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* Views expressed are those of the author and do not necessarily reflect official positions of De Nederlandsche Bank.

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Abstract

Governments across the world have issued inflation-linked debt to finance their deficits. Recent advances in asset pricing models recognize that there may be clientele effects that affect relative prices, especially in bond markets. We study investor demand for inflation-linked bonds using detailed bond portfolio data. Our analysis reveals pronounced market segmentation: insurance companies, with predominantly nominal liabilities, underinvest in inflation-linked securities, while pension funds overinvest. Investors hedging inflation risk exhibit a strong preference for bonds indexed to domestic rather than foreign inflation. A regulatory reform announcement provides quasi-experimental evidence that the demand for inflation-linked bonds may be shaped by regulatory requirements.

Keywords: sovereign bonds, inflation-linked bonds, TIPS, investor clientele, securities holdings.

JEL codes: F21, G11, G15, G22, G23.

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I. Introduction

Investors are aware of inflation risk, acknowledging that it significantly affects the realized returns of their portfolios (see Malmendier and Nagel, 2016; Braggion et al., 2023). To hedge against inflation, inflation-linked bonds have gained renewed attention among investors with rising government deficits after the global pandemic in early 2020, followed by the surging global inflation levels between mid-2021 and 2023 (Cieslak and Pflueger, 2023; Nair and Sturzenegger, 2024). Along with increasing government debt levels, inflation-linked bonds have tripled in size globally over the past decade (Gomez-Gonzalez, 2019; Velandia-Rubiano et al., 2022), reaching outstanding debt volumes of EUR 3.2 trillion (USD 3.5 trillion) at the end of 2022.[1]

While the literature has focused on supply side considerations (Campbell and Shiller, 1996; Roll, 1996; Andreasen et al., 2021) and portfolio optimization strategies (Roll, 2004; Garcia and van Rixtel, 2007; d'Amico et al., 2018; Swinkels, 2018), there is a surprising lack of systematic evidence on investor clientele of inflation-linked bonds. In this paper, we empirically analyze the ownership of inflation-linked bonds to study who hedges against inflation. Our main research question is to understand who invests disproportionately in inflation-linked bonds. And against what inflation do investors want to protect themselves? Will investors tilt their portfolios towards bonds linked to their domestic consumer price index?

To analyze these questions, we use granular portfolio holdings data from different types of investors from 20 euro area countries to study investor demand at the bond level over the period 2013 to 2023. By doing so we close the empirical gap on the investor base of inflation-linked bonds, showing how market segmentation reduces international risk-sharing as certain investors prefer to hedge against local inflation. Analyzing the holdings of euro area investors provides an interesting laboratory setting. Most governments have issued inflation-linked bonds that are linked to (harmonized) inflation in the euro area (see Arnold, 2015), including countries such as Germany, Italy, and Spain (see Equiza-Goñi, 2023). One notable exception is France, which has also issued inflation-linked bonds linked to its domestic consumer price index, allowing us to disentangle the demand for domestic inflation hedging. Furthermore, we assess the impact of a new pension system law in the Netherlands using a difference-in-difference model to assess

[1] According to the latest available BIS Debt securities statistics, table C2, retrieved on 23 June 2025 from https://www.bis.org/statistics/c2.pdf.

how regulatory changes may shift the demand for inflation-linked bonds by pension funds. This reinforces the idea that clientele effects can be related to (the lack of) regulatory pressure to hedge inflation risks.

Our main findings can be summarized as follows. There is a substantial preference for inflation-linked instruments among European investors. At the end of 2023, investors in the euro area hold 13% of the global government bond market, but have a footprint of 20% for inflation-linked bonds. After estimating our bond-level demand regressions adjusting for specific investor preferences, we find that compared to a fully diversified government bond market portfolio allocation, euro area investors have 35 percent higher investment in inflation-linked bonds worldwide than in nominal bonds. Within the euro area, these shares increase to 46% for government bonds and 65% for inflation-linked bonds, suggesting that euro area investors want to hedge primarily against euro area inflation.

We find strong evidence of market segmentation among different investors. The insurance sector invests significantly *less* inflation-linked bonds, while pension funds hold significantly *more* inflation-linked bonds than the average euro area investor. Investors prefer to invest in bonds that protect them against domestic inflation shocks, reducing the sharing of international risk. Such local inflation hedging is especially relevant for retail investors. Our results derived from a pension reform in the Netherlands further show how these preferences to hedge against inflation are shaped by regulation. While pension funds in general exhibit high demand for inflation-linked bonds, this demand was almost completely terminated after the reform announcement, which puts more weight on the nominal value of the pension assets instead of focusing on the (real) liabilities. We explain our results in an investor clientele framework to highlight the importance of understanding why certain investors tilt their portfolios toward inflation-linked bonds.

We contribute to three strands of literature. First, we contribute to the literature on inflation-linked bonds by providing systematic empirical evidence on investor demand for inflation-protective assets (Garcia and van Rixtel, 2007; Christensen et al., 2016; Nagel and Yan, 2022; Cieslak and Pflueger, 2023). Second, we contribute to the literature on investor clientele, market segmentation, and preferred habitat models (Culbertson, 1957; Greenwood and Vayanos, 2010; Guibaud et al., 2013; Vayanos and Vila, 2021) by elucidating its relevance in an unexplored segment of global bond markets, namely inflation-linked bonds. Butler et al.

(2023) show how the decline in the demand by insurance companies for government debt altered the maturity composition of government debt. Our work highlights that bond issuances with inflation hedge may also depend on the development of the domestic insurance sector, but more so on the pension funds. We build on related studies emphasizing the importance of the investor base (Dathan and Davydenko, 2020; Koijen and Yogo, 2023; Kubitza, 2023), suggesting that, for inflation-linked government bonds, this may also be driven by segmented market demand, especially to hedge against domestic inflation. Third, we build on a large literature on the importance of long-term investors and pension fund investor clientele within the government bond market (Greenwood and Vissing-Jorgensen, 2018; Agrawal et al., 2025; Díaz and Hansen, 2025; Jansen, 2025). Building on the macroeconomic findings of Greenwood and Vissing-Jorgensen (2018) that pension fund demand arises from hedging based on regulatory discount curves, our paper suggests that pension fund demand for inflation-linked bonds is indeed sensitive to regulatory shocks. Our work thus highlights how long-term institutional investor demand is shaped by the regulatory environment (see Domanski et al., 2017; Klingler and Sundaresan, 2019; Boermans and van der Kroft, 2024), providing new insights on how investors' hedging of inflation affects demand-based asset pricing (see e.g. Koijen and Yogo, 2019; Van der Beck, 2022; Murray and Nikolova, 2022; Koijen and Yogo, 2023).

The remainder of this paper is organized as follows. Section 2 provides an overview of related literature, Section 3 contains a description of the data and its summary statistics. In Section 4, we explain our methodology, and Section 5 contains the empirical results. Finally, Section 6 concludes.

II. Related literature

Inflation-linked bonds are debt instruments with variable cash flows, as coupon payments and principal are indexed with realized consumer prices. The most common issuers of this type of debt are governments. In the United States, these bonds are commonly known as Treasury Inflation Protected Securities (TIPS). There are three broad research strands on inflation-linked bonds. First, on the supply side, there is a large literature on the security design considerations from the perspective of the issuer, focusing mainly on the mechanics of inflation-linked bonds and the advantages and disadvantages of issuing them. A key element in the design is the

choice of the underlying inflation index and liquidity considerations (Campbell and Shiller, 1996; Roll, 1996; Andreasen et al., 2021). Governments typically use domestic consumer price indices, because to fund government deficits, tax income is strongly correlated with consumer prices. In this way, this acts as a natural hedge for debt repayments. Inflation-linked bonds can provide cheaper funding for longer maturities than conventional bonds for governments (Ermolov, 2021; Velandia-Rubiano et al., 2022) due to the premium on the hedge component (Bekaert and Wang, 2010), driving the supply of inflation-linked bonds.

Second, on the demand side, a large finance literature investigates how inflation-linked bonds improve the efficiency of portfolios by including inflation-linked bonds and the risks and returns for investors (Roll, 2004; Kothari and Shanken, 2004; Garcia and van Rixtel, 2007; d'Amico et al., 2018; Swinkels, 2018). The diversification benefits relative to nominal bonds are significantly influenced by investors' inflation expectations; stable inflation and anchored expectations can diminish these benefits.[2] Investors aiming to maximize real wealth, particularly over longer horizons, gain substantial advantages from inflation-linked government bonds (Kwak and Lim, 2014; Quaedvlieg and Schotman, 2022). In contrast, investors who suffer from money illusion, i.e., think in nominal rather than real terms, want to allocate less to these bonds (Acker and Duck, 2013; Basak and Yan, 2010; Lioui and Tarelli, 2023).

Finally, there is a research gap in the literature on inflation-linked bonds and their investor clientele, which can affect equilibrium pricing (Vayanos and Vila, 2021; Koijen and Yogo, 2023). Currently there exists no systematic evidence on who owns inflation-linked bonds or, alternatively, from an international risk-sharing perspective, which investors are shunning inflation-linked bonds. This is our central contribution by analyzing who hedges against inflation in international government bond markets.

Enhancing our understanding of the investor clientele of inflation-linked bonds is important because governments are strongly dependent on certain investors for funding (Eren et al., 2023). Using inflation-linked bonds provides ways to cater towards these investors, allowing for more stable and cheaper funding given sufficient demand. The general literature on investor clientele highlights how the effects of supply and demand affect asset pricing in corporate bond markets (Dass and Massa, 2014; Greenwood et al., 2010; Koijen and Yogo, 2023). Dathan and Davydenko

[2]For example, inflation-linked bonds did not protect investors much against the inflation spike in the second half of 2021 and onwards, as real interest rates increased almost as much as nominal interest rates, leading to negative returns of both assets.

(2020) document how firms align bond financing with demand for inclusion criteria of the bond index, satisfying the growing demand from passive investment funds. Kubitza (2023) highlights how bond financing of firms is especially vulnerable to portfolio investments from insurance companies and investment funds. Grundy et al. (2024) find complementarities between government financing and corporate bond markets, where government bonds along the maturity curve act as a benchmark for capital markets instead of crowding out corporate bond financing (Lugo and Piccillo, 2019). Butler et al. (2023) show how the decline in the demand by insurance companies for government debt altered the maturity composition of government debt. There are also ETFs that target households to fund governments using inflation-linked government bonds (see Nagel and Yan, 2022). These studies show the importance of understanding the investor base, suggesting that, for inflation-linked government bonds, this may also be driven by segmented market demand.

Investors with real objectives or liabilities allocate more to inflation-linked bonds than the average investor, and those with nominal objectives or liabilities allocate less to inflation-linked bonds. First, life insurance companies tend to have contractually nominal liabilities and hence do not suffer from money illusion when they invest in nominal bonds to hedge their nominal interest rate risk. For example, in the US in 2023, insurance companies sold USD 209 billion in nominal annuities, versus only USD 47 billion inflation-linked annuities.[3] Similarly, in the UK, 82% of the sold annuities were nominally fixed in 2023, while the other 18% were escalating, but sometimes at a fixed rate independent of realized inflation.[4] EIOPA Board of Supervisors (2023) also states that for life insurance companies, which have the largest investment portfolios as their liabilities are long-term, are mostly nominal in nature: "*For the life business, an increase in inflation is expected to have a more neutral effect on profitability than in the non-life business, as the benefits paid by most life products, e.g., mortality and longevity protection, are nominally fixed and, thus, not indexed to inflation.*" Therefore, we argue that insurance companies hold nominal instead of inflation-linked bonds to match the cash flow of their contractually nominal obligations. Hence, insurance companies as a type of investor will invest *less* in inflation-linked bonds than the other investors in general.[5]

[3]Source: limra.com.

