Passive investors in primary bond markets

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December 15, 2023

Abstract

We provide the first evidence that passive investors participate in the primary market for corporate bonds, despite the fact that these bonds are not yet included in their benchmark index. Using two samples (daily ETF holdings of all new issuances and ETF and index mutual fund holdings of month-end issuances), we find that passive funds have higher offering day holdings in bonds with lower underpricing, especially those with negative first day performance. Offering date allocations to passive funds are negatively related to one-month and one-year bond returns and positively related to downgrades in the first year. The effect is linked to primary allocations rather than secondary market purchases or ETF creation baskets. The main findings are driven by both overallocations by underwriters to passive fund families and by fund families to their passive funds.

Keywords: Passive investment, ETFs, Corporate bonds, Primary markets, Underpricing, Conflicts of interest

JEL Classification: G14, G23, G24, G30

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1 Introduction

Corporate bond markets have fundamentally changed over the last twenty years. Driven by historically low interest rates, non-convertible bond issuance quadrupled between 2000 and 2020 according to SIFMA (2021). Over the same period, the percentage of fixed income mutual fund assets following a passive mandate grew from two percent to thirty percent according to the Investment Company Institute (2021). At the intersection of these two key market developments is the role of passive investors in corporate bond issuance. In this paper, we study how passive investors participate in the primary corporate bond market and the performance of the offerings they receive.

While many asset classes have seen an explosion of passive investing, corporate bonds offer an attractive setting to examine the implications for primary markets for several reasons. First, the corporate bond market is a large and important source of firm capital, vastly exceeding the equity initial public offering (IPO) and seasoned offering markets. Second, most bond indices have clear benchmark inclusion rules towards which firms cater the characteristics of their new issue bonds (Dathan and Davydenko, 2020). However, meeting index standards does not guarantee the primary market participation of passive funds because funds do not strictly replicate the benchmark and new issues are not included in the index until the next rebalancing. For these reasons, it is not immediately obvious that passive funds would want or be able to buy bonds on the offering date.

Using daily holdings data for a subset of 20 corporate bond exchange-traded funds (ETFs), we first document that these passive investors hold bonds on their offering date, prior to the bond's inclusion in the benchmark.[1] Our empircal study continues by examining the performance of new offerings held by passive funds. Existing primary market theories do not explicitly model the index weight driven demand of passive investors. However, passive funds do have characteristics

[1] In contrast, passive funds rarely participate in IPOs (e.g., ETFTrends (2021).) While Evans et al. (2023) document that firms with higher ETF ownership have a higher propensity to conduct an seasoned equity offering, they do not provide evidence whether ETFs actually buy shares in the primary market.

that are known to lead to allocations in better and worse offerings. Notably, passive funds are institutional investors from large families (Sherman and Titman, 2002), repeat primary market participants (Cornelli and Goldreich, 2001), and long-term price-insensitive investors that are unlikely to 'flip' their holdings (Jenkinson and Jones, 2004), suggesting favorable allocations in better offerings. In contrast, the funds may be allocated worse offerings because passive investors do not produce information by mandate (Benveniste and Spindt, 1989) and ETFs are unable to participate in quid pro quo trading arrangements (Loughran and Ritter, 2004). The characteristic-driven investment also suggests that the funds may be a dumping ground for offerings with weak demand from other investors (Ritter and Zhang, 2007).

We show that ETFs have higher offering date holdings in less attractive new issue bonds, Limiting the sample to bonds that are eligible for inclusion in the benchmark of the ETF, we find that ETFs have higher holdings in bonds with lower first day returns (i.e., lower underpricing). A one standard deviation increase in ETF offering date holdings is associated with underpricing that is 3.5 basis points (bps) lower. The effect is economically significant, representing 10% of the average underpricing in the sample. Supporting the conjecture of Rock (1986) that underpricing is necessary to attract uninformed investors, on average underpricing is still positive. However, ETFs also have significantly higher holdings in cold bond offerings, defined as bonds with negative first day returns.

Offering date holdings do not necessarily imply primary market allocations. ETF holdings could alternatively be acquired by secondary market purchases or as part of an ETF creation basket. We exploit the illiquidity of the corporate bond market and details of our daily data to disentangle the source of the holdings. For a subset of new offerings, the total ETF holdings on offer date exceed total secondary market trading and ETF creation volume on that date – for these bonds, we know for certain at least one ETF received a primary market allocation. In contrast, we use the subset of new issues that are index-eligible but where total ETF holdings on offer date is zero as our control group. These offerings are likely placed with other institutional investors, such as active mutual funds and insurance companies. We find that bonds in the control group have

average underpricing that is more than 5 times higher than bonds with definite ETF allocation (0.83% compared to 0.16%).

Beyond underpricing, we find that bonds allocated to ETFs continue to be less attractive over the first year of the bond's life. The negative relation between holdings and performance persists through the first month of a bond's life. The bonds with higher ETF offering date holdings are also more likely to be downgraded within the first year. Overall, though ETFs hold new issue bonds with positive underpricing, we find evidence that they receive higher allocations of bonds with worse performance.

The advantage of the ETF-focused analysis is that it grants us precision in identifying when funds buy new bonds, but it is limited to ETFs who report daily holdings. Thus, index mutual funds and monthly reporting ETFs that likely face similar primary market incentives are excluded from our study.[2] In order to take a broader perspective, we turn to monthly holdings of the entire mutual fund industry, which includes active mutual funds and index mutual funds along with ETFs. We focus on the subset of corporate bond offerings that occur on the last two trading days of the month.[3] Using the broader investor sample, we confirm that passive funds (including index mutual funds and ETFs) have higher holdings in bonds with lower underpricing and short-term performance, while active funds have higher holdings in bonds with higher underpricing and short-term performance. The level of offering date holdings by passive funds is negatively related to cumulative abnormal returns for the first twelve months after issuance; while, the level of offer date holdings by active funds is positively related to bond returns.

In our final test we attempt to identify the source of passive funds' relative underperformance in the new issue market. We first develop a proxy for abnormal allocations to passive funds, as the difference between actual passive ownership and the ownership implied by the asset-based weight of passive funds in the industry.[4] We confirm our return results are robust to abnormal

[2]Notably, Vanguard ETFs hold significant passive assets but only report holdings monthly due to the unique VETF structure in which the ETF is a share class of the index mutual fund.

[3]The economic effect of the results using just month-end offerings is similar, but the power of the study is limited by the sample size. Further, we are able to identify offerings that occur on the second to last day of the month but trading begins on the next day. It is likely that these offerings occur after market hours.

[4]This measure takes the allocation to all funds as given. In practice, bookrunners consider allocations to insurance

allocations to passive funds - when passive funds receive more than in aggregate than the asset-weighted implied ownership the new issues have lower underpricing and short-term and long-term returns. There are two potential sources of the abnormal allocations. The first is from the underwriters to the fund family because new issues are subscribed to at the fund family level. The second is from the fund family to their passive funds because the family decides how to distribute the allocation among their funds. Similar to the abnormal aggregate proxy above, we develop two measures of abnormal deviations. Abrnormal allocations to the family is the difference in the total family ownership of the new issue and family's asset-weighted implied ownership of the total allocation to all funds. The difference between the allocation to passive funds and the ownership implied by the asset-weight of passive funds in the family proxies for the abnormal allocation by the family. We find that both abnormal allocations to and by the family are negatively related to the performance of new issuances. Therefore, underwriters overallocate passive families and consistent with Gaspar et al. (2006) the family overallocates their passive funds in bonds with lower underpricing and subsequent short- and long-term performance.

By explicitly analyzing how passive investors participate and perform in primary market relative to other investor types we contribute to the growing literature on the dynamics of the corporate bond primary market. Nikolova et al. (2020) was the first to document that new issue allocations to insurance companies are driven by prior trading relationships and weakly by information production. Using the same dataset, Nagler and Ottonello (2022) document that a mutually beneficial relationship allows underwriters to 'park' bonds with insurers to circumvent inventory constraints. Further, Wang (2021) investigates the partial adjustment phenomenon in new issue bond pricing, Bessembinder et al. (2021) examine syndicate dynamics and allocations, and Goldstein et al. (2021) and Nikolova and Wang (2022) study secondary market trading in the weeks after issuance.

This paper is also related to the literature examining the overall impact of ETFs and other passive investors in the corporate bond market. Dannhauser (2017) documents that higher ETF

companies, pension funds, and other institutional investors in addition to their allocations to asset managers of active mutual funds, index fund mutuals, and ETFs.

ownership reduces bond yields by looking at changes to Markit iBoxx index inclusion rules. Dannhauser and Hoseinzade (2022) show that ETFs also induce secondary market trading fragility in corporate bonds by catering to liquidity-seeking investors. Several papers also examine the impact of passive investors on liquidity of the underlying corporate bonds, such as Dick-Nielsen and Rossi (2019), Holden and Nam (2022) and Marta (2021). Koont et al. (2022) and Shim and Todorov (2023) study the flexibility of representative sampling, rather than strict replication, techniques of the primary ETF market. While these papers focus on the effect of passive investors in secondary trading market for corporate bonds, this is the first paper to examine the potential effect that passive investors have in primary corporate bond markets.

There are important regulatory implications of our finding that passive investors underperform in the $2.3 trillion new issue bond market (SIFMA, 2021). If passive investors are used by underwriters to complete offerings without sufficient demand from active investors, it is possible that the growth of passive assets has facilitated the completion of issuances that otherwise would have failed. This would benefit firms by way of increased market access or more attractive bond terms, and underwriters through increased new issue commissions. Families with passive assets are able to generate repeat demand for offerings, which benefits their higher fee-paying active funds. The impact on passive fund investors is uncertain. Funds are able to avoid secondary market illiquidity and receive some underpricing on average facilitating positive tracking error. In the long-term the effect on tracking error is likely inconsequential since the bond is included in the index, but the long-term underperformance alludes the hidden cost of Reilly (2022).

2 Data

This section details the data used in our study. Subsection 2.1 discusses the various sources. Subsection 2.2 describes the construction of our key variables. Summary statistics are presented in subsection 2.3.

2.1 Data sources and measures

We conduct our analysis in two stages: we first focus on the sample of corporate bond ETFs that report daily holdings, then we expand the sample to include all passive and active mutual funds. In order to complete our analysis, we use four main sources: Morningstar Direct, Mergent's Fixed Income Security Database (FISD), the enhanced version of FINRA's Trade Reporting and Compliance Engine (TRACE), and the Center for Research in Security Prices' (CRSP) Mutual Fund Database.

For the first part of our analysis, we download from Morningstar the daily holdings of 20 bond ETFs that hold U.S. corporate bonds January 2015 to December 2020. We delete holdings reported on weekends or holidays from Securities Industry and Financial Markets Association (SIFMA).[5] For missing holding dates for a fund, we assume the holdings are unchanged from the day prior. As of the end of the sample period, the approximate corporate bonds assets under management (AUM) for the ETFs in our represents 61% of the AUM of ETFs that hold corporate bonds and 93% of assets held by ETFs that report daily holdings.[6] A summary of these ETFs' characteristics can be found in Appendix A.

For each ETF in our daily sample, we determine the index that it tracks, and code that index's criteria for inclusion by following the rules published by the index provider; in our sample, all ETFs follow indexes administered by Bloomberg, ICE or iBoxx. The most frequently used criteria include minimum offering size, rating category (investment grade vs high yield), and time to maturity.[7] We use these index criteria to estimate which bonds each ETF would likely want to purchase, and in some robustness tests, in what quantities.

