Non-Fundamental Loan Renegotiations*

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Abstract

We exploit the semi-annual rebalancing of the Morningstar LSTA US Leveraged Loan 100 Index as an exogenous shock to the trading conditions in the secondary loan market, which are critical to non-bank institutional lenders that rely heavily on the secondary market for liquidity. In line with improved loan liquidity and greater institutional demand arising from the index inclusions, we find that index-included loans achieve lower bid-ask spreads, higher prices, and greater mutual fund holdings. We further find that index-included loans experience significantly higher likelihood of interest rate-reducing renegotiations than index-excluded loans, consistent with non-bank lenders sharing with borrowers non-fundamental surplus driven by the index inclusion. We rule out explanations related to borrower fundamental by showing that non-traded loans included in the same package as index-included loans do not experience interest rate reducing renegotiations and by conducting placebo analyses that employ an artificial index inclusion threshold and the time period preceding the index origination. Overall, our findings provide novel evidence that non-fundamental forces, such as a loan's inclusion in a major index, can trigger loan renegotiation.

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1 Introduction

Loan contracts leave scope for ex post renegotiation because they cannot factor in each possible risk and eventuality ex ante. This contractual incompleteness makes renegotiation a critical exercise for efficient loan contracting. A growing literature has sought to understand how borrowers' fundamentals affect renegotiation dynamics in private commercial lending (Garleanu and Zwiebel, 2008; Roberts and Sufi, 2009b; Roberts, 2015; Nikolaev, 2018; Amiraslani et al., 2023). Yet, the majority of loan renegotiations occur without any clear sign of borrower distress (Roberts, 2015; Denis and Wang, 2014; Bidder et al., 2023), suggesting that there are several factors unrelated to declining borrower fundamentals that prompt renegotiation. To our knowledge, we are the first to examine whether there are *non-fundamental* determinants of loan renegotiations by exploring renegotiations of loans traded in the secondary syndicated loan market.

In particular, we examine whether exogenous changes in the trading conditions of loans on the secondary market (i.e., changes unrelated to borrower fundamentals) motivate lenders and borrowers to renegotiate loan terms. We focus on the secondary loan market because private commercial lending capital is largely provided by nonbank lenders, such as hedge funds, mutual funds, and collateralized lending vehicles (Chernenko et al., 2022; Erel and Inozemtsev, 2024) that rely on well-functioning secondary markets.[1] A critical distinction between bank and nonbank lenders is the liquidity transformation strategy they employ to provide this type of long-term financing to borrowers.[2] Banks typically hold loan interests until maturity, pay for deposit insurance, and establish capital reserves to meet the demand of depositors, while nonbanks rely on secondary markets that allow them to liquidate assets due to their fragile sources of funding (e.g., Hanson et al., 2015; Goldstein et al., 2017; Ma et al., 2022; Emin et al., 2021; Fleckenstein et al., 2023).[3] Although lenders account for

[1] As of 2021, nonbanks hold 75.6% of the riskier private loans. https://www.imf.org/en/Blogs/Articles/2018/11/15/sounding-the-alarm-on-leveraged-lending

[2] Liquidity transformation is the "creation of liquid claims that are backed by illiquid assets," such as when banks use deposits to finance buy-and-hold long-term loans (Chernenko and Sunderam, 2016).

[3] Bank capital adequacy requirement refers to the amount of capital a bank must hold relative to its

secondary market conditions when setting loan terms at loan origination (Santos and Nigro, 2009), loan contracts cannot fully anticipate future market conditions. Therefore, an ex post realization of improved secondary market trading conditions (e.g., heightened loan demand or liquidity) may provide scope and incentives for nonbank lenders and borrowers to renegotiate loan terms to reflect these changes.[4]

In line with this proposition, we make two primary arguments related to the economic link between non-fundamental loan renegotiations and secondary loan market conditions. First, an exogenous (unrelated to borrower fundamentals) improvement in loan trading conditions following a loan's issuance should lead to a surplus for nonbank lenders. Because nonbank lender need to liquidate assets in a timely manner at fair market value, it is reasonable to expect that they require lower compensation (e.g., a lower interest rate) when loan trading conditions improve. Second, lenders are willing to share this surplus with borrowers. Although there is no contractual obligation for lenders to share any ex post surplus with borrowers, borrowers are aware of the trading conditions of their loan and will demand that the liquidity surplus be shared through loan renegotiations.[5] We expect lenders to be incentivized to share liquidity savings with borrowers to reduce the threat of the borrower refinancing because other lenders are likely to charge a lower interest rate that reflects the improvement in a loan's trading conditions.[6] Therefore, we expect that an exogenous improvement in loan

risk-weighted assets. It is often referred to as the capital requirement under Basel III. A discussion of capital adequacy is available at https://www.federalreserve.gov/supervisionreg/topics/capital.htm.

[4]We collectively refer to the loan's demand and liquidity as "secondary market conditions" throughout this paper.

[5]Based on a thorough investigation of the institutional publications and LSTA documentation, we are not aware of any contractual clause that (a) makes the loan's interest rate a function of secondary market liquidity or (b) forces renegotiation upon a change in secondary market liquidity. We also reviewed a large sample of loan contracts to further verify that these clauses are not used.

[6]It is important to note that the majority of capital for traded loans is provided by institutional investors rather than banks and that the institutional lenders are the ones that likely derive the biggest direct benefit from loan liquidity. However, the banks responsible for syndicating and monitoring the loans also ahve significant incentives to be responsive to the demands of borrowers. For example, Gande and Saunders (2012) finds that lending relationships tend to be stronger for borrowers that have loans sold on the secondary market relative to having loans retained by the bank. Phillips (2024) finds that one reason for this is that syndicate banks that sell loans on the secondary market often intermediate trading for the loans, and their participation as market makers in the secondary market increases the strength of lending relationships. The paper also finds that banks are willing to accept lower compensation for intermediating trades as market makers to promote healthy trading conditions for the loans they syndicate.

trading conditions are associated with interest rate–reducing loan renegotiation.

A primary challenge in identifying a causal relation between secondary market conditions and loan renegotiations is that the fundamental characteristics of the borrower are likely to affect both loan trading and its contractual provisions. We overcome this challenge by exploiting a novel setting of the Morningstar Loan Syndication and Trading Association US Leveraged Loan 100 Index (hereafter, LSTA 100) semi-annual rebalance as exogenous variation in a loan's trading conditions. The LSTA 100 index serves as an important benchmark for institutional investors in the private lending market, as most loan exchange-traded funds (ETFs) use the LSTA 100 as a benchmark for their performance.[7] The semi-annual rebalancing sets the composition of the index to the 100 largest traded syndicated loans in terms of par value. This aspect of the index is plausibly exogenous because whether a loan is included in the index relies on its size relative to the universe of traded loans rather than on changes in its market value that are affected by borrower fundamentals. This hard cut-off at 100 for the largest loans suggests that there should be discontinuity around the index inclusion threshold, where loans just above the index benefit from more favorable conditions but are otherwise comparable to those just below. This prediction of more favorable market conditions is motivated by prior research in equity and bond markets that finds that index inclusion significantly improves the liquidity of and institutional demand for the underlying securities (Cao et al., 2019; Marta, 2024; Shim and Todorov, 2022; Koont et al., 2022; Bretscher et al., 2023b). We consider higher institutional demand and higher liquidity to represent better trading conditions, while acknowledging that the literature treats these economic factors as distinct outcomes of market-driven innovations such as market indices. In our institutional setting, a sufficiently strong improvement in either factor should benefit nonbank lenders and may prompt renegotiation.