[4]Source: pensionsage.com

[5]Inflation may be a more important factor for the non-life business such as property and vehicle insurance (see Ahlgrim and D'Arcy, 2012).

Second, Bodie (1990) describes how inflation-linked bonds can be used by pension funds to hedge inflation risks arising from inflation-indexed retirement securities that they could offer to their participants. Chen et al. (2020) suggest that offering inflation-linked pension benefits in markets without assets linked to the same inflation is challenging. Pension funds in the Netherlands aim to (but are not obliged to) increase pension payments with inflation in wages or prices (see Ponds and Van Riel, 2009). Pensions in several other countries of the euro area are partially adjusted for changes in the cost of living, even though some of these pensions are pay as you go and do not directly involve pension funds.[6] Garcia and van Rixtel (2007) state that the demand for inflation-linked bonds from pension funds has increased because they are a suitable instrument for asset-liability management policies. Since most pension funds have the ambition to provide sufficient *real* income during retirement, we argue that pension funds to be an investor type with a *higher* allocation to inflation-linked bonds than the average investor. For the UK, the link between pension funds and inflation-linked bonds is clear, as Schroders (2016) estimate that 82% of long-dated index-linked gilts are owned by UK private pension schemes.[7] Using transaction-level data Bahaj et al. (2023) find that pension funds are the most active investors for long-dated inflation swaps in the UK. Campbell et al. (2009) anecdotally suggest "strong demand from UK pension funds" for UK inflation-linked bonds.

Third, for other investors such as banks, investment funds and households the need to hedge against inflation in government bond markets is less clear. Looking at data from inflation swap markets, Bahaj et al. (2023) find that banks are active both on the long and short side, expecting no net demand for inflation hedging. Nagel and Yan (2022) analyze holdings of ETFs and mutual funds that are retail-oriented to show that funds with inflation-linked bonds received more inflows in periods of high inflation, suggesting that households want to hedge against inflation in periods of high inflation. For investment funds, their role in aggregate depends on their client composition, which is rather diverse and includes fund-to-funds, insurance companies, pension funds and households.[8]

A related question is what inflation investors want to protect themselves against. We argue that there is a home bias effect in the purchase of inflation-linked bonds that is even stronger than the home bias for nominal government bonds. The idea is simple, investors prefer to hold

[6] Source: europeanpensions.net and pensionseurope.eu
[7] Source: schroders.com
[8] See Appendix A1 for details.

inflation-linked bonds which use an underlying inflation index that is most relevant to them, most often a domestic price index. Huang and Milevsky (2011) show that the optimal allocation to inflation-linked bonds with imperfect inflation hedges is substantially reduced, suggesting that investors indeed benefit more from inflation-linked bonds linked to an inflation rate that is relevant to them. We argue that investors are particularly interested in hedging against domestic inflation and, hence, that international inflation-risk sharing is reduced.

III. Data

We merge bond-level data on portfolio holdings of different investors across 20 euro area countries with a list of inflation-linked bonds. First, we use the Securities Holdings Statistics (SHS) Sectoral database compiled by the European System of Central Banks (ESCB) and managed by the ECB. This database includes detailed quarterly portfolio holdings information at the bond level across different types of investors from different countries for the period 2013-Q4 to 2023-Q4. The SHS has very high coverage of the bond holdings of at least 95% for most investor sectors by law (EU Regulation No. 1011/2012) and has been widely used in economic research (see Boermans, 2025). We focus on the following types of investors with mandatory direct reporting of bond level portfolios: insurance companies, investment funds, pension funds, and banks. The data further distinguish between other financial institutions, households, non-financial corporations and governments as other investors, but we do not analyze these separately as these are small and we do not have a clear prior on whether they would be more or less interested in hedging inflation risk.[9]

The portfolio holdings data are merged with the Centralised Securities Database (CSDB) managed by the ECB to obtain reference data for bonds and issuers. In particular, we retrieve information about the bond prices, nominal currency of the bond, issue date and maturity date, the yield to maturity (Yield), the amount outstanding, and the country of the issuer. We also obtain maturity data and exclude bonds with maturities of less than 300 days to exclude money market-like instruments. This also circumvents the observation of passive divestment of bonds upon reaching maturity within our portfolio holdings data. We further restrict the sample to

[9]These sectoral classifications are based on the European System of Accounts (ESA) 2010. Investment funds predominantly consist of mutual funds (excluding money market funds) and ETFs. Data on holdings by the Eurosystem are absent. To our knowledge, there are no policy reasons or guidelines to expect central banks to provide differential treatment to inflation-linked bonds.

bonds with an amount outstanding of at least EUR 500 million, as rather small bonds may have lower liquidity as this threshold is often applied for bond index inclusion. Finally, we calculate a geographical distance matrix between the investor and the issuer using CEPII distance data.

We focus on government bonds issued worldwide. The sample covers 2,537,978 observations at the bond level for eight different investor sectors from 20 different investor countries and 74 different issuer countries across 40 quarterly time periods. There are 12,988 unique government bonds in the sample, of which 3,279 are issued by governments in the euro area. Table 1 contains the descriptive statistics of the bond-level variables used as controls in the regression analysis.

To determine which are inflation-linked, we use the constituency lists of commercial index providers for inflation-linked bond indices. Matched against our holdings data, we retrieve 381 unique inflation-linked bonds, of which most are issued by the US (79) and the UK (38). 63 inflation-linked bonds are issued by euro area governments, stemming from four countries, namely: Germany (EUR 66 billion, in 2023 q4), France (EUR 203 billion), Italy (EUR 129 billion), and Spain (EUR 84 billion).

Figure 1 illustrates the expansion of the government bond markets, with a particular emphasis on the increasing volume of inflation-linked bonds. The figure comprises six panels, providing detailed information on the global and euro area government bond market sizes, as well as holdings data by investor type from our sample. Panels 1A and 1B depict the size of the government bond market and the relative holdings of investors in the euro area. Panels 2A and 2B focus on the inflation-linked bond market and the relative holdings of investors in the euro area. Between 2013-Q4 and 2023-Q4, global tradable government debt increased from EUR 19.7 trillion to EUR 40.1 trillion in nominal terms. Concurrently, within our sample, the volume of inflation-linked bonds also doubled, increasing from EUR 1.4 trillion to EUR 2.7 trillion. The outstanding amount of bonds issued by euro area governments increased from EUR 5.2 trillion to EUR 8.5 trillion over the same period. Inflation-linked bonds constituted approximately 6% of the total, increasing from EUR 326 billion to EUR 462 billion. Ownership data reveal that investors in the euro area held 17% of global government bonds at the end of 2013, which declined to 13% at the end of 2023. The proportion of government bonds in the euro area held by investors in the euro area decreased from 58% to 46%, while the ownership of government bonds linked to inflation in the euro area decreased from 80% to 65%.[10] Panels 1C and 2C show

[10]The SHS-S database excludes holdings of the Eurosystem, which held up to 38% of the euro area government

the holdings of euro area bonds per investor sector and the share of inflation-linked bonds in their portfolios. Banks and insurance companies are the largest holders of euro area government debt, followed by investment funds and pension funds. Insurance companies' government bond portfolios have about 6% in euro area inflation-linked bonds, which hardly varies during our sample period. Pension funds' portfolios have a relatively high allocation to inflation-linked bonds up to 2020, when they substantially decrease their allocation to the relatively low level of insurance companies.[11]

IV. Methodology

We estimate the demand for inflation-linked bonds for different segments of investors to study investor clientele effects for inflation-linked bonds in the euro area. First, we analyze the preferences to hold inflation-linked bonds in a simplified gravity model with bond-level data. Specifically, we use the log of the holding amount per bond at market value (ln HOLD) to obtain the demand function to estimate the determinants of bond holdings.[12] We use subsamples to study the investor clientele for different segments of investors in a full multidimensional panel time-series model on bond-level holdings:

$$\ln \text{HOLD}_{i,s,j,g,t} = \alpha + \beta'_{s-1}\text{ILB}_{i,j,g,t} + \gamma'_{k,s-1}\text{GRAVITY}_{j,g,t} + \theta'_{s-1}\text{X}_{i,j,g,t} + \epsilon_{i,s,j,g,t} \tag{1}$$

where each bond i is held by investors from country j and issued by destination country g, with the vector GRAVITY capturing bilateral country gravity between investor country j and issuer country g based on country size and distance indicators, and the vector X containing a set of control variables at the bond- or issuer-level. The idea is that if investors in general do not care about inflation-linked bonds, the estimated beta will be zero (or insignificant) for the investor sector s segment because the control variables capture investment pull factors like

bond market in 2022 when positions peaked as the Eurosystem stopped reinvestments in maturing bonds. Source: www.dnb.nl. The Public Sector Purchase Program included nominal and inflation-linked government bonds, but there exist no public records today of the underlying allocations or any policy guidance that would favor or disfavor investment in inflation-linked bonds.

[11] Appendix Figure A1 shows the "look through" ownership of global investment funds held by euro area investors.

[12] We use a simplified model based on the securities holdings practitioner's guide of Boermans (2025) without investor type interaction terms, see Table A2 with quantitatively similar results using these methods.

bond size and other variables as attractors in addition to investor sector-specific preferences for the control variables X. The effects of different investor clientele for inflation-linked bonds are captured by allowing the estimated β to vary; that is, for example, pension funds may have a different disposition to hold inflation-linked bonds than, say, banks, keeping other factors of bond-specific and investor-sector specific demand constant. All specifications include investor country, investor sector, and time-fixed effects, with standard errors additionally clustered at investor country j and investor type s.

In other words, Equation (1) tests the premise of inflation-linked bond preferred habitat, namely "relative" overinvestment in inflation-linked bonds by certain investor groups. In addition, we would like to understand whether investors have a stronger preference for inflation hedging with inflation-linked bonds connected to domestic inflation than inflation-linked bonds connected to foreign inflation. The latter is less precise, but if real bond yields abroad are higher and/or inflation rates are highly correlated, foreign inflation-linked bonds might still be attractive. Moreover, in the euro area, all tradable inflation-linked bonds are linked to the inflation of the euro area, except those issued by the French government. So, French investors have the privilege to choose between local and euro area ILBs, whereas investors from other euro area countries do not.[13] Hence, we further interact our ILB indicator with a dummy variable for local ILB, linked to French inflation.

$$\begin{aligned} \ln \mathrm{HOLD}_{i,s,j,g,t} = \alpha + \beta'_{s-1}\mathrm{ILB}_{loc/for} * H_{s-1} + \gamma'_{k,s-1}\mathrm{GRAVITY}_{j,g,t} * H_{s-1} \\ + \theta'_{s-1}\mathrm{X}_{i,j,g,t} * H_{s-1} + \epsilon_{i,s,j,g,t} \end{aligned} \tag{2}$$

V. Results

A. *Demand for inflation-linked bonds across different investor types*

Table 2 contains the main results of our analysis. The first two columns contain the regression results using our sample of global bonds. The first column indicates that investors in our sample generally prefer to allocate more toward inflation-linked bonds within the global government bond market, with a statistically significant coefficient of 0.380. This regression includes fixed effects

[13] Other countries in the European Union that have not adopted the euro have only issued inflation-linked bonds linked to their domestic consumer price indexes, such as Denmark, Sweden, and Poland.

for holder area, sector, and time, but without control variables. The second column includes the control variables (i) market value, (ii) geographical distance, (iii) issuance currency (USD/EUR), (iv) yield to maturity, and (v) remaining maturity. These control variables only reduce the coefficient for the preference for inflation-linked bonds from 0.380 to 0.303, and the latter is still statistically significant. This means that compared to a fully diversified government bond market portfolio allocation, euro area investors have 35.4 percent higher investment in inflation-linked bonds worldwide than expected.[14] These regressions results from Table 2 Columns (1) and (2) are presented in full detail in Appendix Table A2 Columns (2) and (3). For simplicity and ease of interpretation we proceed to show the rest of the results based on subsamples instead of a full model with interactions. Appendix Table A2 shows this gives qualitatively the same results.