For the second part of the analysis, we use CRSP to obtain monthly holdings of all passive

[5]The historical bond market calendar can be found here: https://www.sifma.org/resources/general/holiday-schedule/.

[6]We calculate the percentage of AUM using the ETF screener from VettaFi (formerly ETFdb.com) and include passive ETFs who invest in investment grade corporate, junk bonds, and the total bond market in the U.S. For total bond market ETFs we estimate that 30% of fund assets are in corporate bonds. ETFs managed by Vanguard only report their holdings monthly.

[7]For indexes with an upper bound in terms of time to maturity (e.g., bonds with no more than 10 years to maturity), we calculate the time to maturity as of the first day of the month following issuance, which is commonly the date when indexes rebalance.

and active bond funds. To account for missing observations, we again assume there no change in holdings between two CRSP report dates. We restrict our sample to corporate bond funds using CRSP and Lipper Objective Codes.[8] Passive funds are identified using fund name from CRSP following Appel et al. (2016), Busse and Tong (2012) and Iliev and Lowry (2015) where the CRSP database index fund flag equal to D or B.[9] ETFs are identified using the CRSP indicator flag and a name search. A fund is identified as an index mutual fund if at any point in fund history it is flagged by the name search or a CRSP identifier and is not flagged as an ETF. We eliminate leveraged or inverse funds.[10] We impute the bonds held by the ETF share class of Vanguard by taking the percentage of assets in the ETF times the bonds held by the portfolio.

While our sample of bond funds hold a broad range of fixed income securities, we focus our analysis on their holdings of U.S. corporate bonds, identified using FISD bond type of "CDEB". In order to identify our sample of interest, we exclude convertible bonds, perpetual bonds, preferred securities, asset-backed and mortgage bonds, medium term notes, and foreign currency bonds. Rule 144A bonds infrequently appear in TRACE, so are not included in tests that require return calculations. We further require that the bonds have fixed coupons, and biannual interest payments. Finally, we exclude bonds that are sold under an exchange offering, as these are exchanged from an existing security and are not new issue bonds. Our preliminary sample includes 7,089 U.S. corporate bonds that are eligible for index inclusion, of which 2,551 are issued pursuant to Rule 144A.

TRACE provides daily trading data. The enhanced version of the database is filtered for cancellations, corrections, reversals, agency transactions, duplicate inter-dealer trade reports, and non-cash trades using the methodology of Dick-Nielsen (2014). We eliminate transactions with prices under \$5 and over \$1,000 following Bali et al. (2021). Following Nikolova et al. (2020), po-

[8] We restrict the sample to funds with CRSP objective codes beginning with IC or Lipper Objective Codes equal to A, BBB, SII, SID, IID, or HY.

[9] Index funds are flagged if the CRSP fund name contains the following strings: SP, DOW, Dow, DJ or if the lowercase version of the CRSP fund name contains: index, idx, indx, ind_ (_indicates space), aggregate, composite, russell, s&p, s and p, s & p, msci, Bloomberg, kbw, nasdaq, nyse, stoxx, ftse, wilshire, Morningstar, 100, 400, 500, 600, 900, 1000, 1500, 2000, 3000, or 5000.

[10] Inverse and leveraged funds are identified if the lowercase version of their name contains the following strings: plus, enhanced, inverse, 2x, 3x, ultra, 1.5x, 2.5x.

tential price errors are removed by excluding trades whose price is more than 20 percent from the median price of the ten surrounding trades. Trades on weekends or full-day holidays reported by SIFMA are deleted. Following Bao et al. (2018) and Bessembinder et al. (2009), we remove trades of less than $100,000 in par value.

2.2 Main variable definitions

Our main variable of interest using the daily ETF holdings is the percentage of a new issue bond i that is held by an ETF j on the bond's offer date:

$$OfferDateHolding\%_{i,j} = \frac{BondsHeld_{i,j}}{AmountOutstanding_i} \tag{1}$$

For many bond-ETF pairs, this variable may be 0 because it is outside of the ETF's investment mandate; for example, we would expect that an investment grade ETF should have 0% offer date holdings for all new issue high yield bonds. In order to account for this latent demand, we include in our sample only bonds that we estimate are included in the index that the ETF tracks.[11]

For the broader CRSP sample, we use month-end holdings at the end of a bond's first month and compute $ETFOwnership$, the total number of shares held by all ETFs, J, over the bond's amount outstanding as shown in the equation below,

$$ETFOwnership_{i,m} = \frac{\sum_{j=1}^{J} BondsHeld_{i,j,m}}{AmountOutstanding_{i,m}} \tag{2}$$

Following equation 2, we compute similar measures for active mutual funds, $AMFOwnership$, and index mutual funds, $IMFOwnership$. We adjust ETF and index fund ownership for the Vanguard structure. We then define $PassiveOwnership$ as the sum of ETF and index mutual fund ownership.

Returns in the first ten days of trading are computed following Bessembinder et al. (2021) and

[11] In untabulated robustness tests, we confirm that our results hold using several other measures of offer date holdings: offer date holding % including only bonds that are held within the first 60 days of a bond's life, offer date portfolio weight in an ETF minus the estimated index weight, and the offer date portfolio weight in an ETF minus the estimated index weight including only bonds held within the first 60 days of a bond's life. These analyses are available upon request.

Cai et al. (2007) as the percentage change from the offering price to the secondary market price, adjusted for accrued interest and market movements. Specifically, the raw return of bond i over the n days following the offering date, t, is calculated as:

$$OR_{i,t+n} = \frac{P_{i,t+n} + AI_{i,t+n} - OP_{i,t}}{OP_{i,t}} \tag{3}$$

$P_{i,t+n}$ is is the trade-size-weighted average flat price of secondary market trades on trading day t+n following the following the offering. In our analysis of short-term returns we consider the first twenty trading days after the offering (i.e., $0 \leq n \leq 20$). $AI_{i,t+n}$ is the accrued interest and $OP_{i,t}$ is the offering price. To account for market conditions we subtract the returns of the rating- and maturity-matched Bank of America ICE bond index relative to the day before issuance, $t-1$. Therefore, the offer return $ReturnFromOffer_{i,t+n}$ is:

$$ReturnFromOffer_{i,t+n} = OR_{i,t+n} - IndexReturn_{t-1,t+n}. \tag{4}$$

For each bond, we define $Underpricing_i$ as the first non-missing $ReturnFromOffer_{i,t+n}$ in the first five trading days. We define a dummy that takes on a value of 1 when the raw return from the offering price is negative (also known as a cold offering, or an overpriced bond), and 0 otherwise.

We then look at two other measures of bond quality: ratings changes within the first year of a bond's life and the inclusion of covenants. We define $Upgrade_i$ ($Downgrade_i$) as an indicator variable equal to one if within 365 calendar days of the issue date, the bond's rating or outlook is increased (decreased) by one of the three main ratings agencies, and zero otherwise. For covenants, we follow the framework proposed by Chava et al. (2010) and group covenants from Mergent FISD into four categories: restrictions on *Dividend* payouts, limits on what the firm can do during certain *Events* (e.g., change of control, rating decline), restrictions on debt issuance and other *Financing* decisions, and restrictions on *Investments*.[12] Each dummy variable takes on

[12]The full list of covenants by category can be found in the appendix of Handler et al. (2021).

a value of 1 if at least one covenant is included in a given category and 0 otherwise.

In our analysis of long-term returns we use the measure, Ret_{L5M} obtained from WRDS.[13] This measure of monthly returns to bond i in the month, m is computed as

$$R_{i,m} = \frac{P_{i,m} + C_{i,m} + AI_{i,m}}{P_{i,m-1} + AI_{i,m-1}} - 1. \tag{5}$$

$P_{i,m}$ is the trade-size-weighted price of the bond on its last trading day in a month. The last trade is required to occur in the last five trading days in the month. $C_{i,m}$ is the coupon payment in the month, if any, and $AI_{i,m}$ is accrued interest. We index adjust the raw return by subtracting the return of the rating- and maturity-matched bond index, c, between the last day has an observable price in month $m-1$ and month m to compute monthly return:

$$MonthlyReturn_{i,c,m} = R_{i,c,m} - ICEReturn_{c,m}. \tag{6}$$

To evaluate the long-term performance of new issue bonds, we compute the cumulative abnormal returns (CAR) for each month m since the issuance of bond i in the rating and time-to-maturity category c is computed as

$$CAR\%_{i,m} = \Sigma_{m=1}^{12}(MonthlyReturn_{i,c,m}). \tag{7}$$

In computing, CAR when a bond-return is missing, due to illiquidity, we assume the raw return is equal to the ICE index return and thus the monthly excess return is zero.

2.3 Summary statistics

Table 1 shows the summary statistics for the bonds used in our analysis of ETF holdings. Panel A shows bond characteristics of all new issue bonds, Panel B shows performance statistics for

[13] Dick-Nielsen et al. (2023) highlight issues in computing corporate bond returns using TRACE. The authors highlight that the WRDS standard of winsorizing returns leaves in erroneous trades and minimizes the effect of actual outliers. We have ensured our results are robust to our own calculations of returns that follows the filtering standards and eliminates outliers using deviations from surrounding trade prices. We present the results with WRDS returns for replication purposes.

the subsample of bonds with return data (i.e., excludes bonds issued pursuant to Rule 144A), and Panel C shows the distribution of offering date holdings by ETFs. The median bond in this sample has a face value of $600 million, has 8 years to maturity, and has an average rating of BBB. The median (mean) underpricing for the sample of non-144A bonds is 21 (34 bps), and 27% of offerings have negative first day performance. The median (mean) offering date aggregate holdings for the daily ETF sample is 0.28% (0.54%), though this estimate does not account for individual fund-level demand for bonds. For individual ETFs, the median (mean) offering date holding of bonds eligible for the ETF's benchmark is 0% (0.07%) of the bond's offering amount. We explore the distribution of our main variable of interest further in the next section.

3 Do passive ETFs invest in new issue bonds?

Bond indexes are designed with clear inclusion criteria and most include an unlimited number of securities, so it is easy to determine at issuance whether a bond will be included in a given index. However, there is a delay in timing - a bond will only be added to a benchmark on the next index rebalancing date. Thus, to explicitly follow their passive mandate to match the benchmark performance, passive funds should not participate in primary corporate bond markets. Rather, to minimize tracking error funds should wait until the rebalancing date to buy bonds issued since the last rebalancing. However, secondary markets for corporate bonds are notoriously illiquid, and become more illiquid as the bond ages from its issue date.[14] Given the illiquidity of secondary markets, passive funds may choose to participate in primary markets by requesting an allocation from the syndicate of underwriters.[15]. The portion of the total demand by all funds in a family that is met is determined by the bookrunner, and other syndicate members, who will consider the total book of demand and allocate at their discretion. Individual fund allocations is determined by the internal capital markets of the fund family. Overall, it is unclear when a passive investor would want to acquire a newly issued bond that will soon be eligible for its index. For this reason,

[14] Goldstein et al. (2021) show that for the median corporate bond the largest trading day occurs two days after its issue, with just 29 total trades. By day 10, the median bond trades only 5 times.