Our empirical approach utilizes data on the semi-annual rebalance of the LSTA 100 index constituency and examines the 50 loans above and below the index inclusion threshold

[7]https://www.prnewswire.com/news-releases/sp-licenses-splsta-leveraged-loan-100-index-to-invesco-powershares-set-to-serve-as-basis-for-industrys-first-senior-loan-etf-117234798.html

from January 2014 to August 2023 using a regression discontinuity design (RDD). We first corroborate several important assumptions for RDD in our setting. First, we confirm that there is no discontinuity in other observable loan terms around the index inclusion threshold, including size and maturity. This reduces the concern that there are systematic differences between loans just above versus just below the threshold that affect loan trading conditions and renegotiations. Second, we do not find evidence that borrowers increase the size of their loan prior to the index semi-annual rebalancing to increase the probability of being included in the index. This is consistent with loan size manipulation being costly for lenders as it increases their exposure beyond the amount sought by the borrower for the stated purpose of the loan, as well as costly for borrowers that should incur additional interest expenses that are likely to exceed potential liquidity savings. Moreover, the index inclusion threshold is dynamic (100th largest loan) because it is a function of all other lending activity in the syndicated loan market (that is, the distribution of loan sizes is frequently changing). This makes it difficult for lenders and borrowers to accurately predict the inclusion threshold and manipulate a loan's size to exceed this threshold. As long as the agents do not have precise control over the assignment variable (in this case, the rank of the loan's size in the market), the variation around the inclusion threshold is as good as random (Lee and Lemieux, 2010).

We start our analyses by verifying that index inclusion is indeed associated with better secondary market conditions. We find that loans just above the threshold have discontinuously smaller bid-ask spread, higher trading price, and greater mutual fund holdings. This evidence is consistent with higher demand for and higher liquidity of loans in the LSTA 100 index. Thus, index inclusion results in more favorable loan trading conditions.

We then examine whether the trading conditions affect loan renegotiations. We estimate that loans just above the index inclusion threshold are five times more likely to have interest rate-reducing loan renegotiations over the 90-trading day period following the index rebalance than loans just below the index inclusion threshold.[8] Furthermore, the average reduction

[8]All economic magnitudes represent the local average treatment effect at the threshold.

in the interest rate for these renegotiations is 47 basis points. Thus, non-fundamental loan renegotiations associated with index inclusions result in borrowers' average annual savings of $8.9 million ($43.2 million over the average remaining maturity). Our back-of-the-envelope estimate suggests that borrowers who renegotiate their spread capture 65% of the benefits of index inclusion. Thus, index inclusion results in meaningful benefits that accrue to borrowers through interest rate-reducing non-fundamental loan renegotiations.[9] We conduct robustness analyses to verify that our interest rate reduction findings cannot be explained by tightening in other loan contractual terms around index inclusion. We also do not find that there is a higher likelihood of other non-interest-rate reducing renegotiations for index-included loans, ruling out the possibility that loans index-included borrowers are unconditionally more likely to renegotiate.

Our findings of the interest rate reduction post index inclusion hold in an alternative specification where we perform a *within-loan package* analysis. It is common for traded term loans to be packaged in a deal with other loans that are not commonly traded, such as a revolving credit facility.[10] We exploit this institutional feature to examine the difference in the interest rate between these two loan tranches for traded loans just above and below the LSTA 100 index inclusion (term loans are typically priced at a higher spread than revolving lines of credit) (Marsh and Lee, 2019). We document that the pricing difference between the traded term loan and the revolving facility in the same package is more likely to be reduced for loans included in the index. We also show that there is no difference in the probability of a decrease in the revolver interest rate for packages with loans just above the index inclusion threshold relative to those just below. These analyses mitigate the concern that a contemporaneous

[9]We also explore the timing of loan renegotiations using survival analysis based on a loan's *initial* inclusion into the LSTA 100 index. This analysis estimates how quickly loans are renegotiated after the index inclusion and thus focuses on initial inclusions rather than on loan above versus below the inclusion threshold as in our primary tests. For index-included loans, the probability of having a rate-reducing amendment within the first 250 (500) days of inclusion is 35.7% (71.4%) higher than that of loans just below the inclusion threshold during the same period.

[10]Predominantly, loans traded in the secondary market are non-amortizing term loans. Non-amortizing term loans are loans with a fixed amount payable at the maturity date with periodic interest only payments between the loan disbursement and maturity date.

fundamental shock to the borrower at the time of a loan's inclusion influences our findings because this shock should affect the cost of debt not only for the included loan, but also for revolving loans in the same loan package. This corroborates our assumption that there is no difference in the distribution of fundamental shocks between the loans above and below the inclusion threshold, providing further support for the non-fundamental channel.

We perform two placebo analyses to further corroborate that our findings and inferences are attributable to LSTA 100 index inclusion. First, we use a synthetic inclusion rank of 50, such that the treatment group includes the 50 loans above the placebo inclusion threshold (i.e., the largest 50 traded loans) and the control group includes the 50 loans below the placebo inclusion threshold (i.e., the next largest 50 traded loans). We find that loans just above the placebo index inclusion threshold do not have discontinuously higher liquidity, mutual fund holdings, probability of interest rate–reducing renegotiation, and changes in the interest rate associated with renegotiations. Second, we exploit the period prior to the introduction of the LSTA 100 index in 2008. We use the period from 2001 to 2007 to create a hypothetical LSTA 100 index and identify loans that would qualify for semi-annual inclusion had the index existed. We do not observe that these hypothetical semi-annual inclusions are associated with loan liquidity, probability of renegotiation, or a decrease in interest rate due to loan renegotiation. These placebo analyses provide further evidence that our results are not spurious or driven by omitted factors correlated with loan size, loan liquidity, or interest rate-reducing amendments.

Our next tests validate that improved secondary market conditions directly drive borrowers' interest rate reductions by using a two-stage least-squares (2SLS) design consistent with prior index inclusion studies (e.g., Appel et al., 2016; Ben-David et al., 2018; Bretscher et al., 2023b). We instrument secondary market trading conditions (bid-ask spread, price, or mutual fund holdings) using a loan's index-inclusion status in the first stage and then regress renegotiation outcomes on the fitted values in the second stage. Bid-ask spread and price do not demonstrate any weak-instrument concerns. The second-stage results confirm that

liquidity improvements attributed to index inclusion are a key driver of interest rate-reducing amendments, consistent with our main findings.

We conclude by providing supporting evidence for our hypothesis that the threat of refinancing compels lenders to share surplus related to favorable trading condition with borrowers. We posit that this threat is stronger during credit expansions, as these conditions are characterized by increased availability of credit and more lenient lending standards (e.g., Berger and Udell, 2004; Behn et al., 2016; Rodano et al., 2018). We indeed find that surplus sharing is more pronounced during periods of higher aggregate credit supply by nonbanks, measured by the higher volume of institutional loans (e.g., Becker and Ivashina, 2016) and loans issued by nonbank lenders (Becker and Ivashina, 2014). We also explore how call protections—contractual clauses that impose penalties on early refinancing or restrict prepayment altogether—affect whether lenders share the surplus related to favorable trading condition with borrowers. By limiting the borrower's ability to obtain alternative financing, these protections neutralize the threat of refinancing and thus substantially diminish borrowers' bargaining power. The results confirm that when call protection provisions are active, borrowers do not experience the interest-rate advantages provided by index inclusion. Taken together, these findings underscore that surplus-sharing depends not only on market-wide credit conditions, but also on whether borrowers are free from contractual constraints that would otherwise reduce their bargaining power.

2 Related Literature and Institutional Setting

2.1 Related Literature

Our study is related to four important research areas. First, a stream of research has investigated the economics of loan renegotiations in the context of incomplete contracting theory (Roberts and Sufi, 2009a; Christensen et al., 2016). This theory states that contracts leave scope for renegotiation because they cannot factor in all potential future states of the world and, upon being provided a signal of the state of the world, ex-post renegotiation

improves contract efficiency (Grossman and Hart, 1986; Hart and Moore, 1988; Aghion and Bolton, 1992; Dewatripont and Tirole, 1994). With their central role and extensive implications for contracting, renegotiations and their implications have been widely examined in the theoretical literature (e.g., Bolton, 1990; Aghion and Bolton, 1992; Bolton and Scharfstein, 1996). A major emphasis in this literature is on the implications of information asymmetry between borrowers and lenders with regards to the prospects (i.e., fundamentals) of the borrower. For example, Garleanu and Zwiebel (2008) show that information asymmetry between lenders and borrowers results in more control rights being granted to lenders ex ante.