Since we examine bond investors from the euro area only, the third column restricts the sample of government bonds to those that have been issued by governments of the euro area.[15] The results remain consistent, with an inflation-linked bond preference coefficient of 0.299, again statistically significant. The control variables for the yield to maturity and the remaining maturity are no longer statistically significant in this sub-sample. In column 8, where we investigate the ownership of bonds issued by governments from outside the euro area, the preference for inflation-linked bonds is substantially weaker. The estimated coefficient drops to 0.243 and is no longer statistically significant, suggesting that much of the investor clientele for inflation-linked bonds is within the region and linked to euro area inflation for euro area investors. These results are exactly aligned with our conceptual framework: the benefit from hedging against inflation risk is substantially higher for the inflation to which the investor is exposed (see, e.g., Huang and Milevsky, 2011; Arnold, 2015; Chen et al., 2020).

The next set of results examines which *types* of investors are more or less likely to own inflation-linked bonds. In our analysis, we focus on four main types: (i) insurance companies, (ii) investment funds, (iii) pension funds, and (iv) banks, since the portfolio holdings of other types of investors are markedly smaller. Table 2 contains the regression results separately for different types of investors. For the sample of government bonds from the euro area, the coefficient for inflation-linked bonds is -0.352 for insurance companies, significantly different from zero at the

[14] Our specification is a log-linear model with a dummy, hence we take $\exp(0.303) = 1.354$ to find overallocations of 35.4 percent towards ILBs.

[15] Since Table 1 shows that these bonds are almost exclusively issued in euro currency, we omit the dummy variable for bonds issued in USD or EUR from this regression.

10% level. For the non-euro-area sample the coefficient is only slightly smaller with -0.291, but because the parameter is estimated less accurately, it is no longer statistically different from zero. Insurance companies are less likely to invest in inflation-linked bonds than other investors, which is consistent with the mostly nominal nature of life insurance policies (see, e.g., Ahlgrim and D'Arcy, 2012; EIOPA Board of Supervisors, 2023).

For investment funds, the ownership of inflation-linked bonds shows the opposite pattern. For the sample from the euro area, the coefficient is positive but not statistically significant, suggesting that investment funds do not have a preference for inflation-linked bonds compared to nominal bonds issued by euro area governments. Investment funds do have a strong preference for inflation-linked bonds *outside* the euro area, the coefficient is 0.833 and statistically significant. This result can be partially explained by several large international mutual funds located in Ireland and Luxembourg that follow indices on the US, UK, or global inflation-linked bond markets (see Beck et al., 2024).[16]

Pension funds have a strong preference to invest in inflation-linked bonds in the euro area, evidenced by the 0.538 coefficient, which is statistically significant. This is consistent with the notion that pensions have an objective of providing for consumption during the retirement phase, and liabilities are therefore real in nature. Pension products by euro area pension funds are mostly exposed to inflation in the euro area and not, or to a far lesser extent, to non-euro inflation. This is confirmed by the insignificant coefficient -0.013 for our sample of non-euro area bonds. Pension funds benefit the most from inflation-linked bonds that are closest to the relevant inflation for their participants (see, e.g., Chen et al., 2020).

The fourth category, banks, do not show a preference for inflation-linked bonds, neither for the sample of euro area bonds, nor for the global sample excluding the euro area. The coefficient estimates are 0.243 and 0.074, respectively, and both are statistically insignificant.

B. Catering investor clientele with home-oriented inflation-linked bonds

Investors may prefer to tilt their portfolio toward bonds issued in their home market (see e.g. Coeurdacier and Rey, 2013). This may have to do with regulation, familiarity, or uncertainty. For investors in inflation-linked bonds, an additional element may be the inflation to which the

[16]When we exclude investment funds from Ireland and Luxembourg, two countries with largest international investment fund industry, we indeed find weaker but still statistically significant results for Table 2 Column (10).

government bond is linked. For example, Arnold (2015) argues that linking to euro area inflation makes inflation-linked bonds unattractive, because this inflation is irrelevant to most investors.[17] The French government is the only government to have issued inflation-linked bonds linked to French inflation and to inflation in the euro area. Therefore, we test whether bonds linked to French inflation are more attractive to French investors.[18] The empirical results can be found in Table 3.

The first column shows that French investors have a strong preference for euro area inflation-linked bonds, with a coefficient of 0.860, which is statistically significant. The next column shows the effect for their additional preference for bonds linked to French inflation. The top two rows show that French investors prefer inflation-linked bonds, but even more so when they are linked to French inflation (coefficient 0.840, statistically significant at the 5% level). By contrast, the next two columns show that while non-French investors also prefer inflation-linked bonds – they do so to a lesser extent (0.291 versus 0.860, both statistically significant). Most notably, non-French investors dislike bonds linked to French inflation (coefficient -0.846, statistically significant).

In Table 3 Columns 5 to 9 we investigate the preferences for French domestic inflation-linked bonds across different French investor sectors by using interaction terms for specific investor sectors.[19] These findings show that French insurance companies do not tilt their portfolio differently from other French investors, even though the estimated signs are negative but statistically speaking not different from zero (-0.406 for ILBs and -0.379 for French local ILBs). One potential explanation is that in France non-life insurers are relatively larger than in other euro area countries, highlighting the need to hedge against (local) inflation (EIOPA Board of Supervisors, 2023). For investment funds, an interesting pattern emerges, namely that these investors tilt relatively more towards other EA inflation-linked bonds than to the domestic French ones. This may indicate the international role of the French investment fund sector similar to funds located in Ireland and Luxembourg, serving non-domestic investor clientele (Beck et al., 2024). For French pension funds, we affirm a stronger preference for inflation-linked bonds,

[17]The counterargument against using a local inflation index is that it is the easiest to manipulate by the government, and, euro area inflation rates are correlated with domestic inflation within the monetary union.

[18]Inflation in advanced economies, especially in the euro area with common monetary policy and currency, is highly correlated, but investors may perceive a domestic inflation-link as more attractive, because the historical high correlations may not materialize going forward.

[19]Here we follow our full interaction model as in Equation 1 and in Appendix Table A2 within the sample of euro area bonds.

but this additional tilting is not significantly stronger for local French domestic inflation-linked bonds compared to other French investors. French banks show higher investments in both EA and domestic inflation-linked bonds. Finally, for French households, we find that they strongly prefer local inflation-linked bonds and instead shed bonds linked to euro area inflation, revealing that French households prefer to hedge against domestic inflation (Nagel and Yan, 2022). If anything, these results provide strong evidence that French investors in general strongly prefer French inflation-linked bonds that are linked to domestic inflation.

The last two columns of Table 3 examine home bias in more detail as an alternative explanation of our main findings. In addition to a dummy for the same government issuer as the investor, home, as well as an interaction effect of home with the inflation-linked bond dummy, column 9 includes the distance between the issuing government and the investor as a control variable. When this control variable is included, there is no additional home bias for bond investors in general or for inflation-linked bond investors specifically. The last column shows that when we exclude the control variable for distance between issuer and investor, the home dummy becomes significant. However, the interaction effect with inflation-linked bonds is still insignificant, suggesting that there is no additional home bias for inflation-linked bonds *in addition to* general home bias for bond investors that has been documented before (see e.g. Coeurdacier and Rey, 2013).

C. Dutch pension funds

The Netherlands has the largest pension fund sector in Europe with over EUR 1.5 trillion in assets. In June 2019 the government, employees and employers reached a historical agreement that created a new pension system with a law called "*WTP - Wet toekomst pensionen*" (Future pensions law).[20] This was big news that came rather unexpectedly after many years of negotiations that were stalled without much result. The agreement therefore caused major news headlines for weeks in the Netherlands.

The new pension law will put more emphasis on risks and returns at the individual participant level and, instead of targeting to increase pension entitlements with realized inflation, the pensions will be increased with realized investment returns. This puts less emphasis on stable expected real retirement income. In addition, the distribution of wealth from the collective pension

[20]For more information of the key points of the new pension system, see www.nautadutilh.com.

scheme to the individual participant at the transition point from the old to the new pension system depends on the *nominal* funding ratio. For pension funds to be able to transition, their nominal coverage ratios got a minimal regulatory requirement for the transition period only, given pension funds a new incentive to target nominal coverage of liabilities. The nominal funding levels of many pension funds were close to or below 100 percent, the minimum level. Given the importance on a temporary nominal target towards the transition, there may be less need to hedge inflation risk for Dutch pension funds during this transition phase of 5 to 8 years after the new pension law was passed.

Recall from Figure 1 Panel 2C that within the euro area as a whole, the relative ownership of inflation-linked bonds by pension funds increased steadily from about 8% to 14% in early 2019, but then quickly declined to around 6% by late 2020 and onward. Could this be related to the new Dutch pension law, as it coincides with the timing of the announcement in 2019-Q2?

To investigate this, we employ a classic difference-in-difference model to test how the preferences for inflation-linked bonds by Dutch pension funds shifted after the regulatory announcement compared to several benchmarks as follows:

$$\begin{aligned}\ln \text{HOLD}_{i,s,j,g,t} = \alpha + \beta \text{POST}_t * \text{ILB}_{i,j,g,t} * Pfund^{NL} + \gamma'_{k,s-1}\text{GRAVITY}_{j,g,t} * H_{s-1} \\ + \theta'_{s-1}\text{X}_{i,j,g,t} * H_{s-1} + \epsilon_{i,s,j,g,t}\end{aligned} \tag{3}$$

We estimate the relative shift in demand for inflation-linked bonds by Dutch pension funds – the treated group - compared to a control group of euro area investors. For timing consideration, we look at $POST = 2019 - Q2$ as the period of announcement (5 June 2019) and as robustness in the period $POST = 2019 - Q4$ when the law was officially published in *De StaatsCourant (69065)* with binding agreements on 11 December 2019, which have direct implications for portfolio allocations during the transition phase. As a control group, we take all other EA investors or specifically pension funds.[21] We also vary the definition of the post period and the sample period frame.

Table 4 shows our empirical results. The coefficient in the top row shows that pension funds

[21]Note that for the pre-period it is difficult to find a statistically appropriate control group as shown in Appendix Figure A1 because between 2018-Q4 and 2019-Q1 we saw a spike in inflation-linked bond investments by Dutch pension funds, which is not met by any potential control group. However, for the periods between 2017q1-2018q3, the parallel trend appears to hold.

in the Netherlands substantially decreased their holdings in inflation-linked bonds compared to all other investor types (column 1) and to other pension funds in the euro area (column 2) in the period following the announcement of the new pension system.[22] These results are robust with respect to different specifications.

These findings likely indicate that the new pension system induced a shift in investor preferences away from inflation-linked bonds as the transition phase of the new law emphasizes nominal coverage rates. However, there may be other reasons why we observe these effects. For instance, it might be that Dutch pension funds jointly decided to anchor low long-term inflation expectations around the period of the announcement of the new pension law, which in turn led to sales or even termination of their inflation-linked bond portfolios.[23] During that era, ECB surveys indicate that inflation expectations *throughout* the euro area were lowered.[24] Therefore, it remains puzzling as to why Dutch pension funds would suddenly hold much stronger views compared to other pension funds and euro area investors.

D. Robustness tests

In this section, we analyze the robustness of investor demand across different types of investors looking at moderating factors that may explain the inflation-linked bond clientele. First we explore how the investor clientele may have shifted over the years, in particular by looking at three regime periods: low inflation, Covid-19 and high inflation. Second, governments are mainly interested in the demand from the primary market when bonds are issued. Therefore, we inspect the bond demand for inflation-linked instruments specifically at the period of issuance. Third, we explore whether the demand for inflation-linked bonds depends on the maturity segment. Finally, we estimate the investor clientele for inflation-linked bonds against a narrow counterfactual group of bonds.