[15] Flanagan et al. (2021) quantify the benefit of a direct allocation of new issue bonds that allow investors to avoid the costs of trading for illiquid bonds

Table 1: Summary statistics

Panel A: Bond characteristics

	Count	Mean	Median	Std dev
Offering amount ($M)	7,089	791	600	653
Time to maturity (years)	7,089	11.61	8.63	9.42
Rating	6,954	9.46	9.00	3.66
First year upgrade dummy (%)	6,912	11.73		32.18
First year downgrade dummy (%)	6,912	13.99		34.69
Dividend covenant dummy (%)	5,447	12.94		33.57
Events covenant dummy (%)	5,447	95.08		21.63
Financial covenant dummy (%)	5,447	85.79		34.92
Investments covenant dummy (%)	5,447	77.05		42.05

Panel B: Performance statistics

	Count	Mean	Median	Std dev
Underpricing (%)	4,407	0.34	0.21	0.99
Cold offering dummy (%)	4,407	26.89	0.00	44.34
Daily returns day 0 (%)	4,317	0.33	0.21	0.96
Daily returns day 1 (%)	4,397	0.43	0.28	1.17
Daily returns day 2 (%)	4,407	0.49	0.28	1.42
Daily returns day 5 (%)	4,418	0.57	0.28	1.85
Daily returns day 10 (%)	4,426	0.65	0.28	2.20
Daily returns day 20 (%)	4,435	0.68	0.24	2.56
Monthly returns month 1 (%)	4,338	-0.22	-0.13	1.62
Monthly returns month 2 (%)	4,338	-0.61	-0.46	2.54
Monthly returns month 3 (%)	4,338	-0.89	-0.75	2.41
Monthly returns month 6 (%)	4,338	-1.85	-1.62	3.36
Monthly returns month 9 (%)	4,338	-2.77	-2.43	4.14
Monthly returns month 12 (%)	4,338	-3.56	-3.11	4.46

Panel C: Holding variables

	Count	Mean	Median	Std dev
Offer date holding (%) - all ETFs	7,089	0.54	0.28	0.73
All bonds in ETF index				
Offer date holding (%) - ETF level	52,058	0.07	0.00	0.23
First day of holding	35,137	28.7	0.0	65.2
All bonds held within 60 days				
Offer date holding (%) - ETF level	30,473	0.13	0.01	0.29
First day of holding	30,473	6.8	0.0	13.5

we first examine when (and if) new issue bonds are acquired by our sample of bond ETFs.

We first look at the sample of bonds that are purchased by ETFs within the first 50 days of a bond's life. Panel (a) on the left of Figure 1 shows the full distribution of the bond age at which these pairs are first made; in other words, each time a bond enters an ETF's portfolio for the first time, we track the number of days since the bond's offer date. The largest spike occurs at bond age 0, which means that the ETF acquires the bond on offer date; of the 35,137 bond-ETF pairs that are made within a bond's first year, 18,854 (54%) are made on offer date. A further 3,759 (11%) pairs are made on the day after offer date. Panel (b) on the right, which excludes the pairs made on days 0 and 1, shows that the rest of the distribution is less concentrated.

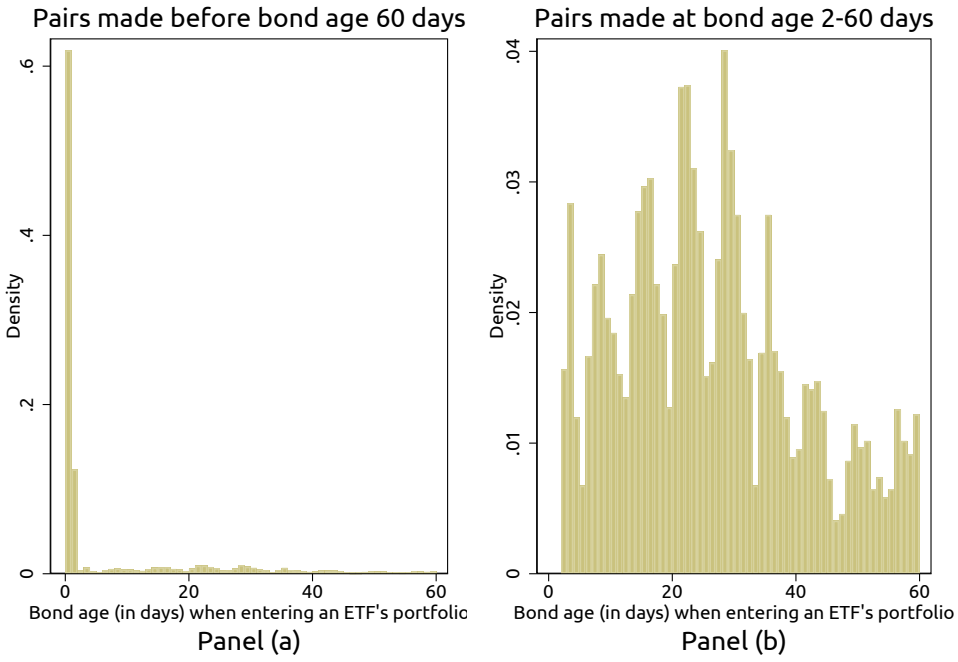

Figure 1: Distribution of bond age at which bond-ETF pairs are first made

We next turn to the distribution of our main variable of interest, $OfferDateHolding\%_{i,j}$. For all bonds meeting the eligibility standards of the ETF's benchmark, we calculate the percentage of the bond that the ETF holds on offer date. There are 52,085 potential matches. The difference in the number of pairs relative to above, reflects the practice of representative sampling for passive bond ETFs, as there are nearly 17,000 bond-ETF pairs that are never made or made after the first

sixty trading days. Panel (a) on the left of Figure 2 shows that the distribution is extremely right skewed. Of the 52,085 bond-ETF pairs included in this graph, 33,204 (64%) are equal to 0. In other words, for most new issue bonds that are included in an ETF's index, the amount the ETF holds on offer date is 0. Panel (b) on the right shows the distribution of the log of our main variable, excluding the instances where the offer date holding is 0. The largest chunk of the distribution can be found between 0.01% and 0.1%, and the mean (median) non-zero offer date holding is 0.20% (0.07%). In terms of dollar amounts, the mean (median) non-zero offer date holding is $1.6 million ($500,000).

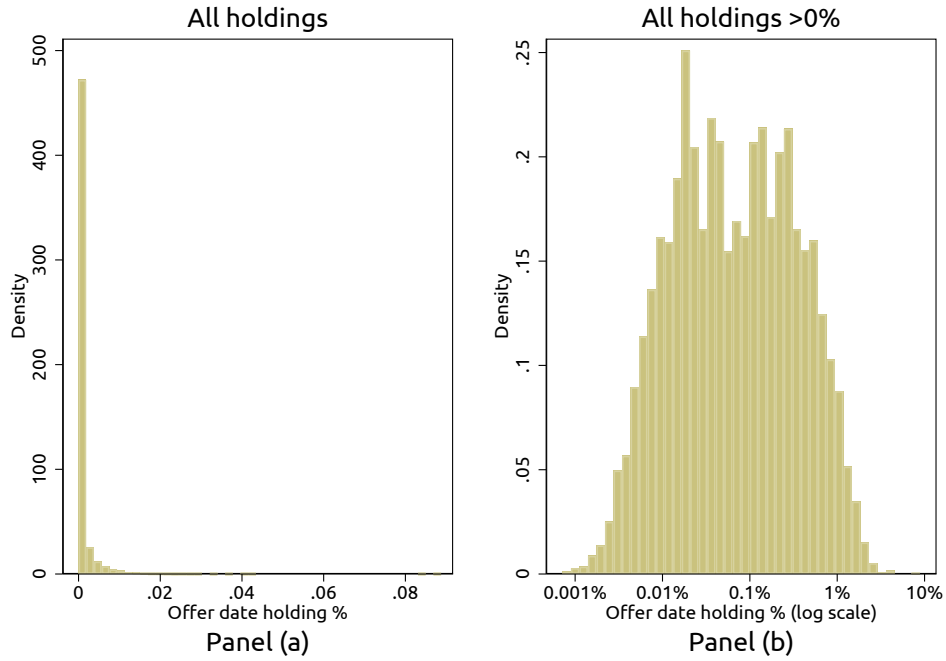

Figure 2: Distribution of offer date holding %

Finally, we examine a time series measure of offer date holdings. We first sum the offer date holdings across the ETFs that we track, ignoring the potential demand from each fund. In Figure 3, we show the average monthly offer date holdings for all ETFs (solid green line), and compare it the monthly time series of the VIX (dashed orange line). The first major pattern we note is that in times of higher volatility, the percentage held by ETFs on offer date drops precipitously; November 2018 and March 2020 stand out particularly in terms of high volatility and low ETF

holdings on offer date. Siani (2022) shows that during such bad times, new issue premiums (the spread between the yield on new bonds compared to bonds already trading) increases; given that ETFs hold fewer new issue bonds when this issuance premium rises, we view this as the first evidence that ETFs may underperform other investor types in terms of their offer date holdings.

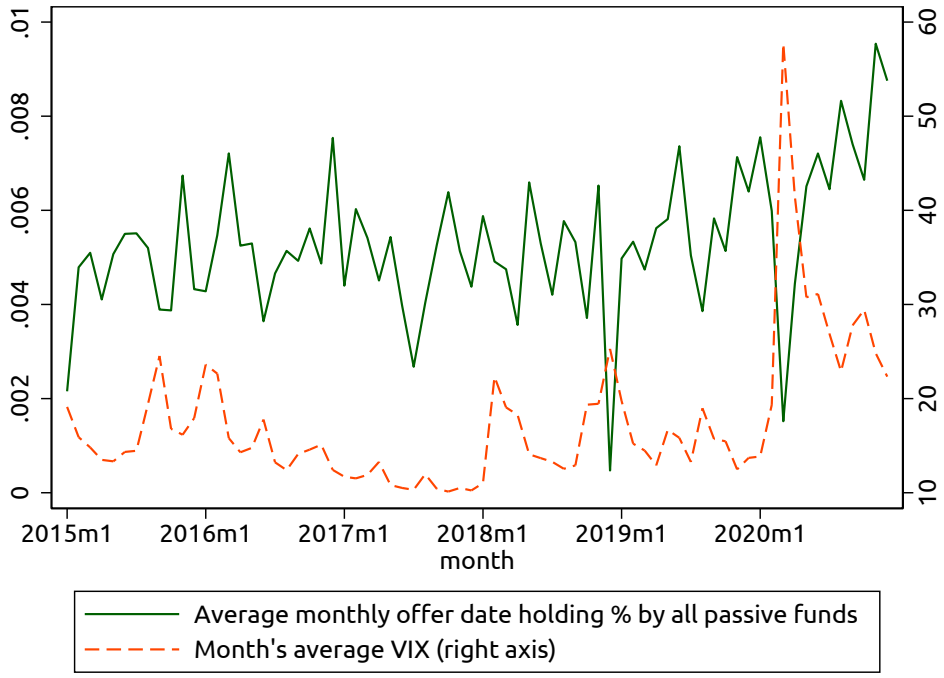

Figure 3: Time series of average monthly offer date holding %

Overall, the results in this section show that in some instances, bond ETFs do hold new issue bonds on their offer date, before the bond is officially included in any indexes. However, there is substantial variation in the percent of a bond that an ETF actually holds on the offer date; many funds hold zero on offer date, but acquire the bonds within the first two months of a bond's life. We explore this heterogeneity of offer date holdings in the next section.