Empirical studies that examine renegotiation focus primarily on the determinants and consequences of renegotiations in response to new information about *fundamentals*. Roberts (2015) emphasizes that renegotiation serves as a crucial mechanism to adjust loan terms to new information about firm fundamentals, thereby addressing the inherent incompleteness of the initial contract. Roberts and Sufi (2009b) show that renegotiations are driven by new information about the borrower's credit quality, investment opportunities, collateral value, and macroeconomic conditions. Denis and Wang (2014) find that renegotiations occur frequently with no covenant violation and find that operating decisions are correlated with covenant changes, implying a role for creditor control even outside of deteriorating borrower conditions. Dou (2020) finds that borrowers with financial statements that better map to their credit risk fundamentals are less likely to renegotiate their financial covenants. In a similar vein, Donovan et al. (2024) find that borrowers and lenders are more likely to renegotiate after accounting standards better reflect the firms' fundamentals. Complementing these studies, Nikolaev (2018) demonstrates that renegotiations are a strategic tool in private lenders' monitoring process. Jiang et al. (2022) shows that rent extraction from renegotiation incentivizes bank monitoring. Furthermore, Amiraslani et al. (2023) find that when syndicate participants waive their rights to private information (i.e., when they serve as "public-side lenders"), the likelihood and timeliness of renegotiations are actually higher following fundamental shocks as these participants delegate their decision rights to lead arrangers. Our work extends

this literature by documenting that non-fundamental forces, such as a loan's inclusion in a major index, can also trigger renegotiation. We further highlight the importance of these renegotiations as the primary channel through which borrowers achieve the interest rate reductions from nonbank lenders.

There are also several studies that examine the association between the secondary loan market liquidity and contractual terms at loan origination. Gupta et al. (2008) find that banks charge lower interest rates on loans that are more likely to be traded on the secondary market. Kamstra et al. (2014) find that loans without a covenant requiring a borrower's permission for loan sale are associated with lower interest rates. Santos and Nigro (2009) show that loans taken out by a borrower following the onset of the trading of its loans are associated with higher interest rates, but when these loans are more liquid, this association is reversed. While these papers suggest that there is an association between secondary market liquidity and loan pricing, they cannot establish a causal relation between these economic constructs. Specifically, their research design lacks any exogenous variation in liquidity, such that both a loan's liquidity and loan terms are plausibly explained by a borrower's fundamentals.[11] Our use of the exogenous LSTA 100 index inclusion threshold allows us to significantly advance this literature by establishing a causal relation between the secondary loan market conditions and the cost of debt. Furthermore, prior studies primarily focus on the incentives of banks in the original loan syndicate to sell loans, such as freeing their capital and improving risk management. In contrast, our study identifies a new economic mechanism behind the causal relationship we establish: the demand for liquidity by the primary traders in the secondary loan market–nonbank institutional lenders.

Our focus on non-bank lenders' is also linked to the growing literature on the real impact

[11]For example, Gupta et al. (2008) rely on the lead arranger's reputation and on the borrower's financial statements being publicly available as instruments to loan liquidity. These variables are endogenous as they relate to a borrower's fundamentals and thus loan pricing. A lead arranger's reputation is associated with a higher borrower quality and also affects syndicate structure, which is related to loan pricing (Bushman and Wittenberg-Moerman, 2012; Sufi, 2007; Ivashina, 2009). Having public financial statements indicates that borrowers have publicly traded equity or bonds and are thus substantially different from private borrowers. Leuz et al. (2008) also suggest that public status is linked to stronger fundamentals.

of institutional investor demand (Basak and Pavlova, 2013). Recent work highlights that the elasticity of asset demand is well below what has been implied by standard asset pricing models (e.g., Koijen and Yogo, 2019; Gabaix and Koijen, 2022; Haddad et al., 2021; Bretscher et al., 2023a). In line with this evidence, studies document that non-fundamental demand shocks by certain investors can have significant long-lasting price effects and subsequently affect firms' real activities. More closely related to debt markets, Bretscher et al. (2023b) find that an exogenous increase in passive fund demand lowers the bond yield in both the secondary and primary markets. Kubitza (2021) finds that insurers' demand shocks for corporate bonds significantly affect firms' financing and investment decisions. In addition, Zhu (2021) shows that mutual fund flows affect firms' new bond issuance, while Adelino et al. (2023) show that the supply of capital from mutual funds has a significant impact on municipal bond financing and local government spending. Darmouni and Siani (2022) build a two-layer asset demand system to illustrate how the feedback loop between investor flows and asset prices can amplify fundamental shocks. To the best of our knowledge, our study is the first to examine the non-fundamental investor demand in the private debt market. While Ivashina and Sun (2011) explores the pressure on the interest rates in the primary loan market due to the higher institutional fund flow, as measured by the number of days a loan remains in syndication, we focus on non-fundamental liquidity demand of nonbank lenders in the secondary loan market. We document the real effect of this demand on loan renegotiations and the cost of loan financing.

Because of our institutional setting of LSTA 100 inclusions, our paper also relates to a rapidly growing literature that studies the impact of index membership. Indexes play an increasingly vital role in financial markets due to a very significant increase in passive investing and benchmarking over the last two decades.[12] Chang et al. (2015) find positive (negative) price effects that follow the addition (deletion) to the Russell 2000 index, and Ben-David et al. (2018) find that higher ETF ownership leads to significantly higher non-fundamental

[12]Related studies also examine funds that track indices and the consequences that this has on constituent firm behavior (Heath et al., 2022).

volatility. In addition, Pavlova and Sikorskaya (2023) show index constituents not only affect passive index funds, but also influence active funds through benchmarking behaviors, and Kashyap et al. (2021) argue that inelastic demand caused by benchmarking creates a "benchmark inclusion subsidy" that benefits the index constituents. With respect to credit markets, Koont et al. (2022) show the liquidity improvement caused by higher corporate bond ETF is caused by the arbitrage activity by the authorized participants. Marta (2024) finds that corporate bond ETF ownership positively influences the liquidity of its constituent securities. We extend these studies by documenting that the constituency in the private loan index leads to more favorable secondary loan market conditions and decreases loan pricing via non-fundamental renegotiations.

Our study is also related to recent research on the transmission of lenders' health to their borrowers. These studies examine negative shocks to the health of banks during the financial crisis of 2008-2009 and document that these shocks transmit to borrowers through the lending channel. For example, Chodorow-Reich (2014) shows that borrowers with pre-existing relationships to banks that experienced poor capital conditions during the financial crisis suffered from worse loan terms if they continued to borrow from those banks. Also, Chodorow-Reich and Falato (2022) find that banks experiencing liquidity shocks reduced their loan commitments during the credit crisis in response to borrower covenant violations, consistent with their internal liquidity affecting their lending decisions. Furthermore, Becker and Benmelech (2021) documents that syndicated loan issuance is more vulnerable compared to corporate bonds during the Covid-19 pandemic. Specific to non-bank financing, Aldasoro et al. (2023) show that non-banks reduce their credit supply by significantly more than banks during crises. Bhardwaj et al. (2024) also show that CLO exposes borrowers to idiosyncratic cash-flow shocks from insurers. In contrast to negative shocks to banks' health explored in prior research, we explore whether non-bank lenders share with borrowers ex-post surplus arising from a non-fundamental improvement in loans' secondary trading conditions. Thus, our study differs from prior research in our focus on: 1) ex-post surplus in loan contracts

versus negative shocks to lenders' health, 2) non-bank institutional lenders versus banks, and 3) secondary loan market channel versus lending channel.