[22] See Appendix Figure A2 for a graphical time-series representation.

[23] The two largest Dutch pension funds at the time of the announcement of the new pension law, ABP and Pensioenfonds Zorg en Welzijn (PFZW), held sizable investments in "inflation-linked debt" according to their public records of more than 30 billion euros in 2018. However, by the end of 2020, these positions were fully terminated by PFZW and nearly liquidated by ABP, decreasing to less than 1 billion euros by the end of 2021, see Appendix Figure A4 for details on these two pension funds, and Appendix Figure A5 for the whole Dutch pension sector.

[24] Link to https://www.ecb.europa.eu/stats/ecb_surveys/survey_of_professional_forecasters/pdf/ecb.spf2019q2~d0f7127183.en.pdf

*D.*1 Regime shifts and demand for inflation-linked bonds

Regime shifts may alter investor clientele. Specifically, periods of low and high inflation or high uncertainty, such as a crisis period, may lead to changes in demand for inflation-linked bonds. To analyze this, we split our main sample into three periods. Table 5 shows a relatively stable demand for inflation-linked bonds that ranges from 0.310 in column (3) in the high inflation period to 0.370 in the covid-19 period in column (2). Comparing these estimated nested coeffcients with Table 2 column (3) suggests that there are no statistical differences for any of the sub-periods. Hence, investor demand for inflation-linked bonds in aggregate has been rather stable during the sample period 2013-Q4 to 2023-Q4. If anything, a crisis period like covid-19 slightly increased demand, while somewhat surprisingly, a high inflation period did not induce a higher demand. One reason for this is that inflation expectations in the long run might be anchored to the goals of the central bank to bring inflation down in those high inflation periods.

*D.*2 Investor clientele upon bond issuance

Government financing is most dependent on investors who subscribe to bond auctions in the primary market. To test if the type of investors funding the government is different in primary bond markets compared to the secundary market, we proxy the primary market demand with an indicator of newly issued bonds with a dummy value of 1 if the issue date of the individual bond falls within the quarter of the observed investment position. When adding the moderating role of new issuances, Table 6 confirms our main findings from Table 2 that insurance companies tend to shun inflation-linked bonds while pension funds display the strongest preference for these bonds across all investor types. However, the role these different investors play in the primary government bond market is rather diffuse. First, in general insurance companies hold significantly fewer newly issued bonds (estimated coefficient = -0.572), but for inflation-linked bonds, there is no statistical difference in this demand (-0.296). Second, investment funds are important buyers in the primary government bond market in general, but they also do not show a different demand when it comes to inflation-linked bonds in the primary market. Third, while pension funds are generally not extra involved in the primary government bond market, they appear to be much less active in the primary market for inflation-linked bonds. Finally, banks are more active in the primary market, but there is no difference in their preference to hold

inflation-linked bonds in the primary or secondary market. Hence, overall our analysis of the primary market reveals that the extra demand for inflation-linked bonds by pension funds is mostly associated with trades from the secondary market.

D.3 Demand for inflation-linked bonds by residual maturity

Preferred habitat models segment markets based on demand for maturity (Vayanos and Vila, 2021). To test if our results depend on duration effects, following Bekaert and Ermolov (2023), we split our focus into three residual maturity segments using sub-samples. Table 7 confirms that investors in the euro area in general tilt their portfolio towards inflation-linked bonds of the euro area, independently of the maturity profile, which aligns with the notion that these instruments provide a hedge against "local" inflation regardless of the remaining maturity. The results further show that within the 5-10 years and over 10 years buckets, insurance companies indeed tend to shun inflation-linked bonds, but this effect is insignificant for the shorter maturities. For pension funds, we find that the overallocation occurs both in the short and long end of the maturity spectrum, yet we fail to find significant effects for the subsample of 5-10 years remaining maturity. For investment funds, we find a weakly significant tilt towards inflation-linked bonds for short maturities, while for banks, we detect no portfolio allocations that deviate from the bond market portfolio. These results corroborate our main findings from Table 2, suggesting that the demand for inflation-linked bonds is not dependent on residual maturity.

D.4 Forced matching inflation-linked bonds to counterfactual demand

Inflation-linked bonds issued by governments are different from other bonds in various respects. One concern is that these ex ante differences may explain our findings, as control variables in an OLS may not be fully able to take these effects into account. To circumvent any of these concerns, we create a counterfactual group of bonds that shares almost identical observed characteristics using forced matching models by limiting our sample only to government bonds from countries that also have inflation-linked bonds issued. In addition, we estimate the probability that a certain bond within this sample is an inflation-linked bond using our control variables as indicators. This first stage matching procedure yields a good model fit (LR χ^2=2,537; Pseudo R^2=0.274; p-value<0.001) and passes ex post the balancing test on all observed factors. We present the results using a nearest neighbor matching without replacement and a strict caliper

setting of 5 percentage points, providing matched counterparts for 54 of the 63 inflation-linked bonds from our main sample from the euro area of Table 2 columns (3) to (7). Comparing our much restricted sample of inflation-linked bonds and matched counterparts confirms previous findings that while euro area investors in general tilt towards inflation-linked bonds, this demand is absent among insurance companies and banks, and in general stronger for investment funds and the strongest among pension funds.

*D.*5 Other sensitivities?

Not displayed are several additional tests. First, when interacting our inflation-linked bond indicator with bond yields, we do not find any indication that our findings are mediated by yields. Second, since we focus on holdings, our results of the DiD in section IV.C on the Dutch pension reform may coincide with large redemptions of inflation-linked bonds at the short Post period. Our tests do not reveal that the holdings of Dutch pension funds were skewed towards instruments close to redemption. In fact, our sample restriction ensures that passive sell-offs related to redemptions cannot drive our results as we impose a remaining maturity of at least 300 days. Upon closer inspection, even around this threshold, the Dutch pension fund holdings did not reveal holdings skewed toward this cutoff, hence suggesting this channel is not an alternative explanation. Third, we also test whether the demand for inflation-linked bonds is larger in countries that experienced higher inflation, both from the investor and issuer perspective. Several robustness tests did not reveal any indication that this provides an alternative explanation of our main results. Fourth, our analysis controls for bond pricing effects because our independent variable *Bondsize* includes the market price. Additional analysis reveals that there is no structural relationship over time for bond prices from ILBs and non-ILBs, if anything, over time these prices tend to comove as depicted in Appendix Figure A3. Finally, we also explored how households tilt towards inflation-linked bonds. While these positions are in aggregate very small compared to other investors, potentially because of the high nominal hurdle to enter this market, we did not find any deviation of household allocations towards inflation-linked bonds compared to the market portfolio. Note that the exception is reported in Table 3 where we find that French households seek to hedge against domestic French inflation by more strongly favoring French domestic inflation linkers over French euro area inflation-linked bonds.

VI. Conclusion

A deeper understanding of the investor base of inflation-linked bonds is crucial, given that governments rely heavily on specific investor segments for sovereign debt financing (Eren et al., 2023). Our study provides systematic cross-country evidence that local investor clientele tends to allocate more towards inflation-linked bonds. Specifically, we empirically demonstrate how market segmentation between different investors explains the demand for inflation-linked bonds. First, euro area investors are relatively speaking mainly interested in euro area inflation-linked bonds and display no preferences for foreign inflation-linked bonds from outside the euro area, with the exception of large international mutual funds mainly located in Ireland and Luxembourg who serve a global investor clientele. Second, focusing on euro area bonds, we find that European insurance companies invest much less in inflation-linked bonds than other European investors, while pension funds and to lesser extent investment funds allocate more of their portfolios towards inflation-linked bonds, most likely because pension liabilities are denominated in real terms. Third, the demand is strongly dependent on the inflation index, as we show by analyzing the demand for French inflation-linked bonds with a local French inflation index. These bonds are generally shunned by European investors, but are in high demand by French investors, especially among retail investors. This effect cannot be explained by general home bias tendencies of government bond investors. Fourth, analyzing the effects of a regulatory pension reform in the Netherlands, we show that the demand for inflation-linked bonds by pension funds is associated with the change in the type of pension liabilities. Our difference-in-difference model shows that after the reform, which put less emphasis on real liabilities but more on nominal asset values to transition to the new system, Dutch pension funds strongly decreased their predisposition to invest in inflation-linked bonds.

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Table 1 – Summary statistics

Panel A:	**Global government**				**ILBs (global government)**			
	Mean	Std. dev	Min	Max	Mean	Std. dev	Min	Max
HOLD (ln)	0.07	0.38	0	22.99	0.13	0.51	0	16.78
Bond Size (nom, ln)	13.58	16.78	0.05	384.32	16.60	11.95	0.05	55.71
Bond Size (mv, ln)	14.09	16.78	0.02	394.86	17.42	11.75	0.06	54.75
Distance	7.16	2.34	0	9.88	7.16	2.36	0	9.88
USD	0.27	0.44	0	1	0.32	0.47	0	1
EUR	0.54	0.50	0	1	0.49	0.50	0	1
Yield	2.66	3.19	-0.95	19.66	0.60	1.85	-0.95	19.66
Maturity (ln)	7.77	0.92	5.70	9.81	7.96	0.82	5.70	9.81
Panel B:	**EA government**				**ILBs (EA government)**			
	Mean	Std. dev	Min	Max	Mean	Std. dev	Min	Max
HOLD (ln)	0.12	0.53	0	22.99	0.18	0.60	0	16.78
Bond Size (nom, ln)	12.58	10.98	0.05	65.27	12.33	4.73	1.84	25.77
Bond Size (mv, ln)	13.62	12.16	0.02	66.36	13.52	5.21	1.92	26.89
Distance	5.77	2.60	0	8.23	5.70	2.57	0	8.10
USD	0.02	0.14	0	1	0	0	0	0
EUR	0.97	0.17	0	1	1	0	1	1
Yield	1.41	1.72	-0.95	19.66	0.20	1.77	-0.95	19.66
Maturity (ln)	7.76	0.89	5.70	9.81	7.91	0.76	5.77	9.34

Notes: Sample period 2013q4-2023q4. Panel A shows a global government bond sample of 2,788,538 observations, of which 113,877 observations for ILBs (4%), whereas Panel B focuses on government bonds from the euro area (n = 1,333,551) of which 55,270 observations for ILBs. *HOLD (ln)* is defined as the total holdings at market value in an individual bond of any given investor (measured at the sector*country level), *Bond Size (ln)* captures the amount outstanding of a bond in nominal terms (nom) or at market value (mv), *Distance* is the bilateral geographical distance between the country of the issuer and the investor, *USD* and *EUR* are indicator variables representing if a bond is denominated in US dollars or euros respectively, *Yield* gives the yield to maturity of a bond, *Maturity (ln)* is the residual maturity measured in days.