4 Passive ETFs primary market performance

In this section, we explore whether there is a relationship between the level of offer date holdings by ETFs of new issue bonds, and various measures of bond performance or quality. Our main regression specification is:

$$QualMeasure_{i,j,k,y} = \nu_i + \lambda_y + \alpha_j + \gamma_k + \\ \beta_1 OfferDateHolding\%_{i,j} + \beta_2 X_{i,j,k,y} + \epsilon_{i,j,k,y} \tag{8}$$

The dependent variables are defined for bond i included in the index for ETF j, issued by a firm in industry k, in year y include: such as underpricing, short- and long-term bond performance, ratings upgrade and downgrade dummies, and the inclusion of covenants. The main covariate of interest, $OfferDateHolding\%$, is defined as the percentage of the bond i held by ETF j on the offer date. To address selection concerns we restrict the sample to only the bond-ETF pairs that meet the eligibility standards of the applicable benchmark. The vector of controls, X, includes the log of bond amount outstanding and the time to maturity at issuance. In order to capture potential non-linearities between ratings and our outcome variables, we include ratings fixed effects, represented by ν_i.[16] We also include year fixed effects, ETF fixed effects and industry fixed effects, represented by λ_y, α_j and γ_k, respectively. The inclusion of rating and industry fixed effects ensure that we are comparing outcomes of bonds with similar risk characteristics, while year fixed effects control for time series trends in performance and offer date holdings. Finally, the inclusion of ETF level fixed effects absorbs potential unobserved heterogeneity between funds.

4.1 Offering day performance

We first examine how offer date holdings by ETFs are related to underpricing, defined as the index-adjusted first trading date return on bond i. The results are shown in Table 2.

Column (1) includes no controls or fixed effects, column (2) adds controls, and column (3) includes controls and the full set of fixed effects. In all specifications, the relationship between offer date holdings and offer date return is significantly negative: ETFs hold more corporate bonds on offer date in offerings with lower underpricing. A one standard deviation increase in the offering date holdings by the ETFs in our sample results in a 3.5 bps lower underpricing,

[16] Because of a limited number of new issue bonds with a rating at CCC+ and below, we collapse all of these bonds into one fixed effect category.

Table 2: Offering date return and ETF holdings

The dependent variable is the index-adjusted first trading day return on a corporate bond. *Offer date holding %* is an ETF's holding of a corporate bond on the offer date; the sample includes only bonds that are estimated to be included in an ETF's index. All columns include ratings fixed effects, and column (3) also includes ETF, year and industry fixed effects. Standard errors clustered at the issuer level are reported below the coefficients. *, **, *** indicate significance at the 10%, 5% and 1% level, respectively.

	(1)	(2)	(3)
VARIABLES	Offer date return	Offer date return	Offer date return
Offer date holding %	-0.212***	-0.125***	-0.151***
	(0.0277)	(0.0231)	(0.0285)
Log of bond size		0.000624**	0.000339
		(0.000279)	(0.000287)
Bond maturity		0.000187***	0.000191***
		(1.63e-05)	(1.65e-05)
Observations	38,631	38,631	38,631
R-Squared	0.010	0.053	0.084
Sample	All bonds in index	All bonds in index	All bonds in index
Constant	Yes	Yes	Yes
Rating bucket FE	Yes	Yes	Yes
ETF FE	No	No	Yes
Year FE	No	No	Yes
Industry FE	No	No	Yes
Cluster	Issuer	Issuer	Issuer

which is 10% of the unconditional average underpricing of 34 bps.[17] In terms of dollar values, multiplying 3.5 bps by the mean bond size of $791 million, the dollar value of lower underpricing in one bond deal is approximately $275,000, and over $1.2 billion across the 4,407 deals with non-missing underpricing data. On average underpricing is still positive, supporting the conjecture of Rock (1986) that underpricing is necessary to compel the participation of uninformed investors, such as passive investors. However, as indicated by the summary statistics there are a portion of offerings with negative first day returns. It is these offerings that the characteristic-driven, price-insensitive, demand of passive funds could potential help ensure the completion of deals, benefitting issuers and syndicate members. To test the role of passive investors in cold offerings, in Table 3 we use the indicator variable for cold offering as our dependent variable. In these so-called "cold" (or overpriced) offerings, the first day's trading price ends up lower than the offering price, implying the bond's yield was too low.

In all three specifications (with and without controls and fixed effects), the take-away is the same: ETFs have significantly higher offer date holdings in cold bond offerings. For example, the average holding by an ETF in a cold offering is 0.066%, while it is 0.058% in a non-cold offering. Alternatively, ETFs hold a non-zero amount of bonds on offering date in 38.5% of cold offerings, and 37.7% of non-cold offerings. Overall, offer date holdings by ETFs is significantly related to bonds with worse first day performance.

4.2 Short-term and long-term performance of new issuance bonds

Beyond underpricing, we examine the performance of new issue bonds in the days and months following the offering. If the underpricing previously documented is temporary, we would expect the performance trend to revert. Alternatively, if the newly issued bonds continue to underperform it is likely that the price insensitive demand of passive investors facilitated completion of lower quality offerings.

We begin by examining the short-term performance of newly offered bonds. We examine a

[17] This is calculated as the standard deviation in offer date holdings, 0.00229, multiplied by the coefficient in column (3), -0.151. We get similar results if instead of one standard deviation, we use the change from zero offer date holdings to the mean non-zero holdings of 0.20%.

Table 3: Cold offerings and ETF holdings

The dependent variable is a dummy equal to 1 if the first trading day return is negative and 0 otherwise. *Offer date holding %* is an ETF's holding of a corporate bond on the offer date; the sample includes only bonds that are estimated to be included in an ETF's index. All columns include ratings fixed effects, and column (3) also includes ETF, year and industry fixed effects. Standard errors clustered at the issuer level are reported below the coefficients. *, **, *** indicate significance at the 10%, 5% and 1% level, respectively.

VARIABLES	(1) Offer date negative return dummy	(2) Offer date negative return dummy	(3) Offer date negative return dummy
Offer date holding %	6.360***	4.994***	5.225***
	(1.585)	(1.553)	(1.822)
Log of bond size		-0.0128	-0.0133
		(0.0181)	(0.0173)
Bond maturity		-0.00282***	-0.00286***
		(0.000719)	(0.000665)
Observations	38,631	38,631	38,631
R-Squared	0.010	0.014	0.043
Sample	All bonds in index	All bonds in index	All bonds in index
Constant	Yes	Yes	Yes
Rating bucket FE	Yes	Yes	Yes
ETF FE	No	No	Yes
Year FE	No	No	Yes
Industry FE	No	No	Yes
Cluster	Issuer	Issuer	Issuer

bond's index-adjusted return from offering price for the first n trading days following its issuance, $n = 0, 1, 2, 5, 10, 20$. The results are shown in Table 4.

Table 4: Performance in first month and ETF holdings

The dependent variable in each column is the index-adjusted return from the offer price to the price on the stated trading day after issuance. *Offer date holding %* is an ETF's holding of a corporate bond on the offer date; the sample includes only bonds that are estimated to be included in an ETF's index. All columns include ratings, ETF, year and industry fixed effects. Standard errors clustered at the issuer level are reported below the coefficients. *, **, *** indicate significance at the 10%, 5% and 1% level, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
			Return through			
VARIABLES	day 0	day 1	day 2	day 5	day 10	day 20
Offer date holding %	-0.152***	-0.199***	-0.252***	-0.365***	-0.423***	-0.483***
	(0.0296)	(0.0431)	(0.0510)	(0.0771)	(0.0912)	(0.106)
Log of bond size	0.000349	0.000749**	0.000593	0.000821	0.00178***	0.00240**
	(0.000294)	(0.000365)	(0.000427)	(0.000536)	(0.000682)	(0.000959)
Bond maturity	0.000190***	0.000248***	0.000290***	0.000375***	0.000460***	0.000524***
	(1.67e-05)	(2.24e-05)	(2.92e-05)	(4.26e-05)	(5.30e-05)	(5.62e-05)
Observations	38,182	38,578	38,628	38,675	38,700	38,752
R-Squared	0.083	0.112	0.140	0.104	0.119	0.121
Sample	All bonds in index	All bonds in index	All bonds in index	All bonds in index	All bonds in index	All bonds in index
Constant	Yes	Yes	Yes	Yes	Yes	Yes
Rating bucket FE	Yes	Yes	Yes	Yes	Yes	Yes
ETF FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Cluster	Issuer	Issuer	Issuer	Issuer	Issuer	Issuer

The level of ETF offer date holdings is significantly and negatively related to bond performance through the end of the first trading month. We also present the results of Table 4 visually in Figure 4, which plots the coefficients and 95% confidence intervals of a regression of daily returns on offer date holdings, run separately for days 1 to 20. The coefficient on an ETF offer date holdings is negative and significant through the first month of a bond's life (approximately 20 trading days), with the coefficient becoming more negative through day 7 then remaining at a roughly constant (but still significant) level.

We next turn to the longer term and examine performance through the first 12 months of a

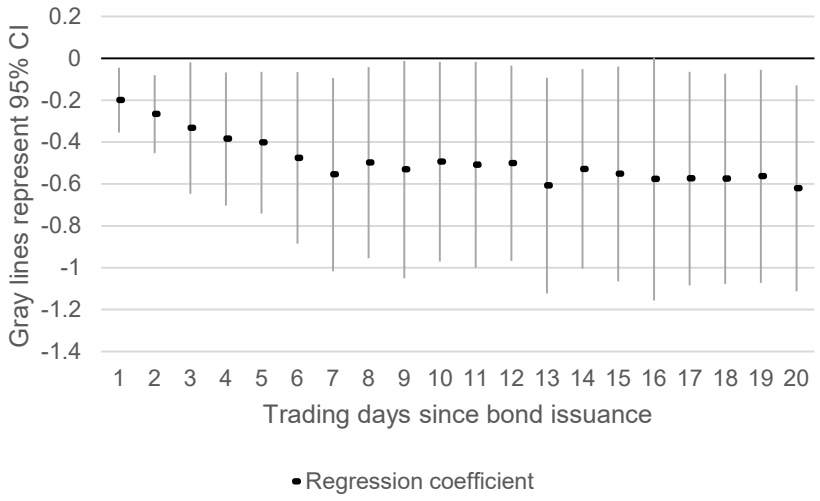

Figure 4: Regression coefficients for $OfferDateHolding\%$ on cumulative daily returns

bond's life. For each month, $m = 1, 2, 3, 6, 9, 12$, following the issue month, we compute cumulative index-adjusted returns. The results are shown in Table 5.

The coefficient for ETF offer day holdings is consistently negative through all 12 months post issuance, and while the magnitude of the relationship is growing (i.e., the coefficient is becoming more negative), it is not statistically significant at conventional levels. Overall, these results show that ETFs have higher holdings on offering date of less attractive bonds, but the results for offering day and short-term underperformance are stronger than long-term underperformance.