2.2 Institutional Setting

Leveraged loans are loans issued to borrowers with high debt compared to their earnings and represent the vast majority of loans traded on the secondary loan market. Traded leveraged loans mostly have a non-amortizing term structure where borrowers do not make principal payments over a loan's duration and only pay one balloon payment upon maturity. Importantly, non-amortizing leveraged loans are predominantly held by institutional lenders that are attracted to these loans due to their high interest rate spreads. Based on the 2018 FEDS Notes from the Federal Reserve, at the time of origination, CLOs and mutual funds account for a majority of the leveraged loan market, and the market share of nonbank institutional lenders keeps increasing after origination due to secondary loan trading.[13]. Banks, in contrast, are unlikely to hold leveraged loans because of their riskiness and non-amortizing term structure, which can affect regulatory capital requirements (Nandy and Shao, 2008; Irani et al., 2021). Instead, banks are more likely to hold revolving or amortizing term loans.[14]

Contrary to traditional banks, many nonbanks rely on secondary market liquidity due to their need to immediately meet redemption requests from their investors and fragile funding sources (Hanson et al., 2015). Redemption concerns correspond to open end fund structures, such as those of mutual funds (Chakraborty et al., 2023). Closed end and securitized investment vehicles, such as CLOs, are not subject to redemption concerns but require liquidity for other reasons. First, many CLOs are actively managed and thus need the ability to trade loan participations to dynamically modify their portfolio (Fabozzi et al., 2021). Second, CLOs must maintain certain credit quality ratios for their portfolio and can be forced to liquidate loan positions (Elkamhi and Nozawa, 2022; Kundu, 2023). Hence, liquidity is an important concern for nonbank lenders.

[13]https://www.federalreserve.gov/econres/notes/feds-notes/the-us-syndicated-term-loan-market-20191125.html

[14]Lead arranging banks, on the other hand, frequently sell most of their loan shares shortly after origination (Blickle et al., 2020).

Prior studies examine the determinants of trading costs, which relate to liquidity, in the secondary loan market. For example, Wittenberg-Moerman (2008) shows that public firm loans, loans with credit ratings, and loans from reputable arrangers have lower bid-ask spreads due to lower information asymmetry associated with these loans. Phillips (2024) finds that a loan's lead arrangers' participation as market makers reduces trading costs for the loan, and finds that lead arrangers trade-off intermediation profits for stronger lending relationships with their borrowers.

The liquidity risk faced by nonbanks that invest in leveraged loans is nontrivial (Wittenberg-Moerman, 2008; Elkamhi and Nozawa, 2022; Kundu, 2023). Although the secondary loan market has grown over the past two decades, trading volumes and settlement times for loans significantly lag those for both investment-grade and high-yield corporate bonds.[15] Moreover, only qualified institutional buyers (QIBs) can participate in the secondary loan market because private loans are not considered securities for the purposes of registration with the Securities and Exchange Commission (SEC) (Saunders et al., 2024).[16] This contrasts with the public bond market, where bonds are registered as securities with the SEC and can be purchased and sold by any investor, including retail investors.[17] Furthermore, although loans are not regulated as securities, proposed regulatory designations of liquidity by SEC define loans as "illiquid" (due to settlement times that can take weeks) and, if enacted, would impair the ability of open-end mutual funds to hold private loans in their portfolios.[18]

To examine how secondary market conditions affect loan contracting, we rely on LSTA 100. This is a market-value weighted index designed to measure the performance of the 100 largest facilities in the US leveraged loan market.[19] It serves as a vital tool for financial

[15]https://www.federalreserve.gov/econres/notes/feds-notes/universe-of-leveraged-bank-loan-and-high-yield-bond-us-mutual-funds-20190802.html

[16]In a related over-the-counter market, Hendershott et al. (2024) finds that there is a significant illiquidity costs that arise from failed trades, which they document based on the failed auctions of CLO tranches among institutional investors. This highlights that in over-the-counter markets there can be many "hidden" costs of illiquidity when one only measures liquidity costs through executed trading or bid and ask quotations.

[17]Rule 144A(a)(1) defines QIB as an institutional investor that owns and manages $100 million ($10 million in the case of a registered broker-dealer) or more in qualifying securities.

[18]https://www.lsta.org/news-resources/open-end-loan-funds-liquidity-risk-already-well-managed/

[19]The LSTA 100 offers an ideal setting to examine the impacts of index exclusions relative to alternative

institutions, such as mutual funds or ETFs, that aim to benchmark the performance of the leveraged loan market. For example, the largest passive ETF, Invesco Senior Loan ETF, tracks the LSTA 100. A majority of loan ETFs (84.3% of total assets under management) use the LSTA 100 as a benchmark.[20] Thus, the LSTA 100 represents one of the most significant benchmarks for investors who track the performance of the US leveraged loan market.[21]

3 Data, Sample and Empirical Method

3.1 Data and Sample

We rely on a variety of data sources for our analysis, including (1) Morningstar for the loans eligible for index inclusion and LSTA 100 constituents data, (2) the Refinitiv LPC database of the daily secondary market loan pricing data and CLO trading data, (3) the DealScan database for loan characteristics and amendment information, (4) CRSP and Morningstar for the mutual fund holding data. We start our sample construction with the LSTA 100 index constituents data.[22] We merge the included loans with the Refinitiv LPC database for the secondary market loan pricing data and trading information. We then merge this sample with DealScan data to obtain loan characteristics and loan amendment information.[23]

bank loan indices. For example, the iBoxx USD Liquid Leveraged Loan Index includes the 100 most "liquid" traded loans. In this case, the liquidity of the loan determines the treatment of index inclusion, rather than vice versa.

[20]There are 6 bank loan ETFs, including Invesco Senior Loan ETF ($6.8B AUM), SPDR Blackstone Senior Loan ETF ($5.4B AUM), First Trust Senior Loan Fund ($2.1B AUM), Franklin Senior Loan ETF ($303M AUM), Pacer Pacific Asset Floating Rate High Income ETF ($200M AUM), and Virtus Seix Senior Loan ETF ($112M AUM). The AUM estimates are based on March 2024 figures. The only two bank loan ETFs that do not benchmark against the LSTA 100 are the First Trust Senior Loan Fund and Virtus Seix Senior Loan ETF.

[21]Eligibility criteria for inclusion in the LSTA 100 is as follows: (a) it is a senior secured loan, (b) it is USD denominated, (c) it has a minimum initial maturity of one year, (d) it has a minimum initial spread of base rate +125 bps, (e) it has a minimum initial size of $50 million, and (f) it is syndicated in the US (but the issuer may be of any origin). Upon inclusion, the ranking order in the index is weighted by the market value of the loan and the maximum weight of any single loan cannot exceed 2%. There is also a weekly rebalance where loans are added to the index only when a vacancy is created by removing a constituent loan if it is repaid or no longer satisfies the eligibility criteria.

[22]Although the LSTA 100 was initiated on October 20, 2008, we start our sample in January 2014 due to data availability.

[23]The Refinitiv LPC dataset is typically merged with DealScan using the Loan Identifier Number (LIN). However, it is important to note that in some cases the LIN in DealScan does not match the LIN reflected in

To construct our regression discontinuity sample, we rank each loan based on its par value ranking immediately after each semi-annual rebalance. We keep the 50 loans above (treatment group) and below (control group) the semi-annual threshold.[24] The sample window for both the treatment and control groups is 90 trading days following each semi-annual rebalance.[25] We exclude the following loans when creating the rank to ensure the inclusion is deterministic as of each rebalance date: (1) loans that are repaid or matured over the 90-day window and (2) control loans that are included into the index over the 90-day window through weekly rebalancing.