Table 2 – Investor preferences for inflation-linked bonds

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Scope:	**Global**			**EA bonds**				**Non-EA bonds**				
Investor:	all	all	all	insur	invfd	pfund	bank	all	insur	invfd	pfund	bank
ILB	0.380***	0.303**	0.299**	-0.352*	0.328	0.538**	0.012	0.243	-0.291	0.833***	-0.013	0.074
	[0.140]	[0.121]	[0.124]	[0.193]	[0.240]	[0.255]	[0.480]	[0.174]	[0.560]	[0.202]	[0.282]	[0.681]
Bond size		0.367***	0.450***	0.398***	0.808***	0.397***	0.644***	0.343***	0.245***	0.513***	0.514***	0.374**
		[0.041]	[0.040]	[0.059]	[0.092]	[0.125]	[0.053]	[0.065]	[0.058]	[0.112]	[0.090]	[0.139]
Distance		-0.329***	-0.362***	-0.384***	-0.256***	-0.277***	-0.388***	-0.104***	-0.063	-0.207***	-0.091*	-0.314**
		[0.024]	[0.027]	[0.051]	[0.057]	[0.057]	[0.087]	[0.036]	[0.095]	[0.049]	[0.049]	[0.126]
USD		0.274***						0.244**	-0.046	0.500***	0.397	0.750***
		[0.094]						[0.096]	[0.211]	[0.120]	[0.283]	[0.162]
EUR		0.834***						1.187***	1.637***	1.346***	0.668	1.461***
		[0.152]						[0.174]	[0.299]	[0.248]	[0.818]	[0.476]
Yield		0.065***	0.020	-0.134**	0.025	-0.127*	0.009	0.047***	-0.054***	0.103***	0.061***	-0.118***
		[0.014]	[0.025]	[0.047]	[0.049]	[0.071]	[0.059]	[0.018]	[0.015]	[0.020]	[0.014]	[0.032]
Maturity		-0.075***	-0.028	0.364***	-0.056	0.224	-0.298***	-0.087***	-0.108*	-0.076**	-0.125*	0.040
		[0.027]	[0.053]	[0.101]	[0.117]	[0.215]	[0.077]	[0.023]	[0.061]	[0.031]	[0.067]	[0.055]
n	2.54 mln	2.45 mln	1.18 mln	251,891	235,296	125,712	165,212	1.27 mln	168,996	504,066	120,896	105,192
Adj. R2	0.239	0.393	0.459	0.498	0.545	0.410	0.347	0.333	0.325	0.342	0.411	0.173
N ILB	381	339	63	63	63	63	63	276	168	274	183	190

Notes: Robust standard errors in brackets *** p<0.01, ** p<0.05, * p<0.10. The dependent variable is $HOLD$ (ln). The global sample in Columns (1) to (2) includes 74 issuer countries, Columns (2) to (7) covers 19 issuers from the euro area (EA), and, Columns (8) to (12) include 55 issuers from outside the EA. Regressions include holder area fixed effects, holder sector fixed effects and time fixed effects.

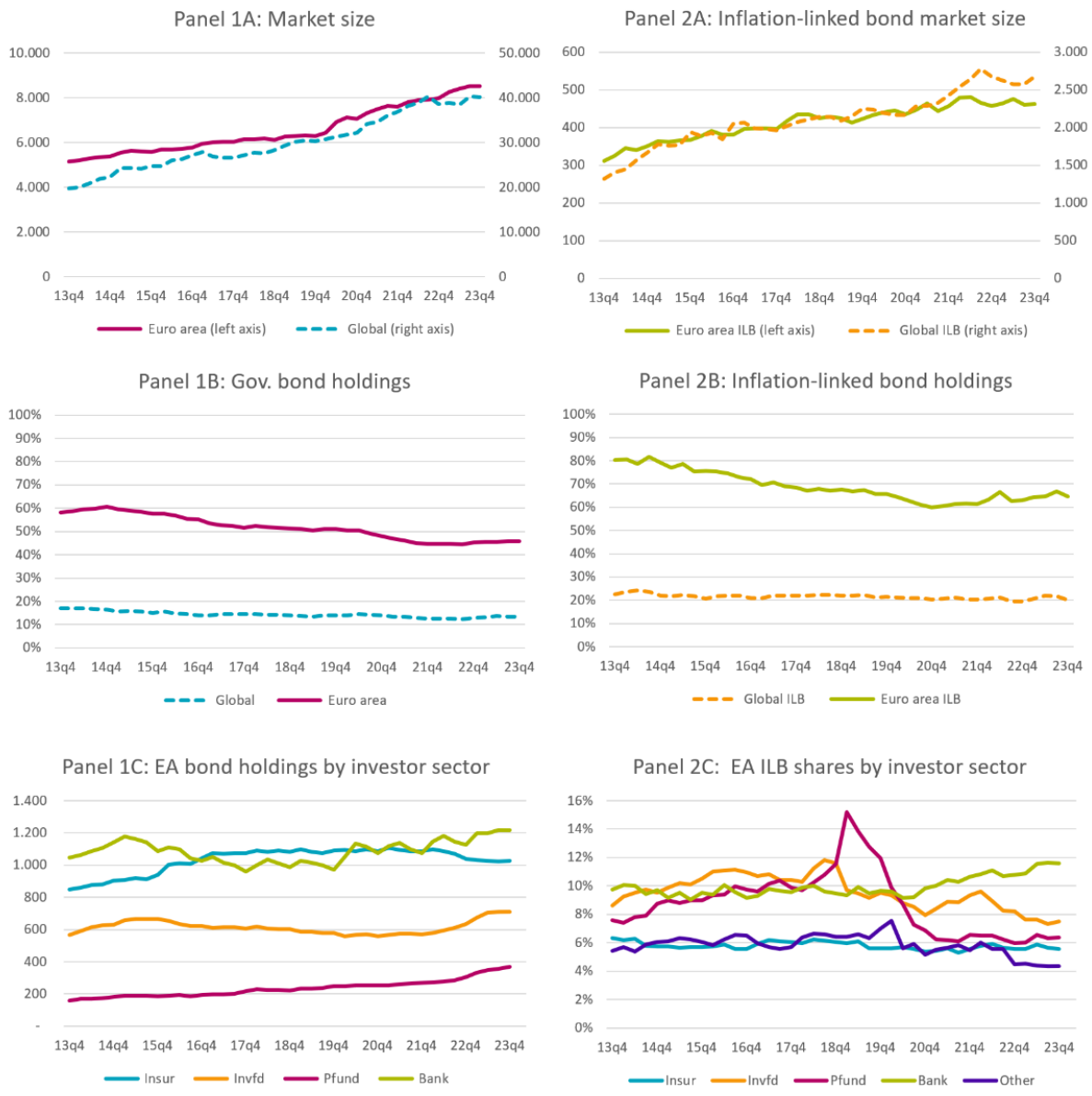

FIGURE 1 – GOVERNMENT BOND MARKETS, HOLDINGS AND INFLATION-LINKED BONDS

Table 3 – Investor clientele catering

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Scope:	FR	FR	non-FR	non-FR	FR	FR	FR	FR	FR	EA	EA
Investor (s):	all	all	all	all	insur	invfd	pfund	banks	hhold	all	all
ILB	0.860**	0.721**	0.291**	0.392***	0.798**	0.544	0.760**	0.498	0.987**	0.302**	0.314**
	[0.281]	[0.264]	[0.133]	[0.134]	[0.334]	[0.318]	[0.272]	[0.320]	[0.286]	[0.136]	[0.136]
ILB FR_{loc}		0.840**		-0.846***	0.894**	0.966**	0.836**	0.626**	0.725*		
		[0.289]		[0.158]	[0.334]	[0.315]	[0.295]	[0.239]	[0.313]		
ILB#s					-0.406	0.895*	1.516**	1.288**	-1.845***		
					[0.491]	[0.428]	[0.476]	[0.475]	[0.244]		
ILB FR_{loc}# s					-0.379	-0.603*	-0.215	1.302***	0.766**		
					[0.332]	[0.303]	[0.299]	[0.234]	[0.312]		
ILB#Home										-0.123	-0.079
										[0.242]	[0.239]
Home			-0.375***	-0.374***						2.500***	-0.248
			[0.029]	[0.029]						[0.204]	[0.394]
Distance											-0.396***
											[0.052]
Bond size	0.680***	0.681***	0.442***	0.441***	0.682***	0.681***	0.681***	0.677***	0.679***	0.447***	0.450***
	[0.121]	[0.121]	[0.041]	[0.041]	[0.121]	[0.121]	[0.121]	[0.121]	[0.121]	[0.040]	[0.040]
Yield	-0.077	-0.075	0.015	0.014	-0.075	-0.076	-0.076	-0.076	-0.077	-0.013	0.023
	[0.076]	[0.077]	[0.026]	[0.026]	[0.076]	[0.076]	[0.077]	[0.076]	[0.075]	[0.025]	[0.024]
Maturity	0.164	0.164	-0.032	-0.032	0.164	0.164	0.164	0.164	0.167	-0.006	-0.030
	[0.136]	[0.136]	[0.058]	[0.058]	[0.136]	[0.136]	[0.136]	[0.135]	[0.135]	[0.054]	[0.052]
n	117,257	117,257	1.06 mln	1.06 mln	117,257	117,257	117,257	117,257	117,257	1.18 mln	1.18 mln
Adjusted R2	0.518	0.519	0.457	0.458	0.519	0.520	0.519	0.521	0.521	0.452	0.459

Notes: Robust standard errors in brackets *** p<0.01, ** p<0.05, * p<0.10. The dependent variable is $HOLD$ (ln). Sample covers EA government bonds. Regressions include a constant term and holder area fixed effects, holder sector fixed effects and time fixed effects.

Table 4 – DiD model for ILB demand by Dutch pension funds

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Post 19Q2-20Q1				**Post 19Q2**			**Post 19Q4**		
ILB#POST#NL_PF	-0.812***	-0.756***	-0.665***	-0.665***	-0.182**	-0.209	-0.499***	-0.472**	-0.284***	-0.315
	[0.077]	[0.177]	[0.071]	[0.163]	[0.071]	[0.194]	[0.072]	[0.200]	[0.063]	[0.204]
ILB	0.408***	0.722**	0.413***	0.741**	0.438***	0.644*	0.413***	0.683**	0.421***	0.702**
	[0.138]	[0.303]	[0.140]	[0.313]	[0.145]	[0.318]	[0.141]	[0.313]	[0.143]	[0.321]
ILB#POST	-0.013	-0.195	-0.056	-0.054	-0.054	-0.005	-0.018	-0.078	-0.055	0.054
	[0.083]	[0.197]	[0.071]	[0.156]	[0.070]	[0.210]	[0.073]	[0.202]	[0.062]	[0.219]
ILB#NL_PF	0.412***	-0.144	0.423***	-0.145	0.238*	-0.258	0.360***	-0.175	0.370***	-0.176
	[0.136]	[0.307]	[0.137]	[0.311]	[0.139]	[0.292]	[0.137]	[0.306]	[0.138]	[0.310]
POST#NL_PF	0.307***	0.312*	0.223***	0.229	0.313***	0.322*	0.296***	0.308*	0.217***	0.232
	[0.034]	[0.160]	[0.031]	[0.145]	[0.037]	[0.178]	[0.037]	[0.177]	[0.034]	[0.163]
NL_PF	2.350***		2.300***		2.289***		2.328***		2.277***	
	[0.224]		[0.259]		[0.226]		[0.225]		[0.260]	
Bond size	0.456***	0.443***	0.465***	0.451***	0.456***	0.443***	0.456***	0.443***	0.465***	0.451***
	[0.042]	[0.129]	[0.043]	[0.126]	[0.042]	[0.129]	[0.042]	[0.129]	[0.043]	[0.126]
Distance	-0.344***	-0.266***	-0.350***	-0.278***	-0.344***	-0.266***	-0.344***	-0.266***	-0.350***	-0.278***
	[0.029]	[0.057]	[0.029]	[0.060]	[0.029]	[0.057]	[0.029]	[0.057]	[0.029]	[0.060]
Yield	0.076**	-0.149	0.091**	-0.133	0.076**	-0.146	0.076**	-0.146	0.091**	-0.133
	[0.038]	[0.144]	[0.041]	[0.148]	[0.038]	[0.142]	[0.038]	[0.142]	[0.041]	[0.149]
Maturity	-0.064	0.199	-0.094	0.177	-0.065	0.197	-0.064	0.197	-0.094	0.177
	[0.060]	[0.245]	[0.061]	[0.239]	[0.060]	[0.245]	[0.060]	[0.245]	[0.061]	[0.240]
n	615,083	65,831	486,917	51,720	615,083	65,831	615,083	65,831	486,917	51,720
Adj. R2	0.465	0.407	0.469	0.419	0.465	0.407	0.465	0.407	0.469	0.419
N holder sectors	8	1	8	1	8	1	8	1	8	1

Notes: Robust standard errors in brackets *** p<0.01, ** p<0.05, * p<0.10. The dependent variable is *HOLD* (ln). Sample covers EA government bonds. Regressions include a constant term and holder area fixed effects, holder sector fixed effects and time fixed effects. Columns (1) and (2) cover the sample period 2017-Q4 to 2022-Q4, where the first column includes all investor types and the second one is restricted to pension funds. Columns (3) to (4) are limited to 2021-Q4, where the former covers all investor types and the latter only pension funds. Columns (5) and (6) range up to 2022-Q4, where the former includes all investor types and the latter is restricted to pension funds. The same applies to Columns (7) and (8). Columns (9) and (10) span up to 2021-Q4, where the first covers all investor types and the last one only pension funds.