4.3 Other measures of bond quality: Rating changes and covenants

The bond performance variables we have examined so far are not defined for the roughly 40% of our corporate bond sample that are issued under Rule 144A, as these bonds do not appear in TRACE. Our final measures of bond quality, namely ratings changes and the level of covenant inclusion, are defined for a larger portion of our corporate bond sample.

Table 5: Performance in first year and ETF holdings

The dependent variable in each column is the cumulative index-adjusted return through the stated month after issuance. *Offer date holding %* is an ETF's holding of a corporate bond on the offer date; the sample includes only bonds that are estimated to be included in an ETF's index. All columns include ratings, ETF, year and industry fixed effects. Standard errors clustered at the issuer level are reported below the coefficients. *, **, *** indicate significance at the 10%, 5% and 1% level, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
				Return through		
VARIABLES	1 mth	2 mths	3 mths	6 mths	9 mths	12 mths
Offer date holding %	-0.0907	-0.0446	-0.0879	-0.193	-0.179	-0.238
	(0.0856)	(0.154)	(0.0954)	(0.184)	(0.185)	(0.196)
Log of bond size	0.000602	-0.000653	-0.00146	-0.00293**	-0.00600***	-0.0100***
	(0.000931)	(0.00119)	(0.000922)	(0.00128)	(0.00177)	(0.00182)
Bond maturity	2.56e-05	-7.50e-05*	-0.000156***	-0.000370***	-0.000565***	-0.000648***
	(3.64e-05)	(4.18e-05)	(4.39e-05)	(6.29e-05)	(7.63e-05)	(8.59e-05)
Observations	38,610	38,610	38,610	38,610	38,610	38,610
R-Squared	0.027	0.052	0.056	0.049	0.047	0.077
Sample	All bonds in index	All bonds in index	All bonds in index	All bonds in index	All bonds in index	All bonds in index
Constant	Yes	Yes	Yes	Yes	Yes	Yes
Rating bucket FE	Yes	Yes	Yes	Yes	Yes	Yes
ETF FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Cluster	Issuer	Issuer	Issuer	Issuer	Issuer	Issuer

We first look at whether offer date holdings by ETFs is related to a bond's likelihood of rating or outlook changes in the first year. In particular, we define a dummy for upgrades and downgrades, that take on a value of 1 if any rating agency increases or decreases the bond's rating or outlook within the first year of the bond's life. The results are shown in Table 6.

Table 6: Rating changes and ETF holdings

The dependent variable in columns (1) is a dummy that takes on a value of 1 if a bond's rating or outlook from any rating agency is decreased in its first year; the dependent variable in columns (2) is similarly defined for rating or outlook increases. *Offer date holding %* is an ETF's holding of a corporate bond on the offer date; the sample includes only bonds that are estimated to be included in an ETF's index. The regressions include ratings, ETF, year and industry fixed effects. Standard errors clustered at the issuer level are reported below the coefficients. *, **, *** indicate significance at the 10%, 5% and 1% level, respectively.

	(1)	(2)
VARIABLES	First year downgrade	First year upgrade
Offer date holding %	1.751*	-1.960*
	(0.952)	(1.007)
Log of bond size	0.0731***	-0.00775
	(0.0188)	(0.00985)
Bond maturity	-0.00125**	0.000493
	(0.000555)	(0.000345)
Observations	51,364	51,364
R-Squared	0.083	0.062
Sample	All bonds in index	All bonds in index
Constant	Yes	Yes
Rating bucket FE	Yes	Yes
ETF FE	Yes	Yes
Year FE	Yes	Yes
Industry FE	Yes	Yes
Cluster	Issuer	Issuer

The first column shows that ETF offer date holdings are significantly positively related to a bond's rating or outlook being decreased in its first year, and negatively related to rating or outlook increases. In terms of economic magnitude, a one-standard deviation increase in offer date holdings by an ETF increases the chances of a downgrade in the first year by 0.4 percentage points, which is 3 percent of the unconditional average.

Finally, we look at the inclusion of covenants on new issue bonds. The dependent variable is a dummy that takes on a value of 1 if the bond includes at least one covenant of the following types: restriction on *Dividend* payouts, limits on what the firm can do during certain *Events*, restrictions on debt issuance and other *Financing* decisions, and restrictions on *Investments*. The results can be found in Table 7.

Table 7: Covenant inclusion and ETF holdings

The dependent variable in each column is a dummy that takes on a value of 1 if the bond includes at least one covenant in each category: restriction on *Dividend* payouts, limits on what the firm can do during certain *Events*, restrictions on debt issuance and other *Financing* decisions, and restrictions on *Investments*. *Offer date holding %* is an ETF's holding of a corporate bond on the offer date; the sample includes only bonds that are estimated to be included in an ETF's index. The regressions include ratings, ETF, year and industry fixed effects. Standard errors clustered at the issuer level are reported below the coefficients. *, **, *** indicate significance at the 10%, 5% and 1% level, respectively.

VARIABLES	(1) Dividend	(2) Events	(3) Financial	(4) Investments
Offer date holding %	-2.537**	-1.276*	3.547***	2.974*
	(1.141)	(0.718)	(1.290)	(1.533)
Log of bond size	-0.00371	-0.0203*	-0.0188	0.0128
	(0.00498)	(0.0110)	(0.0157)	(0.0197)
Bond maturity	-0.000273**	-0.000668	-6.98e-05	-0.000667
	(0.000136)	(0.000406)	(0.000474)	(0.000620)
Observations	42,304	42,304	42,304	42,304
R-Squared	0.451	0.084	0.147	0.171
Sample	All bonds in index	All bonds in index	All bonds in index	All bonds in index
Constant	Yes	Yes	Yes	Yes
Rating bucket FE	Yes	Yes	Yes	Yes
ETF FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Cluster	Issuer	Issuer	Issuer	Issuer

The percentage of a bond held by ETFs on offer date is significantly negatively related to the inclusion of *Dividend* and *Event* covenants, but is significantly positive related to the inclusion of *Financial* or *Investment* covenants. Overall, the relationship between covenant inclusion and ETF ownership is mixed.

4.4 How do ETFs acquire new issue bonds?

Our analysis has used offering date holdings as a proxy for primary market allocations. However, there are two alternative means by which an ETF could acquire a new issue on the offering date. First, the fund managers could engage in secondary market purchases in the OTC market. Second, the ETF could receive the new issue as part of a creation basket. In this last alternative, recipients of primary market allocations flip their allocations, notably insurance companies as found by Nikolova and Wang (2022). If an authorized participant (AP) buys the flipped bonds, they could then include it the basket of the underlying that is exchanged with the sponsor for ETF shares as part of the primary ETF market.[18]

In this section we attempt to identify how ETFs acquire new issue bonds. Doing so allows us to attribute the source of the underpricing to different market participants. Of the 4,407 corporate bonds with non-missing underpricing data, we identify four sub-groups. First, we identify 394 bonds that were definitely not allocated to ETFs: for these bonds, there are no holdings on offer date across all ETFs.[19] Second, we identify 834 new issues that were not acquired via secondary market purchases, because total ETF holdings exceed the institutional ask volume in TRACE on the offering date. For these bonds the offerings are either attributed to the primary syndicate allocation decisions or APs, who are often dealers. Third, we identify 1,078 bonds where the aggregate ETF holdings are in excess of the total creation dollars, computed as the change in shares outstanding times the daily net asset value for all ETFs with offering date holdings. For these bonds offering day holdings are either from secondary market purchases or primary market allocations.[20] The fourth group consists of 182 bonds that were at least partially allocated to ETFs. These bonds, which are a subset of the prior two groups, have total ETF holdings greater than the combined secondary OTC market purchase and primary ETF market creation volumes.

Table 8 presents the average underpricing and short-term performance of the different groups.

[18]The in-kind creation and redemption trades between the AP and ETF sponsor are not TRACE eligible transactions.

[19]Note that there may be additional bonds where ETFs received no allocation, but they will not be included in this sample if at least one ETF acquired the bonds on offer date either by purchase or in-kind creation.

[20]The second and third groups are not mutually exclusive.

Column (6) present tests of the difference in mean performance variables of the subset of bonds that ETFs did not receive allocations (column 2) and the subset for whom we know that ETF holdings are at least partially attributable to primary market allocations (column 5).

Table 8: Performance of bonds with and without ETF allocation

Sample mean variables for various subsets of bonds: the full sample (column 1), bonds where no ETFs held on offer date (column 2), bonds where total ETF offer date holdings exceeded offer day ask volume (column 3), bonds where volume held by ETFs on offer date exceeded creation volume (column 4), and bonds where both the conditions in column 3 and 4 are both met (column 5). The final column shows the difference in sample means of column 2 and column 5; *, **, *** indicates significance at the 10%, 5% and 1% level, respectively.

VARIABLES	(1) All bonds	(2) Non-allocated bonds	(3) Bonds not purchased in secondary market on offer day	(4) Bonds not received by creation on offer day	(5) Bonds not purchased in secondary market or received by creation on offer day	Underperformance by ETFs: Difference between (5) and (2)
Number of observations	*4,407*	*394*	*834*	*1,078*	*182*	
Underpricing	0.34%	0.83%	0.10%	0.36%	0.16%	-0.66%***
Daily CAAR 0	0.33%	0.81%	0.08%	0.35%	0.10%	-0.7%***
Daily CAAR 1	0.43%	1.09%	0.16%	0.41%	0.23%	-0.86%***
Daily CAAR 2	0.49%	1.42%	0.18%	0.44%	0.25%	-1.18%***
Daily CAAR 5	0.57%	1.95%	0.15%	0.53%	0.35%	-1.61%***
Daily CAAR 10	0.65%	2.31%	0.12%	0.56%	0.27%	-2.04%***
Daily CAAR 20	0.68%	2.19%	0.12%	0.59%	0.37%	-1.82%***

The results show that new issue bonds which are allocated to ETFs perform significantly worse. The highest underpricing and short-term returns are to those bonds without any ETF holdings on the offering date. The lowest performance is for the offerings that are acquired via primary market allocation or creation baskets, suggesting that dealers wh serve as both primary bond market bookrunners and as primary market ETF APs contribute to the performance trends documented in this paper. Likewise, bond holdings that we attribute at least partially to primary market allocations have stastistically significantly lower underpricing and short-term returns compared to the subsample completely allocated to non-ETF participants. In particular, underpricing is 0.16% on average for bonds allocated to ETFs compared to 0.83% on average for bonds not allocated to ETFs. This underperformance remains significant through the first month of trading, with non-allocated bonds outperforming allocated bonds by more than 2% by trading day 10.

While Table 8 focuses on sample means, we show in Figure 5 the full distributions for both underpricing and returns through day 10. The sample of bonds that are not allocated to ETFs (green lines) show a mass that peaks further to the right, consistent with the higher sample mean. These bonds also display more variation in returns, including more bonds with both negative and positive returns, but the right tail (performance upside) is meaningfully longer for bonds not allocated to ETFs.

