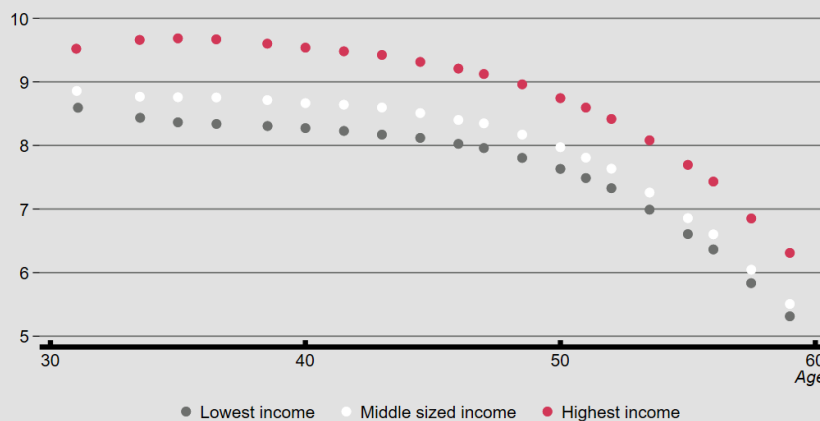
Figure 3 shows the volatility in pension wealth returns across age bins for market-rate product owners, split by income. Pension contracts often have the built-in feature that the level of risk decreases as individuals become older and closer to retirement. In practice, the bond share in the portfolio is increased, while the stock market exposure is reduced. The figure also shows that volatility is highest for the highest income groups.

² An Aktiesparekonto is an account that gives the saver a certain tax discount on investment gains. It has a deposit limit of DKK 106,600 in 2023. Taxation is however an annual deposit tax (investment gains are otherwise taxed when realised), and savers can only have one Aktiesparekonto.

FIGURE 3

Volatility in pension wealth returns decreases towards retirement age

Standard deviation of return to pension wealth



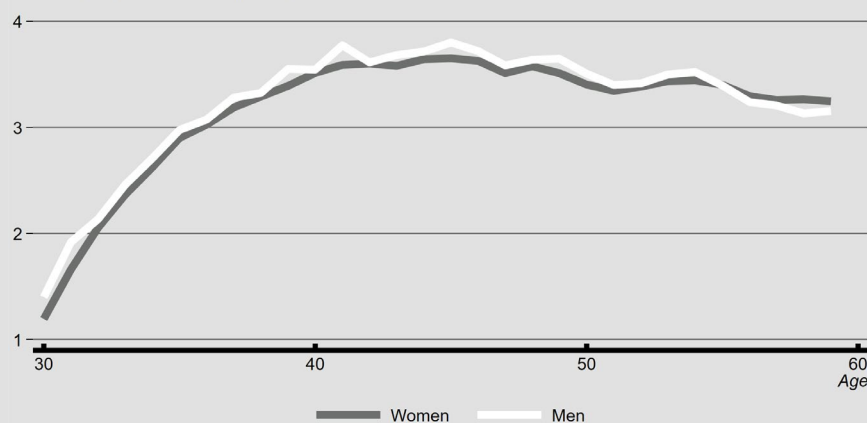
Notes: Refer to the note of Figure 2. Income groups are based on terciles of the within-age group distribution of pre-tax income. Only savers with market-rate products as their dominant product type are included.

Source: Danmarks Nationalbank and Statistics Denmark.

FIGURE 4

Relatively small gender differences in return on pension wealth

Return on pension wealth, per cent



Notes: Refer to the note of Figure 2.

Source: Danmarks Nationalbank and Statistics Denmark.

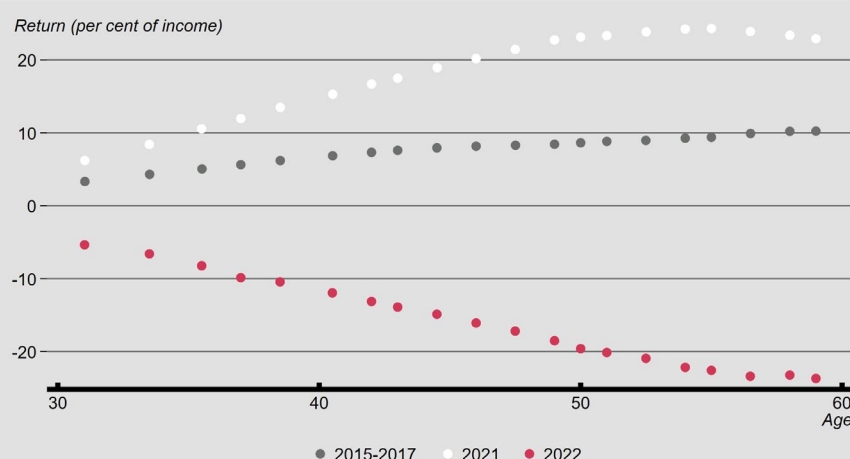
In terms of gender, men have generally had higher returns than women over the sample period, but differences are rather small, see Figure 4. While women experienced somewhat lower returns than men in high-return years, the opposite was the case in low-return years. Risk-taking at the individual or pension fund level as well

as a range of other factors could potentially explain this pattern. Further analysis will be needed to draw any conclusions about the reasons for these differences.