Table 5 – Investor clientele and time insensitivity

	(1)	(2)	(3)
	Low inflation	**Covid-19**	**High inflation**
	(13q4-19q4)	(20q1-21q2)	(21q3-23q4)
ILB	0.318**	0.370***	0.310*
	[0.128]	[0.131]	[0.159]
Bond size	0.460***	0.467***	0.442***
	[0.041]	[0.044]	[0.042]
Distance	-0.384***	-0.346***	-0.325***
	[0.028]	[0.029]	[0.027]
Yield	0.018	0.121**	0.048
	[0.024]	[0.049]	[0.036]
Maturity	-0.051	-0.086	0.017
	[0.054]	[0.059]	[0.055]
n	668,140	178,359	332,805
Adj. R2	0.470	0.458	0.447

Notes: Robust standard errors in brackets *** p<0.01, ** p<0.05, * p<0.10. The dependent variable is *HOLD* (ln). Sample covers EA government bonds. Each Column represents a different regime period (low inflation, covid-19 and high inflation respectively). Regressions include a constant term and holder area fixed effects, holder sector fixed effects and time fixed effects.

Table 6 – Investor clientele in the primary bond market

	(1)	(2)	(3)	(4)	(5)
	all	insur	invfd	pfund	bank
ILB	0.306**	-0.348*	0.333	0.555**	0.012
	[0.125]	[0.196]	[0.238]	[0.254]	[0.486]
ILB#Newly_issued	-0.333***	-0.296	-0.163	-1.025***	0.023
	[0.117]	[0.236]	[0.203]	[0.226]	[0.320]
Newly_issued	0.109	-0.572***	0.310*	-0.236	0.811***
	[0.097]	[0.159]	[0.154]	[0.173]	[0.136]
n	1.18 mln	251,891	235,296	125,712	165,212
Adj. R2	0.459	0.499	0.545	0.411	0.350
Controls	YES	YES	YES	YES	YES
FE	YES	YES	YES	YES	YES

Notes: Robust standard errors in brackets *** p<0.01, ** p<0.05, * p<0.10. The dependent variable is $HOLD$ (ln). Sample covers EA government bonds. Each Column represents a different group of investors from the euro area. All specifications include our (non-displayed) standard set of controls (Bond size, Distance, Yield, Maturity). The explanatory variable "Newly_issued" indicates that the individual bond held was issued within the quarter. Regressions include a constant term and the following fixed effects (FE): holder area fixed effects, holder sector fixed effects and time fixed effects.

Table 7 – Investor clientele and and maturity segments

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
			0-5 yrs					**5-10 yrs**					**>10 yrs**		
	all	insur	invfd	pfund	bank	all	insur	invfd	pfund	bank	all	insur	invfd	pfund	bank
ILB	0.294***	-0.005	0.446*	0.473***	0.018	0.278**	-0.322*	0.400	0.418	-0.386	0.406**	-0.922***	0.237	0.751*	0.375
	[0.104]	[0.192]	[0.222]	[0.164]	[0.546]	[0.128]	[0.176]	[0.236]	[0.270]	[0.608]	[0.180]	[0.276]	[0.300]	[0.399]	[0.358]
n	455,142	86,277	92,429	44,249	71,563	375,406	76,704	74,101	40,090	53,710	348,616	88,890	68,722	41,357	39,914
Adj. R2	0.482	0.448	0.566	0.450	0.360	0.478	0.506	0.598	0.425	0.372	0.455	0.573	0.545	0.511	0.353
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Robust standard errors in brackets *** p<0.01, ** p<0.05, * p<0.10. The dependent variable is *HOLD* (ln). Sample covers EA government bonds. Each Column represents a different group of investors from the euro area across different segments of the residual maturity of bonds for each subsample. All specifications include our (non-displayed) standard set of controls (Bond size, Distance, Yield, Maturity). Regressions include a constant term and the following fixed effects (FE): holder area fixed effects, holder sector fixed effects and time fixed effects.

Table 8 – Matching models

	(1)	(2)	(3)	(4)	(5)
	all	insur	invfd	pfund	banks
ILB	0.394***	-0.163	0.526**	0.947***	-0.293
	[0.125]	[0.181]	[0.194]	[0.245]	[0.527]
Bond size	0.462***	0.792***	0.820***	0.781***	0.399
	[0.097]	[0.240]	[0.102]	[0.214]	[0.391]
Constant	4.900**	-1.972	-2.228	-2.683	8.424
	[2.280]	[5.722]	[2.430]	[5.086]	[9.355]
n	120,028	22,684	24,770	15,507	11,202
Adj. R2	0.421	0.510	0.608	0.428	0.272

Notes: Robust standard errors in brackets *** p<0.01, ** p<0.05, * p<0.10. The dependent variable is $HOLD$ (ln). Sample covers EA government bonds with a forced matching sample including only issuer countries with inflation-linked bonds (France, Germany, Italy and Spain). Each Column represents a different group of investors from the euro area. These specification exclude our standard set of control variables as the bonds are already matched beforehand with the exception of Bond size, as larger bonds allow for (monotonically) larger investments. Regressions include the following fixed effects (FE): holder area fixed effects, holder sector fixed effects and time fixed effects.

Appendix

This appendix provides additional background material.

First, Table A1 provides a correlation matrix of our main variables included in the bond demand estimations. Note here that the strong correlation between Distance and home is expected, as a large share of the government bond holdings are domestically owned and obviously the distance within home is zero. We do not include Distance and home within the same model for this reason, although this degree of multicollinearity is not necessarily an issue given the size of our dataset as also exemplified in Table 3 Column (9) versus Column (10) where we display this impact directly.

Second, our main model does not control for investor-specific demand difference among our control variables but instead relies on subsamples for ease of exposition and interpretation. Following the model specification of Boermans (2025) our model setup does take investor-specific demand into account in Table A2 with interaction terms. These results basically highlight that our main findings from Table 2 are robust when controlling for these investor sector interaction terms, which is why we opted for the simpler exposition in the main text. Specifically, for the global bond market, we find significant tilts toward ILBs by euro area investors. In addition, Columns (5) to (8) show how different investor types tilt their portfolios towards inflation-linked bonds compared to other investors within the global government bond portfolios. These results show that while euro area investors on average hold more inflation-linked bonds than an internationally diversified bond portfolio would suggest, insurance companies display a negative tilt and shun these bonds (-0.761), while pension funds show a stronger demand for these bonds (0.470) compared to other investors. For banks and investment funds we do not detect any significant deviations from the general tilt towards inflation-linked bonds, although in this table the effect of investment funds is weakly significant (0.261, $p<0.10$).

Third, Figure A2 depicts the investments in inflation-linked bonds of Dutch pension funds in relative terms indexed against the starting point of the difference-in-difference *POST* dummy from Table 4.

Fourth, Figure A3 displays the evolution of bond prices in our sample. In general, while ILB prices are higher, they comove with prices of other government bonds in our sample.

Finally, Figure A4 further outlines the holdings of ILBs of the two largest Dutch pension

funds and Figure A5 for the whole Dutch pension system[25], highlighting how they significantly shifted away from inflation-linked bonds after the announcement of the new pension system.

[25] Our sample covers only the largest Dutch pension funds.

Table A1 – Correlation matrix

	ILB	Bond size	Distance	Home	USD	EUR	Yield
ILB	1						
Bond size	0.135	1					
Distance	-0.006	0.044	1				
Home	-0.013	-0.078	-0.799	1			
USD	-0.024	-0.040	0.321	-0.122	1		
EUR	-0.047	-0.017	-0.521	0.216	-0.565	1	
Yield	-0.130	-0.346	0.231	-0.089	0.277	-0.313	1
Maturity	0.033	-0.131	0.026	-0.003	0.038	-0.018	0.152

Notes: ILB is our indicator for inflation-linked bonds. *Bond Size (ln)* captures the amount outstanding of a bond in nominal terms (nom) or at market value (mv), *Distance* is the bilateral geographical distance between the country of the issuer and the investor, *USD* and *EUR* are indicator variables representing if a bond is denominated in US dollars or euros respectively, *Yield* gives the yield to maturity of a bond, *Maturity (ln)* is the residual maturity measured in days.

TABLE A2 – FULL REGRESSION MODEL WITH INTERACTION TERMS (CONTINUES)

	(1) all	(2) all	(3) all	(4) all	(5) insur	(6) invfd	(7) pfund	(8) bank
ILB	0.427***	0.380***	0.303**	0.337***	0.445***	0.183	0.371***	0.357***
	[0.155]	[0.140]	[0.122]	[0.122]	[0.122]	[0.138]	[0.138]	[0.122]
ILB#s					-0.761**	0.261*	0.470**	-0.275
					[0.317]	[0.208]	[0.231]	[0.563]
Bond size			0.367***					
			[0.041]					
Distance			-0.329***					
			[0.024]					
USD			0.274***					
			[0.094]					
EUR			0.843***					
			[0.152]					
Yield			0.065***					
			[0.014]					
Maturity			-0.075***					
			[0.027]					
Size#bank				0.530***	0.529***	0.531***	0.530***	0.532***
				[0.061]	[0.061]	[0.061]	[0.061]	[0.060]
Size#ins				0.297***	0.303***	0.298***	0.297***	0.297***
				[0.039]	[0.040]	[0.039]	[0.039]	[0.039]
Size#if				0.493***	0.492***	0.490***	0.493***	0.493***
				[0.094]	[0.094]	[0.094]	[0.094]	[0.094]
Size#pf				0.286**	0.285**	0.287**	0.288**	0.286**
				[0.125]	[0.125]	[0.125]	[0.125]	[0.125]
Dist.#bank				-0.400***	-0.400***	-0.400***	-0.400***	-0.400***
				[0.076]	[0.076]	[0.076]	[0.076]	[0.076]
Dist.#ins				-0.182**	-0.181**	-0.182**	-0.182**	-0.182**
				[0.074]	[0.073]	[0.074]	[0.074]	[0.074]
Dist.#if				-0.232***	-0.232***	-0.232***	-0.232***	-0.232***
				[0.034]	[0.034]	[0.034]	[0.034]	[0.034]
Dist.#pf				-0.327***	-0.327***	-0.327***	-0.327***	-0.327***
				[0.125]	[0.125]	[0.125]	[0.125]	[0.125]
Home#bank				-0.212	-0.212	-0.210	-0.213	-0.209
				[0.908]	[0.907]	[0.909]	[0.908]	[0.911]
Home#ins				1.590**	1.608**	1.593**	1.589**	1.589**
				[0.658]	[0.657]	[0.658]	[0.658]	[0.658]
Home#if				-0.256	-0.256	-0.259	-0.257	-0.256
				[0.362]	[0.360]	[0.358]	[0.361]	[0.361]
Home#pf				-0.554	-0.553	-0.555	-0.553	-0.555
				[0.894]	[0.895]	[0.892]	[0.891]	[0.894]
	...	...	...	...	...	...	...	...