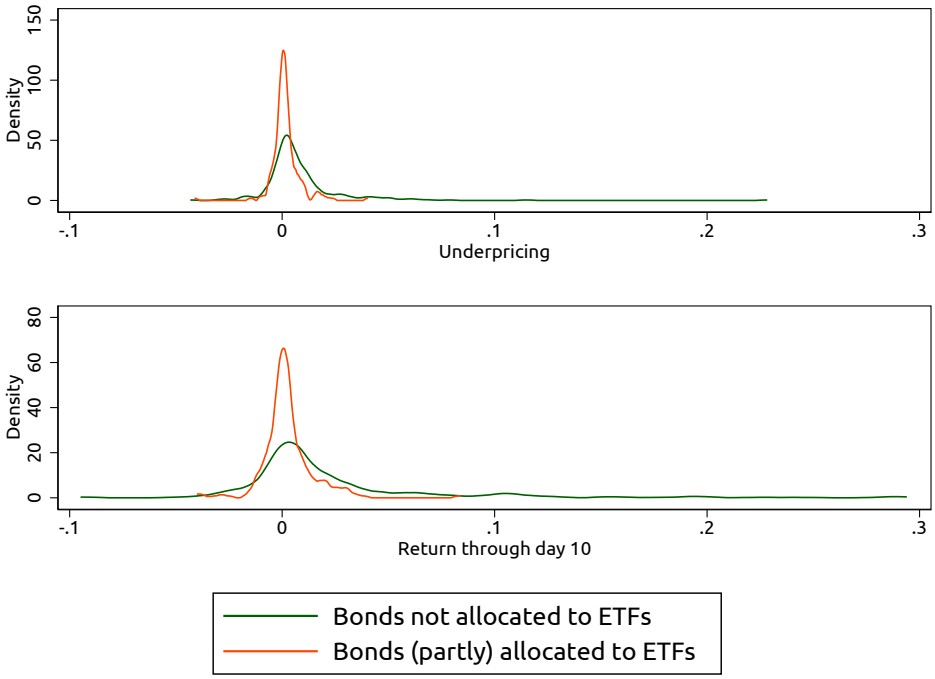

Figure 5: Distribution of underpricing (top graph) and return through day 10 (bottom graph) for bonds not allocated to ETFs (green lines) and bonds allocated to ETFs (orange lines).

4.5 Discussion of ETF holdings and bond quality

The results in this section indicate that ETFs hold a higher offer date percentage in less attractive corporate bonds that have: lower underpricing, worse short-term performance, marginally worse long-term performance and a higher likelihood of being downgraded. We have also provided evidence that the results are driven by offer date holdings received via allocations of new issue bonds in the primary market rather than secondary market purchases.

This dramatically higher passive allocation in less attractive offerings, measured by first day

performance, is consistent with passive investors being used as a 'buyer of last resort' in new issue bonds in order to ensure a deal is completed. In the absence of passive demand, either the offering may have been withdrawn (worse for the firm and the underwriters) or the terms of the bond would need to be made more attractive to active investors (worse for the firm). Thus, firms and underwriters are benefiting at the expense of passive investors.

5 An examination of the broader bond fund landscape

The ETF sample used so far allows us to precisely identify the exact date that the funds acquire new bonds. However, the passive investment trend extends beyond just ETFs that report daily holdings. Notably excluded from the prior analysis are Vanguard ETFs and all index funds that report holdings monthly. In this section, we extend our analysis using monthly holdings information from CRSP. We can also use this broader sample to compare how passive funds perform relative to active mutual funds and to consider within family allocation decisions.

The main drawback of the CRSP database is that holdings are reported only monthly; for new issue bonds issued within a month, month-end holdings will represent allocations and purchases on offering date, plus any trading decisions within the offering month. For this reason, we focus our analysis on the sample of bonds issued at the end of the month to minimize the number of trading days between offer date and the reporting date of holdings (a similar argument made by Reuter (2006)). The sample size is limited by this requirement; therefore, we extend the sample period to January 2011 to December 2020 and consider new offerings on the last two trading days of a month. The latter empirical decision not only increases the power of our tests, but also includes new issues that show up as holdings and offering date on the second to last trading day of the month but do not begin trading until the last trading day, i.e. those likely issued after the trading day ended. Table 9 presents bond characteristics of the sample of month end bond offerings in Panel A. Panel B presents summary statistics on the performance variables underpricing, short-term returns from offering price, and long-term returns.

Figure 6 shows that the average holdings of new issue bond offerings by investor type. The

Table 9: Summary statistics for the month-end offering sample

Panel A: Bond characteristics

	Count	Mean	Median	Std dev
Offering amount ($M)	580	845.06	600.00	755.85
Time to maturity (years)	580	12.83	10.01	10.52
Rating	559	7.80	8.00	2.99
Industrial dummy (%)	580	66.00		47.00

Panel B: Performance statistics

	Count	Mean	Median	Std dev
Underpricing (%)	587	0.40	0.23	0.82
Daily returns day 0 (%)	569	0.39	0.22	0.80
Daily returns day 1 (%)	558	0.43	0.25	0.89
Daily returns day 2 (%)	523	0.47	0.27	1.03
Daily returns day 5 (%)	501	0.40	0.23	1.25
Daily returns day 10 (%)	457	0.53	0.21	1.98
Daily returns day 20 (%)	459	0.69	0.19	2.49
Monthly returns month 1 (%)	557	0.33	0.00	2.04
Monthly returns month 2 (%)	557	0.07	-0.16	2.14
Monthly returns month 3 (%)	557	-0.32	-0.49	2.16
Monthly returns month 6 (%)	557	-1.31	-1.35	2.73
Monthly returns month 9 (%)	557	-0.37	-0.56	3.64
Monthly returns month 12 (%)	557	-0.90	-0.84	4.49

first thing to note is that passive holdings (solid orange line) have increased steadily over the sample period, with very similar growth patterns for both index mutual funds and ETFs.[21] The average holdings of active funds (dashed green line) are greater than passive funds and show less of a pronounced increase, though they have been on an upward trend since 2015. The combined holdings of all fund investors follows a similar trend to that documented in Koijen and Yogo (2023), who examine the overall ownership structure of U.S. corporate bonds.

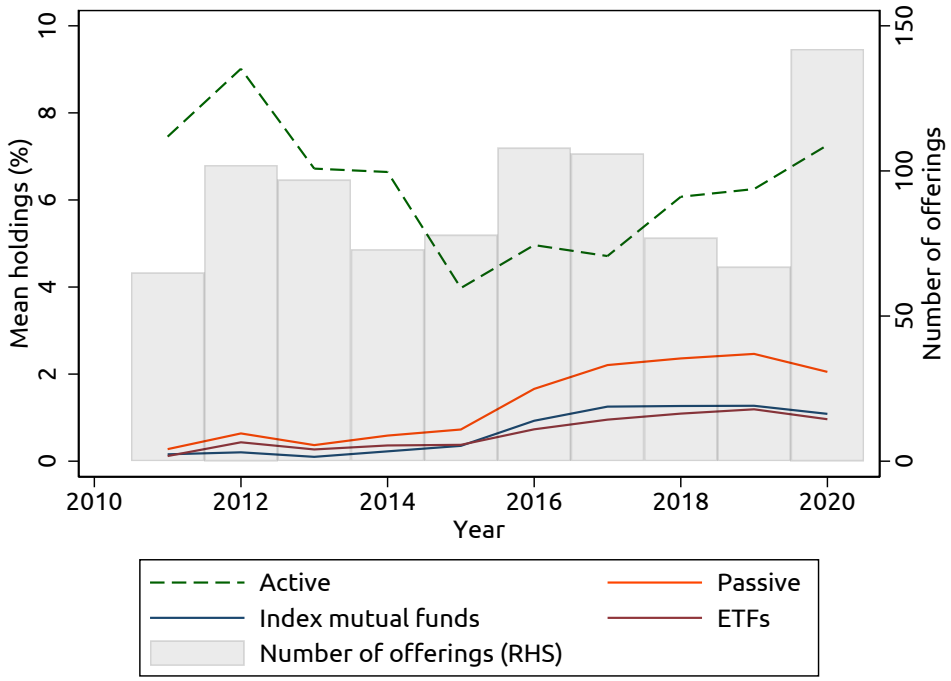

Figure 6: Holdings by investor type in month-end offerings.

5.1 Active funds outperform while passive underperform

For preliminary evidence, we first examine the relative performance of active and passive funds by splitting our sample of month-end offerings based on levels of ownership, with the results shown in Figure 7. The left graph splits bonds into terciles based on the level of ownership by active mutual funds, while the right graph splits bonds into terciles of passive fund ownership. The bonds with the highest active mutual fund ownership (short dash blue line in the left graph)

[21] ETF holdings are higher here compared to the summary statistics, as this sample will include the entire universe of ETFs, not just the daily reporters that we focus on.

significantly outperform bonds with the lowest active ownership (long dash green line). The results suggest that active mutual funds, known to trade more frequently and generate information, receive higher allocations int he most favorable new offerings. In contrast, the relation for passive funds is exactly the opposite. Bonds with the lowest passive ownership (long dash green line in the right graph) have the best performance through the first month, significantly outperforming bonds with the highest passive ownership (short dash blue line). Not only do the offerings with the highest passive ownership have the lowest initial underpricing, but also the offerings begin to underperform after ten trading days.

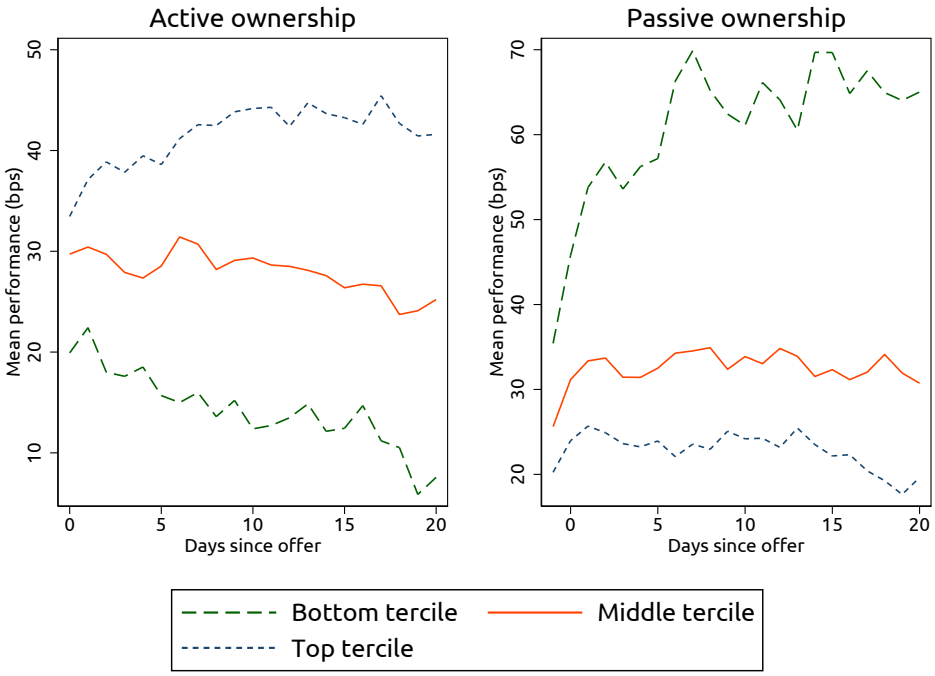

Figure 7: Mean bond performance by level of active or passive ownership for bonds issued in the last two trading days of each month

To test the statistical significance of of the findings and to provide broader evidence of the role of all passive funds, we re-run the regression found in Table 2 using as variables of interest the percentage held by passive funds and active mutual funds of bonds issued on the last two days of each month. Due to limited sample size, we include a dummy to capture industrial issuers rather than including industry fixed effects. Standard errors are clustered at the issuer level following

Nikolova et al. (2020). Columns (1) - (3) include just the main covariates of interest, while columns (4) - (6) add controls. Columns (1) and (4) include no fixed effects, columns (2) and (5) just ratings fixed effects, and columns (3) and (6) include both ratings and offering year fixed effects. The results are shown in Table 10.