As shown in Figure 1, some years are exceptional, either as low-return years such as 2022 or high-return years such as 2021. For comparison, returns were much more steady during 2015-2017. During this steady period, older savers earned a higher return than younger savers (relative to their income), simply because older savers have larger pension balances. This is reflected in the grey age profile of returns in Figure 5. In high-return years such as 2021, the effect of having large pension balances becomes even more evident, as the age-gradient becomes even steeper. Interestingly, in a year such as 2022, where returns were low and bond prices fell, the picture is the opposite – older savers experienced a larger loss of wealth in 2022 than younger savers. This happened to some extent because older savers generally have more bond-based portfolios compared to younger savers. This generally results in less volatility in returns for the older savers (see e.g. Figure 3), but as the data shows, this may not hold in years with large interest rate increases.

FIGURE 5

Older savers experienced largest wealth gains in 2021 and lowest in 2022



Notes: Refer to the note of Figure 2.

Source: Danmarks Nationalbank and Statistics Denmark.

Net financial wealth returns are positive for most groups

For most age groups in Denmark, returns on total financial assets, including pension, were larger than interest expenses on total liabilities in the period that our data spans (see Figure 2). Figure 6 divides all individuals into ten equally sized bins based on their total outstanding debt. The far right deciles cover borrowers with the largest debt, additionally showing that their interest expenses were larger than for any other group. However, individuals with higher debt levels also earned higher (nominal) returns on their pension wealth. Accounting for both financial assets and liabilities, net financial wealth returns were positive for all debt deciles except the two highest.

FIGURE 6

Net financial wealth returns have been positive – except for the most indebted borrowers

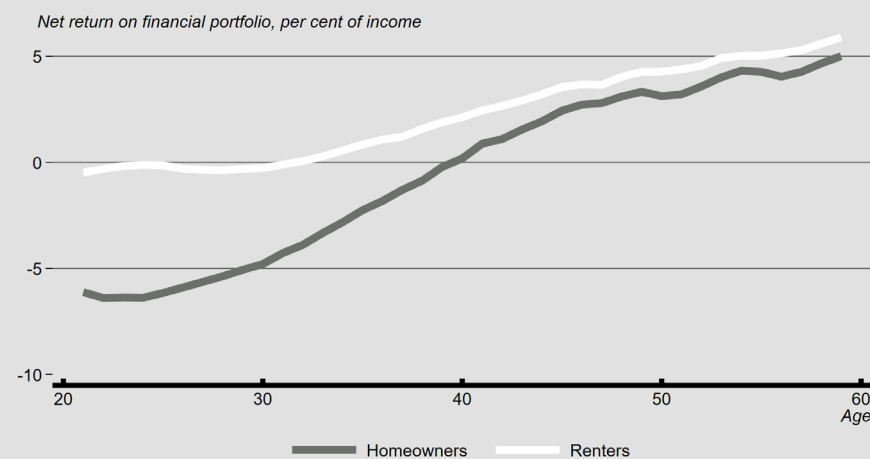


Notes: Refer to the note of Figure 2. Deciles for debt level are based on gross debt.
Source: Danmarks Nationalbank and Statistics Denmark.

Younger homeowners generally had negative net returns on their financial wealth. This is illustrated in Figure 7, showing that net returns were negative for homeowners until around age 40. This reflects that this segment yet remains to build sizable financial wealth but have sizeable debt to finance home purchases. Tenants who rent their home, on the other hand, do almost consistently earn positive net returns on their financial wealth.

FIGURE 7

Net wealth return profiles differ between owners and renters



Notes: Refer to the note of Figure 2. The net return on the financial portfolio is the total returns on liquid assets and pension wealth minus interest expenses.

Source: Danmarks Nationalbank and Statistics Denmark.

Time to retirement plays a role for savings behaviour

Imagine that pension wealth returns unexpectedly increase by 1 percentage point while in the working age. Older savers earn the largest return when measured as share of their income, because they already have a large pension balance. Younger savers do, however, have many years left in the accumulation phase, in which they will earn compound interest.