Our final sample consists of 425 loans (265 unique borrowers). There are 286 loans (197 unique borrowers) in the treatment group and 269 loans (216 unique borrowers) in the control group.[26] Table 1 reports summary statistics. Detailed variable definitions are reported in Appendix A.

3.2 Empirical Method - RDD

We apply a regression discontinuity design (RDD) to utilize the LSTA 100 index inclusion cutoff at the semi-annual rebalancing. Essentially, an RDD allows us to compare loans just above and below the index inclusion threshold and examine potential discontinuity after controlling for the nonlinear effects of the running variable (i.e., rank based on par-value size). Specifically, we estimate the following model:

$$DependentVariable_{i,t} = \beta \mathbb{1}_{Rank_{it}>=0} + f(Rank_{i,t}) + Controls_{i,t} + WeekFE + \epsilon_{i,t} \quad (1)$$

the LPC dataset. The reason is that DealScan assigns a new LIN following a loan's amendment and then applies this LIN retroactively to all the historical data regarding the loan. To address this issue, we manually match the old (original) loan LIN to a loan tranche identifier in DealScan and then use this identifier to connect the LPC and DealScan datasets. This step is necessary to adequately identify loan renegotiations and the terms being renegotiated.

[24] All of our results are robust to using bandwidths of 40 and 60 loans above and below the threshold (untabulated).

[25] We use 90 days instead of 180 days, which is the period between the semi-annual balances, to avoid any potential anticipatory effects ahead of the next semi-annual rebalancing. Our findings are robust to alternative period selections such as 60 days and 120 days (untabulated).

[26] This means that 130 loans experience periods both above and below the index inclusion threshold.

$Rank_{it}$ is the par-value rank at each semi-annual rebalance. We center the rank variable around the inclusion threshold by subtracting 50 and then reversing it (because we keep 50 loans above and below the threshold). Hence, a non-negative number means loans are included in the index and a negative number indicates that loans are not included in the index. In other words, loans with ranks from 0 to 49 are above the threshold (i.e., included in the index) and loans with ranks from -50 to -1 are below the threshold (i.e., not included in the index). $\mathbb{1}_{Rank_{it}>=0}$ is a dummy variable equal to one if the loan is above the loan inclusion cutoff, and zero otherwise. $f(Rank_{i,t})$ is a polynomial function of the running variable (i.e., rank). We choose the polynomial order to be two following the recommendations of Gelman and Imbens (2019). We adopt this specification to mitigate the risk of over or under-fitting near the cutoff. Higher-order polynomials (such as those of 3 or 4) can lead to overfitting and generate spurious trends that distort estimates. On the other hand, a linear specification (order of 1) tends to oversimplify relationships. We interact $f(Rank_{i,t})$ with $\mathbb{1}_{Rank_{it}>=0}$ to allow for local polynomials above and below the index-inclusion threshold. We include week fixed effects to control for any time trends in the market-based tests and we control for the loan maturity, loan size, public firm indicator and the number of financial covenants in both the market-based and contracting tests. Standard errors are clustered by week for the market-based tests and by rebalancing period for contracting tests.

3.3 Tests of RDD Model Assumptions

3.3.1 Rank Predicts Treatment Assumption

As the first test in support of RDD model assumptions, we show that the rank of the loan predicts treatment. In Figure 1 Panel A, we plot all of the inclusions in and exclusions from the LSTA 100 index over time. The largest changes in the composition of the LSTA 100 occur during the semi-annual rebalances at the end of June and December. In Figure 1 Panel B, we show that the weight of the loan within the index (y-axis) is discontinuous at the inclusion threshold (denoted by rank 0), where ranks above (below) the threshold on the left (right) have non-zero (zero) weights. In other words, all loans above the threshold are treated and all

loans below the threshold are not treated, which justifies our use of the sharp RDD method.

3.3.2 Loan Characteristics Around the Treatment Threshold

Another assumption for RDD is that other observable properties of the subject are not discontinuous around the treatment threshold (Lee and Lemieux, 2010). If other observable variables demonstrate discontinuities around the threshold, then that would suggest that treatment is not quasi-exogenous. We confirm this using observable loan terms for loans around the inclusion threshold, including loan size, maturity, number of financial covenants, and public firm indicator as dependent variables for Model 1. Each dependent variable is measured as of the day immediately following each semi-annual rebalance. Table 2 and Figure 2 report these tests. We find no discontinuities for these observable characteristics of loans just above the index inclusion threshold compared to those just below. We conclude that it is unlikely that there are systematic differences in loans just above versus below the threshold that are attributable to factors other than index inclusion.

3.3.3 Lenders and Borrowers Cannot Precisely Control the Assignment of Treatment

An additional assumption for RDD empirical strategies is that agents cannot precisely control treatment (Lee and Lemieux, 2010). In Section 2.2, we discuss the institutional reasons for why we believe that this assumption is valid for LSTA 100 index inclusion. These reasons include (1) the index inclusion threshold cannot be perfectly predicted in advance of the semi-annual rebalance dates because it is based on the loan issuance behavior of all other syndicated loan issuers, and (2) the fact that increasing the size of a loan beyond the amount needed to the borrower increases risks for lenders as well as interest payments for borrowers (which are likely to exceed potential liquidity savings), such that manipulating the size of a loan is costly for both lenders and the borrower.[27]

[27]Furthermore, if lending syndicates are aware that other syndicates manipulate the loan size to get into the index, then they will rationally respond by increasing their own loan size, which will lead to further

Nevertheless, we provide further support for our arguments by examining whether there is a higher probability of size-increasing loan renegotiations for loans just above the index inclusion threshold immediately prior to the index inclusion cutoff date. Specifically, in Table 3, we estimate Model 1 restricting the sample to loan observations in June and December, which correspond to one month *prior* to each semi-annual rebalance period. The dependent variable in column (1) is an indicator variable equal to one if the loan has a size-increasing loan renegotiation during the month, and zero otherwise. The dependent variable in column (2) is the amount of the change in the loan size at the end of the month compared to the beginning of that month. $\mathbb{1}_{Rank_{it}>100}$ reports whether lenders and borrowers manipulate the loan size prior to a semi-annual rebalance to improve their probability of meeting the index inclusion threshold. A positive and significant coefficient would be consistent with manipulating the probability of treatment (loan index inclusion) and invalidate the assumption that lenders and borrowers cannot precisely control the assignment of treatment. We do not find this to be the case. In fact, the coefficient on $\mathbb{1}_{Rank_{it}>100}$ is negative and insignificant. This is inconsistent with borrowers and lenders manipulating the probability of treatment prior to the index cutoff determination. This is strong evidence in favor of treating the assignment of treatment as "like random" around the index inclusion threshold (Lee and Lemieux, 2010).

4 Index Inclusion and Secondary Market Conditions

Our first set of tests examines whether loans in the LSTA 100 have discontinuously higher liquidity and institutional demand relative to loans just below the threshold. We estimate Model 1 with liquidity and demand dependent variables. The first dependent variable we explore is a commonly used liquidity measure: the bid-ask spread ($BidAsk$). Prior studies that examine the secondary loan market rely on this measures to proxy for liquidity-related transaction costs due to the absence of publicly available market-wide loan trading data (Wittenberg Moerman, 2009; Phillips, 2024). We also examine the loan price on the secondary loan market ($Price$) and the percentage of loans held by mutual funds ($MF_Holdings$) as

manipulations and is not a sustainable behavior in loan market.

the dependent variables.[28] Loan prices should increase following the index inclusion because of the lower liquidity costs and the higher demand of nonbank lenders for more liquid loans. Mutual fund holdings are an observable proxy for investor demand. Each dependent variable is measured as of the end of each week for all weeks occurring within the 90 days after each semi-annual rebalance.