Table 10: Underpricing: Month end offerings

The dependent variable is the index-adjusted first trading day return on a corporate bond, underpricing. Issuance month holdings of active mutual funds and passive funds (index mutual funds and ETFs) are computed as a percent of the bond's offering amount. Control variables used in Columns (4) – (6) include the log of amount outstanding and the bond time to maturity at issuance, and an indicator variable for bonds from industrial issuers. Columns (1) and (3) use no fixed effects. Columns (2) and (5) use only ratings fixed effects. Columns (3) and (6) use ratings and offering year fixed effects. Standard errors clustered at the issuer level are presented below the coefficients. * indicates significance at the 10% level, ** at the 5% level, and *** at the 1% level.

VARIABLES	(1) Offer date return	(2) Offer date return	(3) Offer date return	(4) Offer date return	(5) Offer date return	(6) Offer date return
Passive ownership %	-4.384***	-4.487**	-4.946*	-2.884*	-2.426	-2.34
	(1.631)	(1.829)	(2.631)	(1.492)	(1.568)	(2.332)
AMF ownership %	2.700**	2.648**	2.086**	3.387***	3.255***	2.875***
	(1.206)	(1.227)	(0.963)	(1.267)	(1.167)	(0.965)
Log of bond size				-6.42	-9.862	-11.04
				(9.191)	(9.247)	(9.269)
Bond maturity				1.894***	2.047***	1.984***
				(0.481)	(0.489)	(0.412)
Dummy for industrial issuer				20.480***	21.095***	21.125***
				(7.516)	(7.699)	(7.909)
Observations	558	548	548	558	548	548
R-Squared	0.04	0.098	0.11	0.118	0.188	0.194
Sample	Bonds in last 2 days of mth	Bonds in last 2 days of mth	Bonds in last 2 days of mth	Bonds in last 2 days of mth	Bonds in last 2 days of mth	Bonds in last 2 days of mth
Constant	Yes	Yes	Yes	Yes	Yes	Yes
Rating bucket FE	No	Yes	Yes	No	Yes	Yes
Year FE	No	No	Yes	No	No	Yes
Industry FE	No	No	No	No	No	No
Cluster	Issuer	Issuer	Issuer	Issuer	Issuer	Issuer

Similar to the results in the ETF-only sample, the level of passive ownership is negatively related to the underpricing of the new issue. The results are statistically significant for four of the six specifications. Economically the effects are significant, implying 5.8 percent to 12.3 percent lower underpricing for each one percentage point increase in passive ownership relative to the mean bond in the sample. In contrast, the aggregate ownership of active funds is positively related to underpricing. The effect is statistically significant in each specification. Economically a one

percent increase in active mutual fund ownership of a new offer bond implies 5.3 percent to a 8.5 percent greater underpricing relative to the mean bond in the sample.

We continue to examine the short-term and long-term performance of the new issue bonds similar to the ETF sample results in Table 4 and Table 5, respectively. In both tests, we include ratings and offering year fixed effects and all control variables. Standard errors are clustered at the issuer level. Table 11 presents the results of the short-term performance for the monthly bond holdings.

Table 11: Performance in first month and active and passive fund holdings

This table presents the results of short-term performance of bonds issued on the last two-trading days of the month. The dependent variable is the return from the offering price in basis points in excess of the maturity- and category-matched ICE benchmark over the same period. Issuance month holdings of active mutual funds and passive funds (includes both index mutual funds and ETFs) are computed as a percent of the bond's offering amount. Control variables include the log of amount outstanding and the time to maturity at issuance, and an indicator variable for bonds from industrial issuers. The regressions include ratings and offering year fixed effects. Standard errors clustered at the issuer level are presented below the coefficients. * indicates significance at the 10% level, ** at the 5% level, and *** at the 1% level.

	(1)	(2)	(3)	(4)	(5)	(6)
			Return through			
VARIABLES	day 0	day 1	day 2	day 5	day 10	day 20
Passive ownership %	-2.675	-4.336*	-8.519***	-10.413***	-18.116***	-26.103***
	(2.374)	(2.484)	(2.977)	(3.542)	(6.741)	(6.738)
AMF ownership %	2.841***	3.817***	4.154***	6.313***	10.580***	12.762***
	(0.958)	(1.219)	(1.441)	(1.283)	(2.522)	(2.971)
Log of bond size	-11.147	-7.6	-1.006	3.362	19.68	45.761
	(9.405)	(8.214)	(10.336)	(8.709)	(14.615)	(30.041)
Bond maturity	1.910***	2.277***	2.466***	2.196***	3.461**	4.951***
	(0.415)	(0.484)	(0.601)	(0.798)	(1.352)	(1.499)
Dummy for industrial issuer	19.876**	20.629**	18.134*	15.426	10.859	14.342
	(8.181)	(8.318)	(10.111)	(13.074)	(22.758)	(27.481)
Observations	537	545	516	492	452	453
R-Squared	0.193	0.224	0.207	0.196	0.214	0.318
Sample	Bonds in last 2 days of mth	Bonds in last 2 days of mth	Bonds in last 2 days of mth	Bonds in last 2 days of mth	Bonds in last 2 days of mth	Bonds in last 2 days of mth
Constant	Yes	Yes	Yes	Yes	Yes	Yes
Rating bucket FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	No	No	No	No	No	No
Cluster	Issuer	Issuer	Issuer	Issuer	Issuer	Issuer

Supporting the ETF-level findings, the level of passive ownership in a new issue bond is significantly negatively related to its performance through 20 trading days. The results suggest that

the negative relation to underpricing is not temporary, but continues through approximately the first month of the bond's life. The effect is both statistically and economically significant for all time periods considered. After twenty trading days a one percentage point increase in passive ownership of a new offering implies 37.7 percent lower returns relative to the mean bond. In contrast, active fund ownership is positively related to new issue bond performance. After twenty trading days a one percentage point increase in passive ownership of a new offering implies 37.7 percent lower returns relative to the mean bond. For active funds the economic effect is 18.4 percent higher returns.

Table 12 presents of the long-term performance results using the monthly sample of bonds. To examine if the relative underperformance of corporate bonds issued to passive funds continues beyond the short-term, we consider the long-term cumulative returns in the first twelve-months after issuance. In these tests, the return to the month-end market price, not the offer price as in the previous tests. Cumulative abnormal returns (CAR) for each month m since the issuance of bond i in the rating and time-to-maturity category c is defined in Equation (7) of the data section above.

The underperformance of new issue bonds more highly allocated to passive funds from their offer price continues through the first year. In contrast, there is some evidence that new issues with greater allocations to active funds continue to outperform in the market up to twelve months after the offering month. Taken together, the results of this section confirm and expand our conclusions from the ETF-only sample: not only do passive funds have higher holdings in less attractive bonds, active mutual funds have higher holdings in higher-performing bonds.

5.2 Who is to blame for passive investors' underperformance?

In the daily ETF sample we provided evidence that underperformance is at least partly driven by allocations. However, there are two potential sources of allocations from the underwriters to the fund family or from the fund family to passive funds. In the former, the underwriter decides how much to allocate to a given fund family (e.g., Vanguard) and then in the latter the fund family's

Table 12: Performance in first year and active and passive holdings

This table presents the results of long-term performance of new bond issued on the last two-trading days of the month. The dependent variable is the cumulative abnormal return in basis points of the bond relative in excess of the maturity- and category-matched ICE benchmark over the same period. Issuance month holdings of active mutual funds and passive funds (including both index mutual funds and ETFs) are computed as a fraction of the bond's amount outstanding. Control variables include the log of amount outstanding and the log of bond time to maturity at issuance, and an indicator variable for bonds from industrial issuers. The regressions include ratings and offering year fixed effects. Standard errors clustered at the issuer level are presented below the coefficients. * indicates significance at the 10% level, ** at the 5% level, and *** at the 1% level.

	(1)	(2)	(3)	(4)	(5)	(6)
			Return through			
VARIABLES	1 mth	2 mths	3 mths	6 mths	9 mths	12 mths
Passive ownership %	-17.663***	-21.614***	-14.437***	-20.241***	-24.311**	-35.960***
	(4.848)	(6.356)	(4.977)	(6.941)	(10.835)	(12.366)
AMF ownership %	5.343**	3.54	4.985**	6.334*	8.454	12.728**
	(2.515)	(3.365)	(2.467)	(3.279)	(5.157)	(5.76)
Log of bond size	57.603**	69.945**	11.418	37.323	73.923	40.655
	(27.707)	(34.319)	(18.119)	(38.26)	(72.477)	(79.246)
Bond maturity	2.426*	1.157	1.208	-0.962	0.16	-2.312
	(1.238)	(1.157)	(1.095)	(1.438)	(1.837)	(2.029)
Dummy for industrial issuer	-14.59	5.478	12.335	43.644	68.324*	63.508
	(20.518)	(22.91)	(21.613)	(28.052)	(39.941)	(50.596)
Observations	547	547	547	547	547	547
R-Squared	0.262	0.18	0.16	0.148	0.155	0.099
Sample	Bonds in last 2 days of mth	Bonds in last 2 days of mth	Bonds in last 2 days of mth	Bonds in last 2 days of mth	Bonds in last 2 days of mth	Bonds in last 2 days of mth
Constant	Yes	Yes	Yes	Yes	Yes	Yes
Rating bucket FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	No	No	No	No	No	No
Cluster	Issuer	Issuer	Issuer	Issuer	Issuer	Issuer

internal capital market group decides how to distribute the allocation between its funds. In this subsection, we utilize the month-end sample to disentangle if the underperformance we have documented to date is driven by underwriters, fund family managers, or both.

To begin, we first look at the industry as a whole: do passive investors receive higher-than-expected allocations in underperforming bonds? In order to estimate expected allocation, we compare holdings by passive funds in bond *i* relative to the proportion of total industry assets that are in passive funds. Formally, we calculate

$$AbnormalPassive_i = \%Passive_i - \frac{PassiveAssets_m}{TotalAssets_m} * \frac{\Sigma_{k=1}^{K} BondsHeld_{i,k}}{OfferingAmount_i} \tag{9}$$

where each *k* is a bond fund in our sample. This proxy does not consider the underwriters broad decision to allocate insurance companies, pension funds, mutual funds and ETFs. Rather it takes the the aggregate allocation to all investment vehicles in our study and considers deviations from pro-rata standards between active and passive. In other words, any positive deviation from pro-rata AUM is a higher-than-expected allocation to passive funds rather than active funds. Any negative deviation is a lower-than-expected allocation to passive funds in favor of active funds. In Table 13, we study the relation between the abnormal allocation to passive funds and the three performance variables study previously - underpricing, measures of short-term performance (up to 20 trading days) and long-term performance (up to 12 months). In the interest of space, the coefficients on control variables are not presented but are included.

The results support the findings of the prior subsection. When passive funds are overallocated (underallocated) relative to their weight in the industry new bond offerings underperform (outperform). We next attempt to determine if underperformance can be attributed to decisions made by the underwriters or by the fund families.