In Figure 8, we illustrate the impact of a one-year 1 percentage point higher-than-expected pension wealth return on savers' budgets. The budget effects are simply 1 per cent of the average pension wealth within each age group. Moreover, we compute the compound interest that arguably should be added on top of the excess return. In our simple setup, compound interests are based on a fixed 5 per cent annual return until retirement at age 60 and a discount rate of 3 per cent.

FIGURE 8

The effect of a temporary shock to pension wealth returns vary across age groups



Notes: The Figure shows the average contemporaneous effect on pension wealth of a 1 percentage point increase in returns for one year as well as the compound interest accruing from that age until retirement (which for simplicity is assumed to be at age 60), scaled by current income. The combined height of the bars can thus be interpreted as the net present value of the expected wealth increase at retirement as a result of this temporary increase in the realised return. We assume a future return of 5 per cent and a discount rate of 3 per cent.

Source: Danmarks Nationalbank and Statistics Denmark.

This exercise illustrates that compound interests matter most for mid-working age, around age 43. At this point in life, pension balances are fairly large on average and there are sufficiently many years left in the accumulation phase to earn sizable compound interest on the 1 percentage point excess return. Arguably, choice of risk profiles also matters to this particular segment of savers, as the impact of compound interest is smaller for both younger and older segments.

The implications for savings and spending behaviour of an unexpected shock to net wealth returns are not straightforward to gauge. Several important factors are at play. For instance, do savers form expectations about whether the shock is transitory or persistent? Are savers forward-looking agents who rationally optimise their savings intertemporally, or are they inattentive towards changes in circumstances and more likely to be characterised as rule-of-thumb savers? Finally, how important are liquidity constraints in the context of pension wealth returns? Pension wealth is often a less liquid type of saving than savings in non-retirement accounts. An unexpected excess pension wealth return could in principle lead to increased income both immediately and in the future, but if the saver does not have liquid wealth to draw upon or is already at her borrowing limit, the excess return can only be spent when the balance is paid out in retirement. A deeper understanding of the elasticity of intertemporal substitution when including pension wealth should be the topic of future studies.

BOX 1

The new pension flow data (PENSFLOW)

The first step in estimating gains in pension wealth is to construct a complete dataset on pension wealth stocks and flows for the Danish population. Granular pension wealth data (PENSFORM) has been collected since 2014 by Danmarks Nationalbank and Statistics Denmark in collaboration with all pension companies and banks in Denmark. Contributions (PENSIND) and payouts (PENSUDBE) are tax data collected by Statistics Denmark. However, the payouts data does not include tax-exempt payouts from "aldersopsparing", which cover approximately 9 pct. of the overall stock of pension wealth after tax in Denmark. This leaves a hole in the payouts data, which we fill by imputing payouts from "aldersopsparing" in collaboration with Statistics Denmark.³

These four datasets are merged using the Danish citizens' unique identifier (CPR number). Also, to maintain the granularity of the data, we merge at the company, contract, pension type and tax code level. The longitudinal nature of the datasets allows us to residualise the size of pension wealth changes from one year to the next, which cannot be attributed to transactions or consolidation of wealth. This is what we in this paper refer to as returns to pension wealth or pension wealth gains. The measure is seen from the pension savers' point of view and cannot directly be compared to returns on investments at the pension fund level. The new dataset, PENSFLOW, is available through Statistics Denmark Research Service.

PENSFLOW contains information about the payout profile (life-long annuity, fixed-year annuity, or lump sum) and whether the contribution is made by the saver or by an employer on behalf of their employee. Finally, the data holds information on whether the contract is a market-rate or average-rate product (see Box 2 for more information).

The dataset is highly disaggregated as a policyholder can have several contracts with different pension companies. Moreover, each contract can have several payout profiles. Before computing gains in pension wealth, we restrict the sample in two ways:

- We only consider working-age individuals in their contribution phase.
- We track all changes in pension wealth not directly associated with corresponding contributions or disbursements to more accurately measure the net increase in pension wealth and mitigate any concealed administrative costs arising from divestment and reinvestment processes. Approximately 7 per cent of our contributing-phase sample exhibit wealth movements that are not matched by corresponding contributions or payouts each year. Contracts subject to these transitions are termed "shifters" for the given fiscal year, and their returns are denoted as NA (not available) for that specific period.⁴

The gains in pension wealth that we compute are approximated following Dietz (1968):

$$\frac{d_{ifpst} - d_{ifpst(t-1)} - f_{ifpst}}{d_{ifpst(t-1)} + 1/2 f_{ifpst}},$$

where d_{ifpst} denotes the total stock of pension wealth for individual i in fund f with pension type p and tax-code s measured by the end of year t , while f_{ifpst} denotes the total pension contribution during year t . We identify two key metrics of wealth gains: a gross growth rate and a net growth rate. The first takes contributions as given and does not remove expenses linked to administrative and risk coverage costs. This is necessary for a comparable measure across all types of institutions, as commercial banks and company pension funds (firmapensionskasser) do not report administrative fees and risk coverage costs. The net growth rate, only available for pension funds, discounts contributions using the data on administrative fees and risk coverage costs available.