Figure 3 plots each dependent variable by the LSTA 100 rank of the loan controlling for loan size, whether the borrower is public, the number of financial covenants and maturity. The X-axis reflects ranks above (below) the threshold to the right (left) of the vertical line at 0. Lines are fitted from quadratic local polynomial regressions. Each plot demonstrates a discontinuity around the index inclusion threshold, indicating that there is higher liquidity and institutional demand for loans in the LSTA 100 index. Specifically, we observe that loans just above the threshold have lower bid-ask spreads, higher prices, and greater mutual fund holdings.

We report the coefficients of the index inclusion treatment variable in Table 4. Across all specifications, we find evidence in favor of index inclusion increasing liquidity and institutional demand. In column (1), we find that index inclusion reduces bid-ask spread by 6.329 basis points, which represents 9% of the sample mean. In column (2), we find that index inclusion increases loan price by 1.013, representing 1% of the sample mean.[29] In column (3), we find that mutual fund ownership is 21.2 bps higher for index-included loans compared to those just below the inclusion threshold, which is 19% of the sample mean.[30] Overall, we report consistent and meaningful improvements in liquidity and institutional demand for loans included in the index relative to those that are not in the index.

[28]Loan prices are based on daily loan bid and ask quote data from Refinitiv. Evidence from prior work demonstrates that quotes are highly correlated to transaction prices by CLOs (Phillips, 2024). In Appendix B Table B1, we confirm that our results are robust to using realized transaction prices from CLO trades.

[29]In Appendix B Table B1 we use realized loan trading prices using equal-weighted and volume-weighted CLO trades. We find similar results.

[30]Our measurement of mutual fund holdings is below the amount reported in industry publications (10%). We require that mutual funds report the CUSIP to match the mutual fund portfolio data to our loan data. We concede that this will result in measurement error but are not aware of any reason to believe that the measurement error biases us in favor of finding a discontinuity around the threshold.

In Appendix B Figure B1, we present robustness analyses using alternative bandwidth selections of 30, 40, and the optimal bandwidth from the 'rdrobust' package following Calonico et al. (2014). In Panel A of Figure B1, we show that our secondary market results are robust to these alternative bandwidths, corroborating findings in our primary analyses.

5 Loan Renegotiations

In this section, we examine how nonbank lenders' demand for liquidity affects loan contracting. We posit that if borrowers benefit from the increase in loan liquidity due to their index inclusion, this should manifest in loan renegotiations that reduce the interest rate spread. Therefore, we expect to find that these interest-rate decreasing renegotiations occur more often for loans in the LSTA 100 index relative to those not included in the index.

5.1 Loan Renegotiation Probability

We test whether index inclusion increases the probability of borrower interest-rate-reducing loan renegotiations by using two dependent variables and employing Model 1. The two dependent variables are $Interest_Reduce$ and $\Delta InterestRate$. $Interest_Reduce$ is an indicator variable equal to one if a loan is renegotiated within the 90 days of a semi-annual rebalance and the renegotiation includes an interest rate reduction, and zero otherwise. $\Delta InterestRate$ is a continuous variable of the change in the interest rate of the loan between the day immediately following the semi-annual rebalance and the end of the 90-day period after the semi-annual rebalance. Thus, there is only one observation per loan per semi-annual rebalance period. Collectively, these dependent variables allow us to examine whether loans included in the index experience amendments that are interest rate reducing and the extent of the interest rate reduction.

Figure 4 presents the plots of interest-rate reducing amendments around the inclusion threshold. As we observe in Panel A, there is a discontinuity around the inclusion threshold, where the occurrence of interest rate reducing renegotiations is substantially higher for the index-included loans relative to the excluded loans. Panel B presents a similar picture with

respect to changes in the loan spread. Table 5 presents the multivariate results.[31] We find that loans in the LSTA 100 Index have a higher probability of being renegotiated during the 90-trading day period following the index rebalance. In terms of economic significance, column (1) shows that index-included loans have a 9.8% higher probability of experiencing an interest-rate reducing renegotiation, which represents 140% of the sample mean. This evidence suggests a significant difference in the occurrence of interest rate-reducing loan renegotiations between the loans just above and below the index threshold. The local average treatment effect size of 9.8 implies that the occurrence of interest rate-reducing renegotiations for the loans just above the index threshold is 11.9% and below the threshold is 2.1% based on the sample mean occurrence being approximately 7% of observations.[32] This constitutes a more than fivefold higher probability of index-included loans having interest rate-reducing renegotiations. Considering that the average basis point reduction for interest rate reducing renegotiations is 47 basis points, borrowers experience an average annual savings of $8.9 million (up to $43.2 million over the average remaining maturity) due to non-fundamental loan renegotiations associated with index inclusions.[33]

Furthermore, a back-of-the-envelope estimate suggests that borrowers who experience interest rate reducing renegotiation capture 65% of the benefits of index inclusion. We calculate the surplus as follows: in line with Flanagan (2023), who finds that bank loans are refinanced, on average, two years into a stated maturity of five years, we infer that the ratio of actual time-to-maturity (TTM) to the stated TTM is around 0.4. We apply this ratio to the stated TTM of renegotiated loans in our sample, yielding an estimated duration of 1.4 years. Using this duration approximation and our estimated increase in price from index inclusion of 1.013, we estimate the total yield decrease resulting from index inclusion

[31]In Appendix B Table B2 we add time fixed effects (each semi-annual rebalance) and find that our inferences are unchanged.

[32]This is calculated using a system of equations, where (a) the difference between the treated and untreated averages equals 9.8 (the LATE) and (b) the average of the treated and untreated averages is 7 (the sample average).

[33]The dollar savings estimate is based on an average loan size at the threshold of $1.9 billion and an average remaining maturity of 4.88 years.

as follows:

$$\Delta Yield = -\frac{\Delta Price}{\text{Duration}} = -\frac{1.013}{1.4} \approx -72.4 \text{ basis points.}$$

Since borrowers receive an average spread reduction of 47 basis points conditional on having a rate-reducing renegotiation, they capture about 65% of the total surplus (47 bps / 72.4 bps equals approximately 65%).

Finally, in column (2), we find that the average interest rate reduction for index-included loans is 4.509 bps larger, which is 140% of the sample average change in the interest rate. For the average loan in our sample, this constitutes the expected savings of index inclusion based on the average probability of experiencing a rate-reducing renegotiation and the average rate reduction. Overall, our evidence with respect to the likelihood of interest rate reducing renegotiations and the extent of the interest rate reduction is consistent with institutional investors sharing non-fundamental benefits with borrowers, leading to a reduction in the cost of financing charged to borrowers. In Appendix B Table B3, we also examine the likelihood of any non-interest-rate-reducing loan amendments and do not find that there is a discontinuity in the rate of these amendments. This reinforces our arguments that our findings are not attributed to changes in borrower's fundamentals as these changes should trigger note only rate reducing renegotiations but also these other renegotiations.

In supplementary analyses, we also examine the timing patterns for the cumulative renegotiation probability between the treatment and control loans. Specifically, we estimate the Kaplan-Meier cumulative survival probability curve as in Kaplan and Meier (1958).[34] This approach allows us to capture the timing dynamics of renegotiations and provides insights into the likelihood that the renegotiation timing differs between groups. A higher cumulative renegotiation probability for treated loans would allow us to conclude that index inclusion is associated with an increased probability of renegotiation occurring earlier for treated loans compared to loans just below the threshold. Figure 5 presents the result. The

[34]The Kaplan-Meier cumulative probability is a non-parametric estimator used to estimate the survival function from time-to-event data. In our context, it provides a stepwise estimate of the probability that a loan is renegotiated beyond a given time point.

treatment group (red line) includes loans added to the LSTA 100 index for the first time and the control group (blue line) includes the 50 loans below the index inclusion threshold at the time of each inclusion for the treatment loans. The shaded area represents the 90% confidence interval.