Notes: Robust standard errors in brackets *** p<0.01, ** p<0.05, * p<0.10. The dependent variable is $HOLD$ (ln). Regressions include fixed effects.

Table A3 – Full regression model with interaction terms (CONTINUED)

	(1) all	(2) all	(3) all	(4) all	(5) insur	(6) invfd	(7) pfund	(8) bank
ILB	0.427***	0.380***	0.303**	0.337***	0.445***	0.183	0.371***	0.357***
	[0.155]	[0.140]	[0.122]	[0.122]	[0.122]	[0.138]	[0.138]	[0.122]
ILB#s					-0.761**	0.261*	0.470**	-0.275
					[0.317]	[0.208]	[0.231]	[0.563]
	...	...	...	...	...	...	...	...
USD#bank				0.709***	0.708***	0.710***	0.709***	0.711***
				[0.205]	[0.204]	[0.206]	[0.205]	[0.204]
USD#ins				-0.210	-0.190	-0.205	-0.211	-0.211
				[0.260]	[0.262]	[0.260]	[0.261]	[0.260]
USD#if				0.349**	0.349**	0.349**	0.349**	0.349**
				[0.142]	[0.142]	[0.141]	[0.142]	[0.142]
USD#pf				0.331	0.326	0.340	0.344	0.330
				[0.213]	[0.211]	[0.217]	[0.218]	[0.213]
EUR#bank				1.393***	1.394***	1.390***	1.393***	1.388***
				[0.324]	[0.324]	[0.324]	[0.324]	[0.325]
EUR#ins				1.618***	1.602***	1.615***	1.619***	1.619***
				[0.370]	[0.371]	[0.370]	[0.370]	[0.370]
EUR#if				0.891***	0.895***	0.899***	0.892***	0.891***
				[0.313]	[0.313]	[0.311]	[0.313]	[0.313]
EUR#pf				0.671	0.673	0.669	0.667	0.671
				[0.622]	[0.622]	[0.623]	[0.623]	[0.622]
Yield#bank				-0.027	-0.027	-0.028	-0.027	-0.029
				[0.021]	[0.021]	[0.021]	[0.021]	[0.020]
Yield#ins				-0.043**	-0.051***	-0.045**	-0.043**	-0.043**
				[0.022]	[0.019]	[0.021]	[0.022]	[0.022]
Yield#if				0.086***	0.087***	0.088***	0.086***	0.086***
				[0.019]	[0.019]	[0.020]	[0.019]	[0.019]
Yield#pf				0.102***	0.103***	0.099***	0.098***	0.102***
				[0.021]	[0.020]	[0.020]	[0.020]	[0.021]
Mat.#ba				-0.218***	-0.219***	-0.215***	-0.218***	-0.214***
				[0.077]	[0.077]	[0.078]	[0.077]	[0.074]
Mat.#ins				0.161***	0.171***	0.163***	0.160***	0.160***
				[0.059]	[0.056]	[0.059]	[0.059]	[0.059]
Mat.#if				-0.057	-0.059	-0.062	-0.057	-0.057
				[0.039]	[0.039]	[0.040]	[0.039]	[0.039]
Mat.#pf				-0.076	-0.078	-0.073	-0.072	-0.076
				[0.118]	[0.118]	[0.117]	[0.118]	[0.118]
n	2.5 mln	2.5 mln	2.5 mln	2.5 mln	2.5 mln	2.5 mln	2.5 mln	2.5 mln
R-squared	0.002	0.238	0.392	0.372	0.373	0.372	0.372	0.372
Investor j FE	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Investor s FE	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R2	0.002	0.238	0.392	0.372	0.373	0.372	0.372	0.372

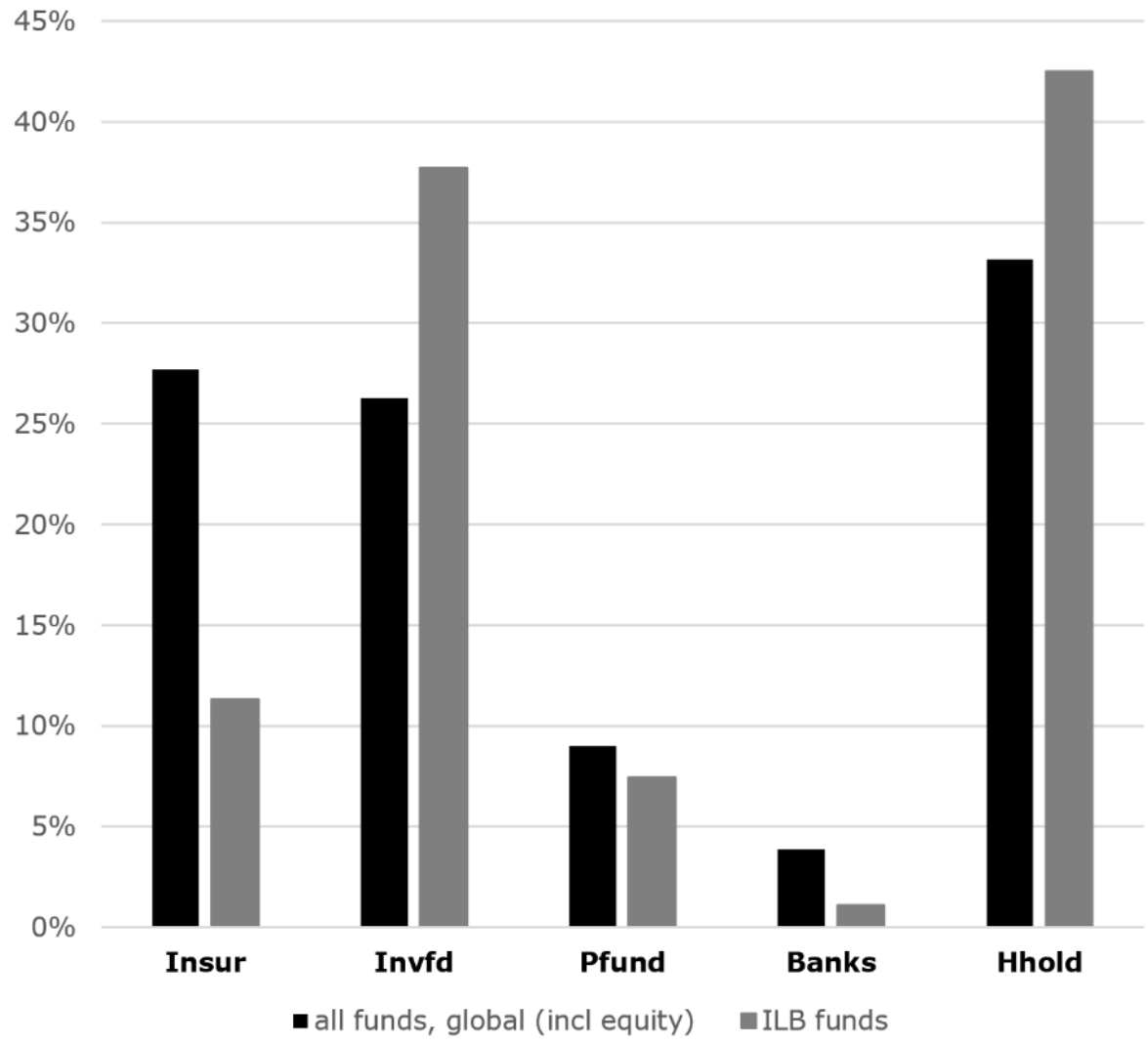

Figure A1 – Euro area holdings of global funds

Notes: This figure shows the average distribution of ownership among euro area investors in global funds over our sample period (2013Q4-2023Q4). The data are derived from the SHS-S covering 21,204 global investment funds (including equity and mixed funds) with ISIN code and 34 funds that hold only inflation-linked debt ("ILB funds"). We manual compile a list of 34 ILB funds that include funds from Amundi, ASR, AXA, BND, BNP, CapitalAtWork, CM-AM, Colchester, Credit Suisse, Dimensional, DPAM, Eurizon, Fidelity, iShares, MFS, M&G, Natixis, NT, State Street, UBS, Vanguard and Xtrackers. The percentage of holdings indicates how large the share of the total investments in global funds is for each investor sector from the perspective of the euro area, which include the primary fund holders, namely insurance companies (*Insur*), investment funds (*Invfd*), pension funds (*Pfund*), banks (*Banks*) and households (*Hhold*).

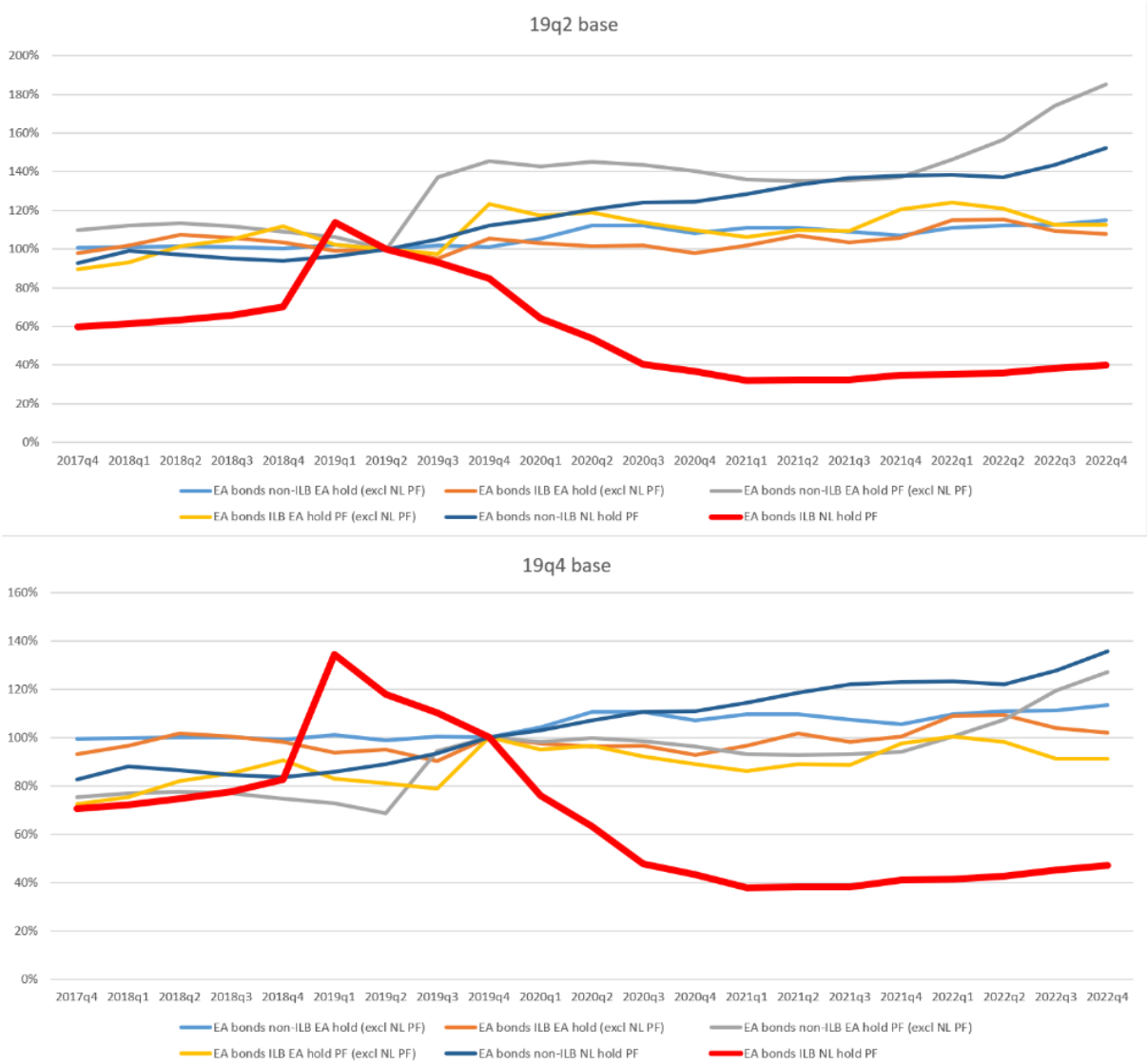

FIGURE A2 – ILB RELATIVE PORTFOLIO HOLDINGS AND THE DUTCH PENSION LAW CHANGE

Notes: In June 2019 a new Dutch pension system law was annoucement and published in December 2019, marking a massive transition. The figure shows the relative portfolio holdings in inflation-linked bonds and non-ILB government bonds issued by euro area sovereigns across different "benchmark" investor sectors. The red line indicates the positions of Dutch pension funds in ILBs, which dropped by more than 50% in the POST periods (both for the benchmarks 2019-Q2 and 2019-Q4).