When estimating pension wealth gains, we further dissect the gross and net growth rate metrics into four different metrics:

- A "broad" gross growth rate: considers all components of pension wealth (including the various reserves) and does not subtract administrative fees and risk coverage costs.
- A "narrow" gross growth rate: considers only pension deposits and special bonus provisions and does not subtract administrative fees and risk coverage costs.
- A "broad" net growth rate: considers all components of pension wealth (including the various reserves) and corrects contributions, removing administrative fees and risk coverage costs.
- A "narrow" net growth rate: considers only pension deposits and special bonus provisions and corrects contributions, removing administrative fees and risk coverage costs.

The broad gross growth rate is the only measure available for all institutions, including Arbejdsmarkedets Tillægspension (ATP), a statutory Danish lifelong supplementary pension that by law includes everyone active in the Danish labour market, and Lønmodtagernes Dyrtidsmidler (LD).⁵

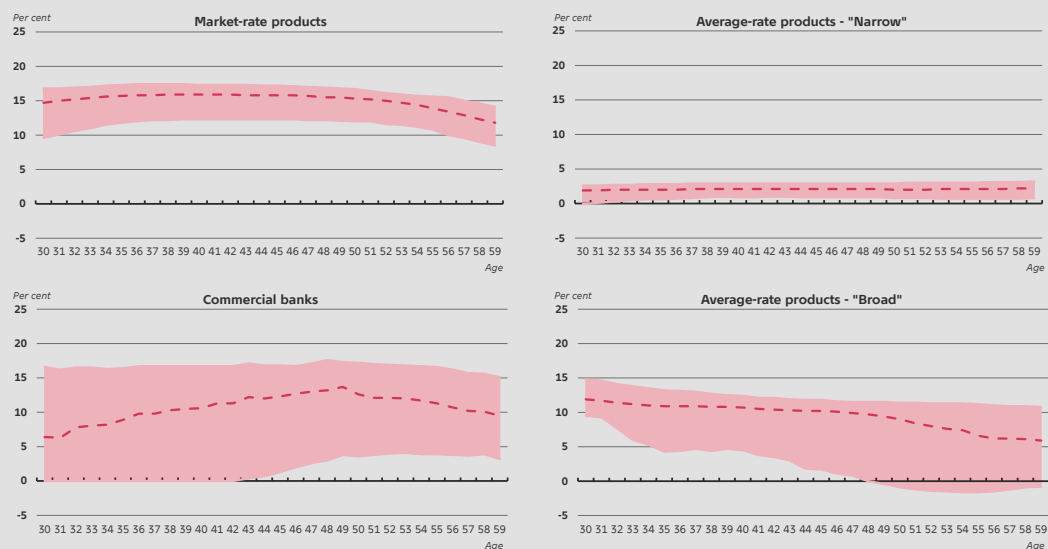
³ Documentation concerning this imputation can be found here: [Link](#).

⁴For the analysis presented in this memo, we exclude individuals having at least one contract denoted as a "shifter" in that year, except if these contract(s) contain zero wealth.

⁵ More detailed information can be found here: [Link](#).

FIGURE 9

Median gross returns to pension wealth for different product types in 2021



Notes: The figure shows the median gross pension wealth gains split by product type. Light pink bands denote the 1st and 3rd quartiles. For average-rate products, we calculate two return measures. One measure that includes the return on pension deposit and special bonus provision, and another measure that accounts for all individualized collective provisions.

Source: Danmarks Nationalbank and Statistics Denmark.