Panel A presents the plots of the analyses of the rate-reducing amendment. We document a drastic increase in the renegotiation probability after a loan's initial index inclusion, while the control loans have a more gradual cumulative renegotiation probability curve after each treatment loan's initial index inclusion. In particular, for loans newly included in the index, the likelihood of a rate-reducing amendment within the first 250 (500) trading days post-inclusion is 35.7% (71.4%) greater than that of loans falling below the inclusion threshold over the same period. We use these periods, which correspond to one and two year windows after initial index inclusion, because we do not have a basis for an expectation of the timing of renegotiations relative to this inclusion.[35] This analysis suggests that there is a considerable amount of interest rate-reducing renegotiation activity that occurs within the first one and two year period after initial inclusion. In Panel B, we presents the plots of the analyses of all other (non-rate-reducing) amendments. Importantly, we do not observe a contrasting pattern across treatment and control borrowers for these other amendments. This additional evidence further supports the credibility of index-inclusion as a cause for interest-rate reducing renegotiations, mitigating a concern that there are fundamental differences in loan amendments for loans included in versus excluded from the index.

5.2 Within Loan Package Analyses

To further support our inference that non-fundamental renegotiations lead to a decrease in the loan interest spread, we exploit variation within the loan deal (Ivashina and Sun, 2011). We identify treatment and control loans that are packaged in a deal with a revolving loan facility. We then examine the pricing of traded term loans relative to the pricing of revolving facilities in the same package, for term loans included in the index versus those

[35]This contrasts with our main analysis where we examine 90-day trading windows after semi-annual rebalances because we do not condition those analyses on new index inclusions.

that are not (i.e., 50 loans above and below the index inclusion threshold). If there is some contemporaneous fundamental shock to the borrower at the time of a loan's inclusion in the index that affects its cost of debt, it should affect the cost of debt of all loans in the same package and not just the term loan. In this case, we should not observe a change in the term loan–revolver price difference for traded versus non-traded loans. However, the change in the term loan–revolving facility interest rate difference would result from renegotiations that deferentially influence the interest rate of the traded loan versus that of the non-traded revolving facility, such as when traded loans benefit from the interest rate-reducing renegotiations due to their favorable secondary market conditions.

To examine the within loan package variation, we design dependent variables to capture the term loan–revolving facility interest rate difference. We first define $RateDiff$ as the interest rate difference between the traded loans and the revolving facility in the same deal. We then define $RateDiff_Reduce$ as an indicator variable equal to one if $RateDiff$ at the end of the 90-day window is lesser than the $RateDiff$ as of the day immediately following the semi-annual rebalancing and zero otherwise. $\Delta RateDiff$ measures the change in the $RateDiff$ at the end of the 90-day window compared to the day immediately following the semi-annual rebalance. We use $RateDiff_Reduce$ and $\Delta RateDiff$ as the dependent variables in the within loan package analyses. Figure 6 plots the frequency of interest-rate term loan reductions (relative to revolvers) for index-included borrowers around the inclusion threshold. In Panel A, we show that there is a discontinuity around the inclusion threshold, where the occurrence of interest rate reduction amendments for term loans relative to revolvers is substantially higher for the index-included borrowers relative to the excluded borrowers. Panel B presents a consistent results with respect to the changes in the loan spread.

Table 6 presents the multivariate analyses. In column (1), we find that the pricing difference between the traded term loan and the revolving facility in the same package is 7.7% more likely to be reduced for term loans included in the index relative to control borrowers' loans. The estimate of this differential rate reduction is about 5.092 bps as reported in column

(2), which reflects the expected savings of index inclusion based on the average probability of experiencing a rate-reducing renegotiation and the average rate reduction (incremental to any change in the revolving credit facility rate). These analyses provide powerful evidence that the effect of index inclusion on the cost of debt is specific to the loan actually affected by the inclusion and that there are no contemporaneous changes in borrower fundamentals that may lead to a spurious association.

To further support this inference, in columns (3) and (4) we test whether there is a higher probability of a reduction in a revolver interest rate and a larger magnitude of this reduction for packages that include traded loans just above the index inclusion threshold versus those just below. If borrowers with loans in the LSTA 100 index systematically experience more favorable changes in fundamentals, then we should observe a change in the probability and magnitude of interest rate-reducing renegotiations for the revolving facilities of the index-included borrowers. We test this by changing the dependent variable to $RevolverRate_Decrease$ and $\Delta RevolverRate$, which capture whether the borrower experiences a renegotiation that reduces their interest rate on their revolving credit facility and the amount of the interest rate change over the 90-day period post the semi-annual rebalance, respectively. In columns (3) and (4), we fail to find any evidence that this is the case. Overall, this provides further support for our conjecture that rate-reducing renegotiations for index-included loans are not attributable to changes in borrower fundamentals. Taken together, our analyses in Table 6 demonstrate that secondary market trading conditions have a causal effect on loan pricing through non-fundamental renegotiations.

In Appendix B, we present results using alternative bandwidth selections of 30, 40, and the optimal bandwidth from the 'rdrobust' package, consistent with our approach for the secondary market results. We report these results in Panel B of Figure B1. We find that our results are robust to these alternative specifications for both the interest rate-reducing loan renegotiation tests (e.g., Table 5) and the within-package tests (e.g., Table 6 columns (1) and (2)).

5.3 Other Contractual Term Amendments

Our analyses show that index-included loans are more likely to have interest rate-reducing renegotiations relative to loans just below the inclusion threshold. We next examine whether other loan terms are also more likely to be amended for index-included loans. If the loan renegotiations are not attributable to changes in fundamentals as we argue, we would not expect to see renegotiations for index-included loans to affect important non-price terms, such as the size and maturity.

We employ Model 1 and include two dependent variables that capture changes in these other terms of the loan. Table 7 reports the results. In column (1) the dependent variable is the change in the amount of the loan ($\Delta Size$). In column (2) the dependent variable is the change in loan maturity ($\Delta Maturity$). In column (3) the dependent variable is the change in the number of financial covenants ($\Delta N_Covenant$). Each dependent variable measures the difference in the amount between the day immediately following the semi-annual rebalance date and the end of the 90-day period after the rebalance. Consistent with our expectations, we do not find any discontinuous change in loan size, maturity or number of covenants for loans included in the index versus those that are not. Overall, these findings suggest that index-included loan renegotiations are interest rate-reducing, and these interest rate reductions are unlikely to be attributable to changes in fundamentals or in response to changes in other loan terms.

5.4 Placebo Tests

Our results so far provide support for the causal influence of non-fundamental liquidity shocks on borrowers' loan renegotiation and borrowing costs. To enhance the validity of our findings, we conduct a placebo test using an alternative index inclusion rank threshold of 50 instead of 100. Specifically, the treatment group includes the 50 loans above the placebo inclusion threshold (i.e., the largest 50 traded loans) and the control group includes the 50 loans below the placebo inclusion threshold (i.e., the next largest 50 traded loans). This allows us to rerun our main analyses using alternative index inclusion treatment to verify

that our results are not spurious or driven by some unknown factor correlated with the loan rank, loan liquidity, or interest rate-reducing amendments. We present the results of these analyses in Table 8 and include dependent variables from our main analyses, including Table 4, Table 5, and columns (1) and (2) of Table 6. Panel A presents the market-based tests and Panel B presents the renegotiation tests. Indeed, we find no discontinuity at the alternative rank threshold for any of the liquidity or renegotiation measures.

To further support our findings, we conduct an additional placebo test using the period prior to the introduction of the LSTA 100 index. The LSTA 100 was introduced in October 2008, so we use the period from 2001 to 2007 to create a hypothetical LSTA 100 index and identify loans that would qualify for semi-annual inclusion had the index existed. This procedure allows us to further strengthen our analyses using hypothetical semi-annual inclusions. Specifically, we do not expect to observe that our placebo treatment for semi-annual inclusions is (1) positively associated with loan liquidity, (2) positively related to renegotiation probability, or (3) negatively related to the change in interest rate due to loan renegotiation.