Table 13: Passive allocation and bond performance

This table presents the results of regressions of performance measures for bond issuances in the last two trading days of a month on a proxy for deviations from pro-rata allocations to passive funds. The covariate of interest is a proxy for the abnormal allocations to all passive funds. The covariate, *Abnormal Passive*, is computed for bond i issued in month m for as the difference between actual passive ownership and the asset-weighted proportional ownership of the total allocation to all K bond funds in our sample. Control variables include the log of offering amount, bond time to maturity, and an indicator variable for an issuance from an industrial issuer. Standard errors clustered at the issuer level are presented below the coefficients. Column (1) presents the underpricing results, columns (2) - (5) the short-term performance, and columns (6) - (8) the long-term performance. * indicates significance at the 10% level, ** at the 5% level, and *** at the 1% level.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
					Return through			
VARIABLES	Offer date return	day 2	day 5	day 10	day 20	3 mths	6 mths	12 mths
Abnormal Passive %	-6.117**	-11.864***	-17.567***	-29.039***	-38.371***	-17.760***	-22.445***	-43.640***
	(2.631)	(4.111)	(4)	(7.678)	(7.57)	(6.229)	(7.244)	(12.103)
Observations	548	516	492	452	453	547	547	547
R-Squared	0.187	0.202	0.193	0.209	0.315	0.159	0.144	0.096
Sample	Bonds in last 2 days of mth	Bonds in last 2 days of mth	Bonds in last 2 days of mth	Bonds in last 2 days of mth	Bonds in last 2 days of mth	Bonds in last 2 days of mth	Bonds in last 2 days of mth	Bonds in last 2 days of mth
Constant	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Rating bucket FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	No	No	No	No	No	No	No	No
Cluster	Issuer	Issuer	Issuer	Issuer	Issuer	Issuer	Issuer	Issuer

To disentangle if the abnormal allocation is driven by the underwriter to the fund family or by the fund family to its passive funds, we compute two proxies. First, our proxy for the abnormal allocation to family f by the underwriter is computed as:

$$AbnormalToFamily_{i,f} = \frac{BondsHeld_{i,f}}{OfferingAmount_i} - \frac{FamilyAssets_{f,m}}{TotalAssets_m} * \frac{\Sigma_{k=1}^{K} BondsHeld_{i,k}}{OfferingAmount_i}. \tag{10}$$

The measure is the deviation of the total ownership of the fund family from the asset-weighted pro-rata allocation of the entire industry's ownership of the offering. Thus, abnormal allocation to the family means that we are implicitly comparing families with passive funds to active-only fund families. Second, we construct our proxy for the abnormal allocation by the family as the difference in family f's actual ownership by passive funds p and the portion of the family's total ownership predicted by the weight of passive assets in the family. The proxy which we label as abnormal allocation by family is computed as:

$$AbnormalByFamily_{i,f} = \frac{\Sigma_{p=1}^{P} BondsHeld_{i,p}}{AmtOutstanding_i} - \frac{\Sigma_{p=1}^{P} Assets_{p,f,m}}{FamilyAssets_{f,m}} * \frac{BondsHeld_{i,f}}{AmtOutstanding_i} \tag{11}$$

In Table 14, we present the performance results using both measures of abnormal allocation, showing underpricing, short-term returns and long-term returns. We include only fund families with positive passive assets that are able to consider making an abnormal allocation to passive funds.[22]

[22]The results are robust to using all offering-family combinations, including active only families. The results are also robust to considering pro-rata allocations determined by credit quality of the funds to account for the split of assets between investment grade and high yield funds. To proxy for the unmet demand of families we also considered all family-bond observations with non-zero family ownership in the one- and two-months after the issuance. Results are available upon request.

Table 14: Family and fund-level abnormal holdings and bond performance

This table presents the results of regressions of performance measures for bond issuances in the last two trading days of a month on a proxy for deviations from pro-rata allocations to passive families by underwriters and by passive families to passive funds. The sample includes observations of new issuance holdings by families with positive passive fund assets. Abnormal to Family proxies for the abnormal allocation to all funds in family f from underwriters. It is computed for family f for bond i issued in month m as the difference between actual family ownership and the asset-weighted proportional ownership to the family of the total allocation to all bond funds. To proxy for the abnormal allocation by the family to its passive funds, p, we compute Abnormal by Family. It is computed as the difference between actual ownership of passive funds in the family and the asset-weighted proportional ownership to the passive funds of the total allocation to the family. Control variables include the log of offering amount, bond time to maturity, and an indicator variable for an issuance from an industrial issuer. Standard errors clustered at the issuer level are presented below the coefficients. Column (1) presents the underpricing results, columns (2) - (5) the short-term performance, and columns (6) - (8) the long-term performance. * indicates significance at the 10% level, ** at the 5% level, and *** at the 1% level.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
					Return through			
VARIABLES	Offer date return	day 2	day 5	day 10	day 20	3 mths	6 mths	12 mths
Abnormal to Family %	-6.371***	-9.587***	-12.292***	-18.246***	-18.976**	-11.051**	-9.848	-20.907*
	(1.794)	(2.74)	(4.007)	(5.665)	(8.499)	(4.937)	(6.855)	(12.343)
Abnormal by Family %	-6.932**	-15.484***	-25.110***	-44.285***	-58.981***	-27.424**	-41.528***	-74.870***
	(2.795)	(5.318)	(7.454)	(12.809)	(11.97)	(10.68)	(14.444)	(24.457)
Observations	1,067	1,034	1,007	934	963	1,061	1,061	1,061
R-Squared	0.254	0.203	0.177	0.229	0.306	0.185	0.146	0.102
Sample	Bonds in last 2 days of mth	Bonds in last 2 days of mth	Bonds in last 2 days of mth	Bonds in last 2 days of mth	Bonds in last 2 days of mth	Bonds in last 2 days of mth	Bonds in last 2 days of mth	Bonds in last 2 days of mth
Constant	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Rating bucket FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	No	No	No	No	No	No	No	No
Cluster	Issuer	Issuer	Issuer	Issuer	Issuer	Issuer	Issuer	Issuer

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Both sources of abnormal allocation are significantly negatively related to bond performance, indicating that (1) underwriters are more likely to allocate worse performing bonds to fund families with passive assets compared to other investor types, and (2) these fund families put the worse performing allocations within their passive funds. For the long-term results (shown in columns (6)-(8)), the abnormal allocation by the family are magnitudes larger than the allocation by underwriters suggesting that the internal capital markets effect may dominate. If we make the reasonable assumption that fund managers earn higher fees on active funds than passive funds, then result (2) is consistent with Gaspar et al. (2006), who examine equity IPO allocations within fund families and find IPOs with higher underpricing end up in higher-value funds. The above results indicate that, while they benefit from positive underpricing in their purchases of new issue bonds, passive investors underperform other investor types in the allocations they receive due to decisions made at the underwriter level and at the fund manager level.

6 Discussion and conclusion

Using the corporate bond market as a laboratory, our paper shows the presence of passive investors in primary markets has important welfare implications for firms, investors and intermediaries. The corporate bond market is attractive to conduct this analysis due to its large size and unique index inclusion features (i.e., publicly known criteria for inclusion and unlimited number of securities).

We first use daily ETF holdings to show that fund manager's participate in primary offerings, despite the bond's benchmark inclusion not occurring until the next rebalancing. Our analysis of daily ETFs and total month-end holdings of index mutual fund and ETFs, finds that that passive investors are have higher holdings in less attractive new issues. New issue bonds with greater passive offering date holdings have lower underpricing, are more likely to have negative first day returns, and underperform in both the short-term and long-term. Further, the bonds are more likely to be downgraded, particularly those with a BBB rating. Exploiting the illiquidity of corporate bond markets, we are able to attribute these offering holdings to allocations rather than

secondary market purchases or ETF primary market activity. The placement of these underperforming new issues into passive funds is due to a combination of underwriter overallocation to passive families and within family overallocation to passive funds.

The findings of this paper support theoretical predictions that suggest funds that do not produce information, generate lower trading revenue, and have price insensitive demand, like passive funds, will receive worse allocations. Further, the results have important implications for regulators, corporations, fund families, and investors. Firms are able to rely on passive demand to complete offerings. Fund families are able to continuously participate in primary markets regardless of active fund demand. Thus, when higher quality offerings occur the family obtains allocations that they distribute to their higher-fee active funds. Finally, passive investors have access to on average positive underpricing that may offset the new hidden cost Reilly (2022) of long-term underperformance.

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Appendix A Overview of ETF Sample with Daily Holdings

Table A1: Characteristics of sample ETFs

* indicates the ETF holds non-corporate bonds as part of its mandate.

ETF Ticker	Manager	Name	Rating Category	Maturity Category	Benchmark Index Provider	AUM in billions (YE 2021)
AGG*	iShares	iShares Core U.S. Aggregate Bond ETF	IG	-	Bloomberg	$87.9
LQD	iShares	iShares iBoxx $ Investment Grade Corporate Bond ETF	IG	-	iBoxx	$35.8
IUSB*	iShares	iShares Core Total USD Bond Market ETF	IG	-	Bloomberg	$16.0
SCHZ*	Schwab	Schwab U.S. Aggregate Bond ETF	IG	-	Bloomberg	$9.1
USIG	iShares	iShares Broad USD Investment Grade Corporate Bond ETF	IG	-	ICE	$6.6
SPAB*	SPDR	SPDR Portfolio Aggregate Bond ETF	IG	-	Bloomberg	$6.2
GBF*	iShares	iShares Government/Credit Bond ETF	IG	-	Bloomberg	$0.4
IGSB	iShares	iShares 1-5 Year Investment Grade Corporate Bond ETF	IG	1-5 years	ICE	$22.4
IGIB	iShares	iShares 5-10 Year Investment Grade Corporate Bond ETF	IG	5-10 years	ICE	$11.2
SPSB	SPDR	SPDR Portfolio Short Term Corporate Bond ETF	IG	1-3 years	Bloomberg	$7.7
SPIB	SPDR	SPDR Portfolio Intermediate Term Corporate Bond ETF	IG	1-10 years	Bloomberg	$6.7
SLQD	iShares	iShares 0-5 Year Investment Grade Corporate Bond ETF	IG	0-5 years	iBoxx	$2.5
GVI*	iShares	iShares Intermediate Government/Credit Bond ETF	IG	1-10 years	Bloomberg	$2.3
IGLB	iShares	iShares 10+ Year Investment Grade Corporate Bond ETF	IG	10+ years	ICE	$2.0
HYG	iShares	iShares iBoxx $ High Yield Corporate Bond ETF	HY	-	iBoxx	$16.7
JNK	SPDR	SPDR Bloomberg Barclays High Yield Bond ETF	HY	-	Bloomberg	$9.7
USHY	iShares	iShares Broad USD High Yield Corporate Bond ETF	HY	-	ICE	$8.3
SHYG	iShares	iShares 0-5 Year High Yield Corporate Bond ETF	HY	0-5 years	iBoxx	$5.4
SJNK	SPDR	SPDR Bloomberg Barclays Short Term High Yield Bond ETF	HY	0-5 years	Bloomberg	$5.1
HYS	PIMCO	PIMCO 0-5 Year High Yield Corporate Bond ETF	HY	0-5 years	ICE	$1.1

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