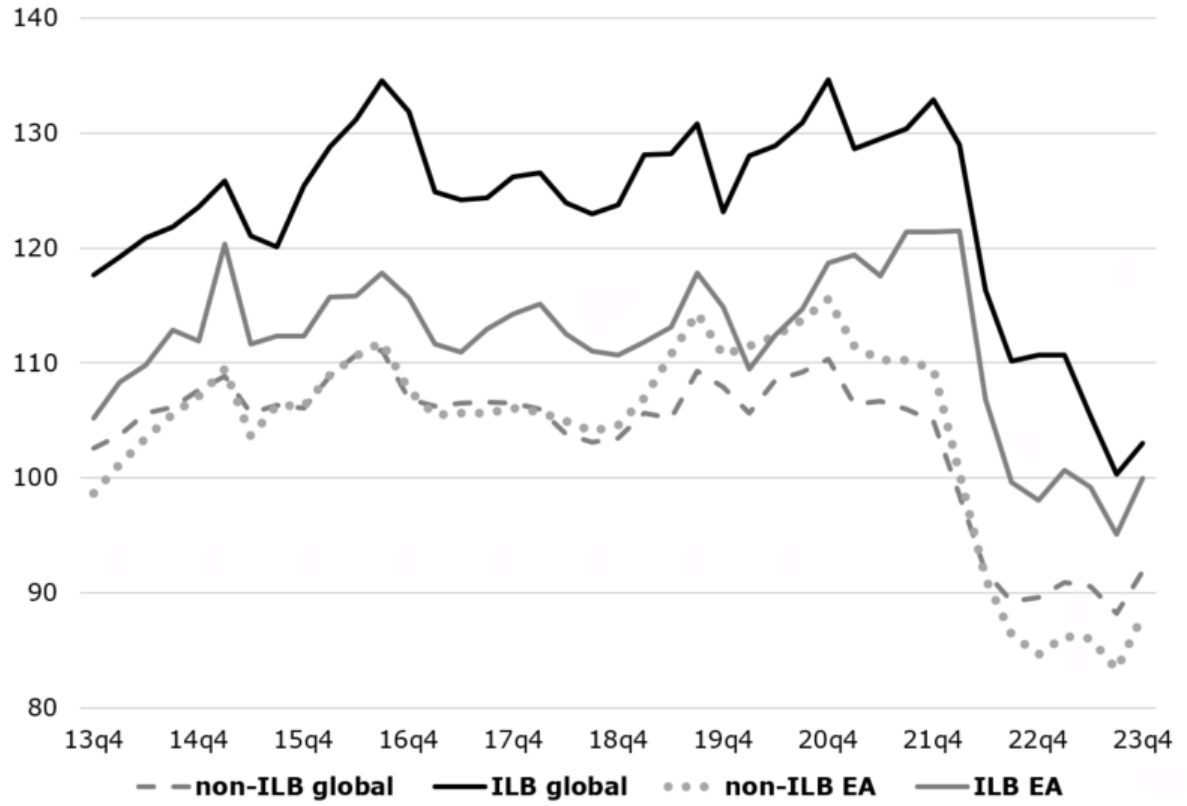

Figure A3 – Evolution of bond prices

Notes: The figures shows the average bond prices for our sample of government bonds, where we distinguish between inflation-linked bonds (ILBs) and the issuer region, with EA denoting euro area government bond issuances.

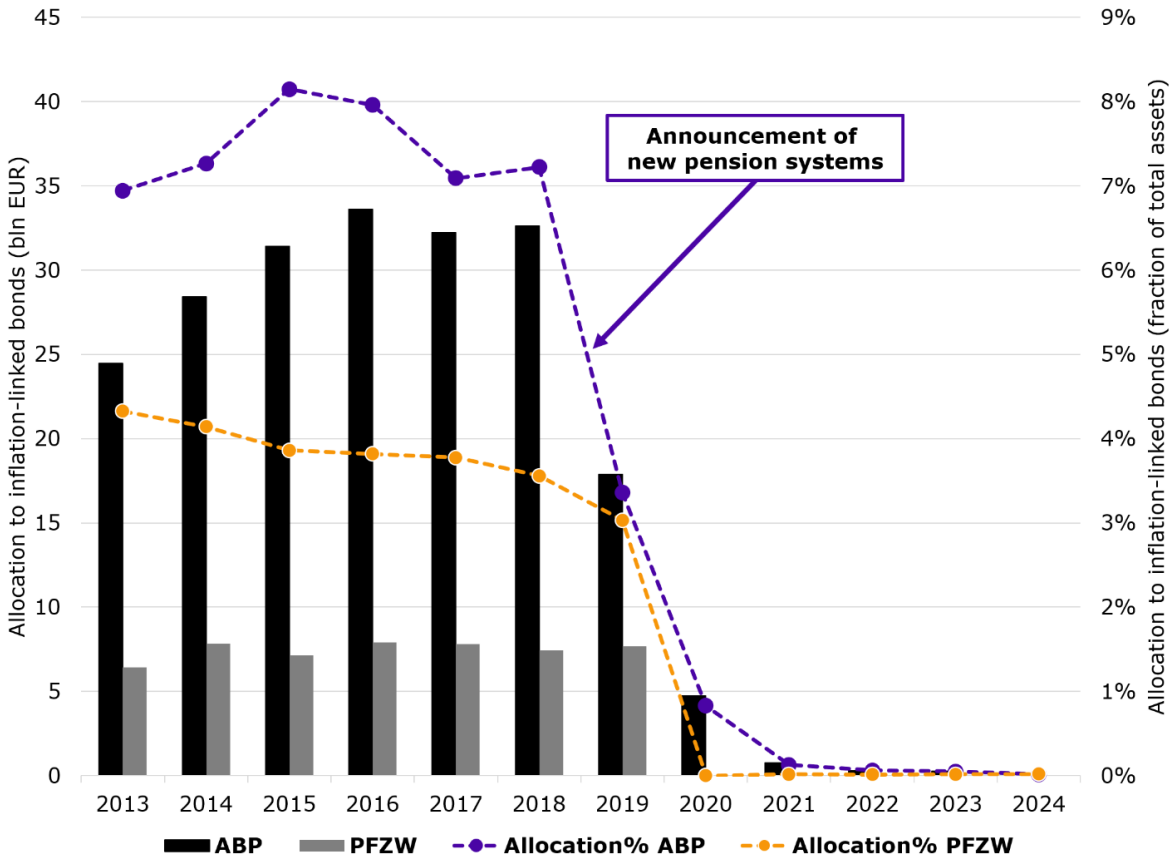

FIGURE A4 – ILB HOLDINGS BY THE TWO LARGEST DUTCH PENSION FUNDS

Notes: Evolution of holdings of inflation-linked bonds. The figures is based on the annual reports of the two largest Dutch pension funds, Algemeen Burgerlijk Pensioenfonds (ABP, or National Civil Pension Fund) and Pensioenfonds Zorg en Welzijn (PFZW, or Pension Fund for Care and Welfare Sector).

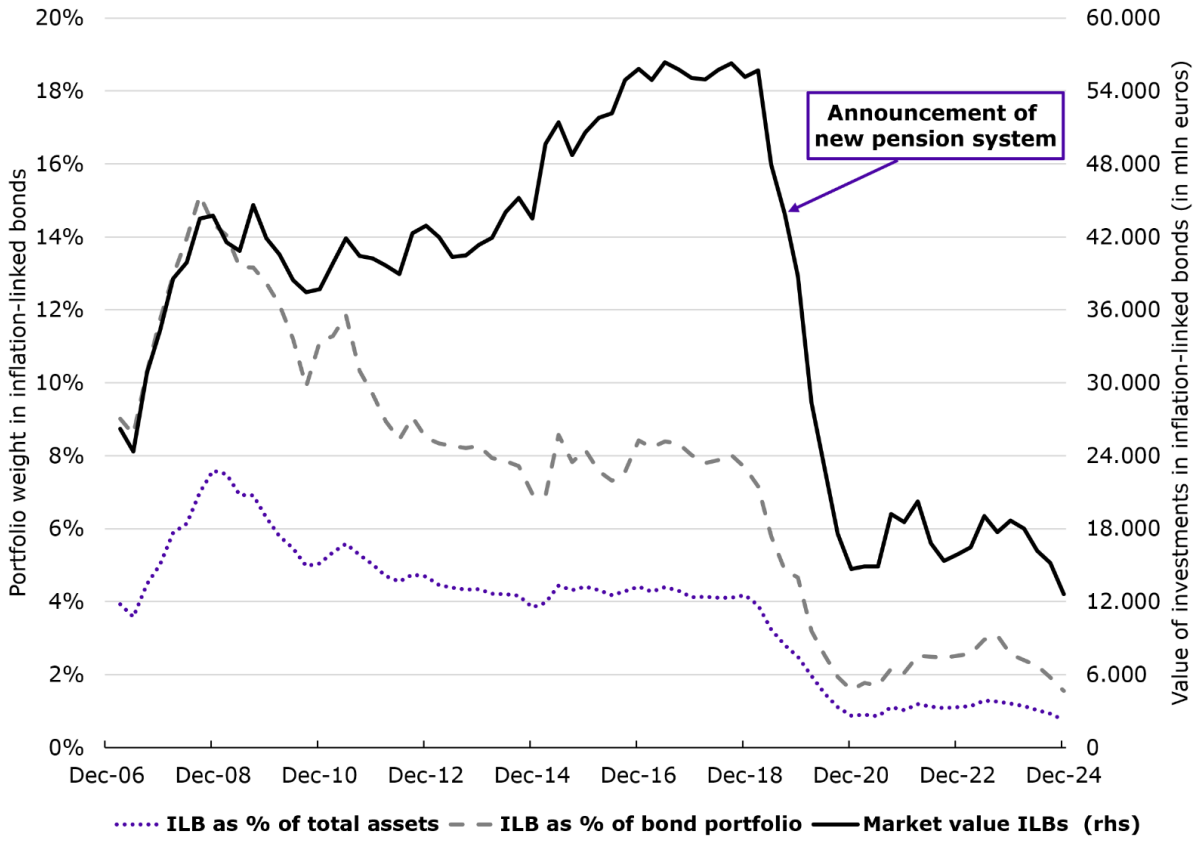

FIGURE A5 – ILB HOLDINGS WITHIN THE DUTCH PENSION FUNDS SECTOR

Notes: Evolution of holdings of inflation-linked bonds. The figure is based on public data published by the supervisor.

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