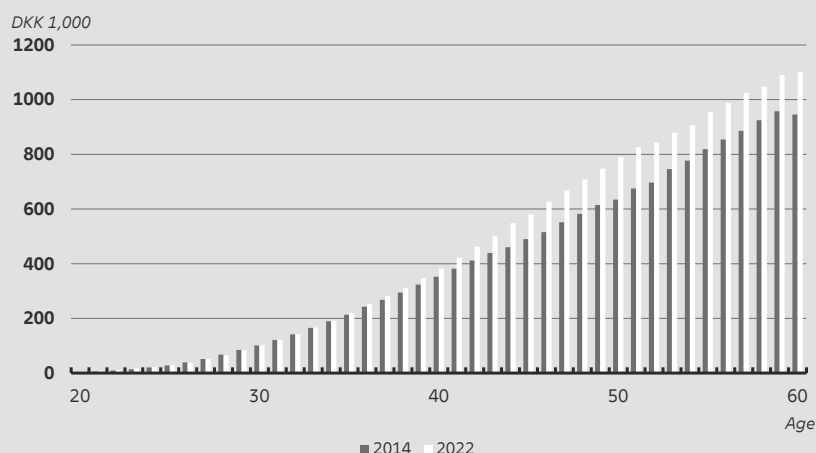
BOX 2

Market-rate versus average-rate pension products in Denmark

The average pension wealth for people aged between 20 and 60 years has increased from around DKK 390,000 in 2014 to DKK 545,000 in 2022 measured after tax, see Figure 10. The total pension wealth is composed of pension savings primarily in banks, in ATP and in pension funds. Pension funds typically offer the pension saver either a market-rate or an average-rate product.

FIGURE 10

Average pension wealth in 2014 and 2022



Notes: The figure shows average pension wealth after tax split by age for people not receiving any pension payments.

Source: Danmarks Nationalbank and Statistics Denmark.

For the pension saver, the major difference between a market-rate and an average-rate product is the volatility of the return on their pension wealth. An average-rate product comes with a guaranteed minimum return whereas the return on market-rate products typically fluctuates with the stock market return.

Average-rate products come with a guaranteed minimum return on the pension deposit. Hence, the risk of market volatility is primarily carried by the pension fund, and to be able to meet the guaranteed returns the pension fund will accumulate considerable provisions, which will serve as buffers in bad times. The buffers work to smoothen the return on pension wealth for the pension saver over time. The pension wealth for individuals having an average-rate product will consist of the actual pension deposit and a share of the provisions built by the pension company.

Market-rate product returns are closely linked to the return on the pension funds' investments. Market-rate products can potentially be a source of capital gains, yet the risk associated is also higher causing the pension balance to become more volatile.

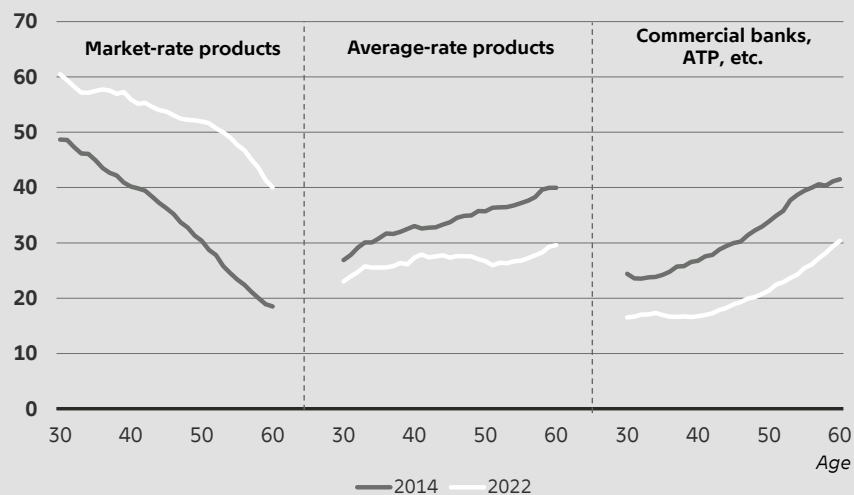
Market-rate products often allow clients the opportunity to choose between different risk profiles for their pension savings, for example, by choosing their portfolio composition or individually deciding specific investments. Some pension companies implemented a life-cycle investment strategy to manage the clients' risk in these products. Within a given risk profile, funds belonging to younger individuals are invested into more risky assets with potentially higher returns. As the individual ages, the risk exposure of the pension wealth is gradually decreased, reaching its lowest when the client is close to retirement.

Over recent years, there has been a shift from average-rate to market-rate products. In 2014, market rate products took up 22 per cent of the total pension balance and in 2022, the share increased to 37 per cent.

FIGURE 11

The market-rate product share has increased by 10-20 percentage points

Per cent of total
pension wealth



Notes: The category "Commercial banks, ATP, etc." includes pension wealth in commercial banks, ATP, Lønmodtagernes Dyrtdsfond, company pension funds and the product type "Livrente uden ret til bonus". Pension wealth is measured after tax for people who are not receiving any pension payments.

Source: Danmarks Nationalbank and Statistics Denmark.

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