We reestimate our main analyses in Table 4, Table 5, and columns (1) and (2) of Table 6 and present the placebo results in Table 9. In columns (1) and (2) of Panel A, we observe that there are no changes in the bid-ask spread or the loan price following index inclusion. Please note that we are unable to examine mutual fund holdings because we do not have the holdings data for this period. These results are inconsistent with placebo inclusion loans experiencing any improvement in liquidity. In columns (1) to (4) of Panel B, we find no evidence of associations between hypothetical index inclusion and loan amendments or the magnitude of interest rate changes. Overall, the evidence from our placebo tests reinforces the validity of the LSTA 100 weekly index inclusion as a shock to secondary loan market conditions that prompts non-fundamental renegotiation.

5.5 Two-Stage Least-Squares (2SLS) Analyses

Our results independently show that index inclusion increases liquidity and interest rate-reducing renegotiations. We next directly link the liquidity improvement from index inclusion to renegotiation by estimating a two-stage least-squares (2SLS) regression. The method is commonly used in the index inclusion literature (e.g., Appel et al., 2016; Ben-David et al., 2018; Bretscher et al., 2023b). The detailed specification is as follows:

$$DependentVariable_{i,t} = \beta \widehat{SecondaryMarket}_{i,t} + f(Rank_{i,t}) + Controls_{i,t} + WeekFE + \epsilon_{i,t}$$

$$SecondaryMarket_{i,t} = \gamma \mathbb{1}_{Rank_{it}>=0} + f(Rank_{i,t}) + Controls_{i,t} + WeekFE + \eta_{i,t}$$

The treated and control groups are defined as in previous analyses. In the first stage, we use the index inclusion indicator $\mathbb{1}_{Rank_{i,t}\geq 0}$ as an instrument for secondary market trading conditions, including bid-ask spread, price, and mutual fund holdings. In the second stage, we regress renegotiation outcomes on the fitted secondary market variable from the first stage. In Appendix B, Table B4 and B5 report the results with dependent variables from our baseline analyses and within-deal test (Table 5 and 6). For both tables, Panel A shows the results for the second stage, while Panel B presents the corresponding first-stage results. The renegotiation outcome variables are defined the same as before. For columns (1) and (4), the secondary market variable is the bid-ask spread ($BidAsk$). For columns (2) and (5), it is the secondary market price ($Price$). For columns (3) and (6), it is mutual fund holdings ($MF_Holdings$). In both stages, we include week fixed effects and control for loan size, time to maturity, public firm status, and the number of financial covenants. Standard errors are clustered at the week level.

In both Table B4 and B5, F-statistics for the first stage for bid-ask spread and price are significantly above the critical value of 10 suggested by Stock and Yogo (2005), indicating these instruments are not weak. The F-statistics for mutual fund holdings is below the threshold, but we report the analysis for completeness.[36] The F-statistics are reported in

[36]As we noted earlier in this paper, the mutual fund holdings we are able to identify are measured with

Panel A. In the second stage of Table B4, the coefficients on instrumented secondary market conditions are significant and consistent with our previous analyses across all specifications, consistent with the direct link between the liquidity improvements resulting from index inclusion being responsible for the interest rate reducing renegotiations. Table B5 reports the second stage results of our within-package designs. We continue to find that the effect of index inclusion on the cost of debt is specific to the loan affected by the inclusion.

6 Mechanism Tests

6.1 Aggregate Credit Supply

Building on our causal evidence of the effect of secondary market liquidity on borrowing costs, we next test the mechanisms behind lenders' propensity to share liquidity cost savings with borrowers. We posit that the threat of refinancing compels lenders to share the cost-saving surplus with borrowers. In this section, we exploit the aggregate credit conditions and call protection periods to explore this mechanism.

Credit markets are highly procyclical and the phase of credit expansion is typically characterized by increased availability of credit, lower interest rates, and more lenient lending standards, making it easier for borrowers to obtain loans (e.g., Berger and Udell, 2004; Behn et al., 2016; Rodano et al., 2018). Thus, if refinancing risk is a reason why lenders share liquidity cost savings with borrowers, we should observe greater surplus sharing during times of credit expansion, because borrowers can more easily refinance and thus have greater bargaining power when negotiating with lenders during index-inclusion-related renegotiations.

We capture the aggregate institutional credit supply using two measures of institutional capital investment. $High_InstVolume$ is an indicator variable equal to one if the volume of quarterly institutional loans (i.e., loans that are structured for institutional investors, sourced from LoanConnector Database) is above the sample median and zero otherwise. This volume of institutional loans represents periods of high institutional investor demand

error and this is likely the cause for the weak instrument test failure.

and a potential overheating in the secondary loan market (Becker and Ivashina, 2016). $High_ChangeNonBank$ is equal to one if the quarterly change of non-financial corporate loans issued by nonbank institutions from U.S. Flow of Funds Accounts (OLALBSNNCB - Nonfinancial Corporate Business; Other Loans and Advances; Liability, Level) is above the sample median and zero otherwise. The higher values of this variable reflect higher institutional demand for private loans (Becker and Ivashina, 2014). We use model 1 and interact these measures with our treatment variable. Our first two dependent variables are an interest rate-reducing amendment indicator variable ($Interest_Reduce$) and the measure of the magnitude of the change in the interest rate ($\Delta InterestRate$), in line with the dependent variables we examine in Table 5. The last two dependent variables are related to our within package analyses and are an indicator if the traded term loan versus revolver interest rate difference is decreasing ($RateDiff_Reduce$) and the amount of the change in the rate of the traded loan versus the revolving facility ($\Delta RateDiff$), consistent with Table 6.

Table 10 presents the results. We find evidence consistent with our expectation that credit availability facilitates refinancing around the LSTA 100 index inclusion. We find in column (1) of both panels that there is a significant and positive association between the interaction term and interest rate-reducing amendments. We also find in column (2) of both panels that there is a more pronounced reduction in interest rate charged to the borrower during credit expansion periods. Columns (3) and (4) of both panels utilize our within loan package design and find supporting evidence that the effect of index inclusion on the interest rate reduction is more pronounced during periods of higher availability of institutional lending capital even when compared to changes in the revolving credit facility. Overall, these findings are consistent with lenders passing savings to borrowers associated with more favorable secondary market conditions through interest rate-reducing renegotiations primarily when the threat of refinancing is more pronounced.

6.2 Call Protection Periods

We next explore how call protection provisions shape the link between index inclusion and renegotiation outcomes. Call protection restricts borrowers' ability to refinance or prepay before maturity, effectively raising refinancing costs and weakening the borrower's threat to exit. If our core mechanism holds that borrowers negotiate more favorable terms primarily by threatening to refinance, then we should observe an attenuation—or neutralization—of these benefits when call protection is in effect.

Table 11 reports our findings. We modify Equation 1 by introducing an indicator variable, *Call_Protection*, which equals one if the loan remains within its call protection period 90 days after index inclusion.[37] We then interact $\mathbb{1}_{Rank_{i,t}\geq 0}$ (the treatment indicator) with *Call_Protection* to identify whether call protection diminishes the surplus-sharing effect of index inclusion.

The results in Columns (1) and (2) show that call protection largely neutralizes the benefits of index inclusion. In Column (1), the coefficient on $\mathbb{1}_{Rank_{i,t}\geq 0}$ indicates that loans above the index inclusion threshold are more likely to experience an interest rate-reducing amendment; however, this effect is offset by the negative interaction term $\mathbb{1}_{Rank_{i,t}\geq 0} \times Call_Protection$, with the sum of the coefficients being statistically insignificantly different than zero (untabulated p-value 0.48). In Column (2), we find a similar offsetting result where the sum of the coefficients are also statistically insignificantly different than zero (untabulated p-value 0.70).

Columns (3) and (4) reinforce this pattern using our within-loan-package measures of interest-rate differences between the traded term loan and the revolving credit facility. In Column (3), the positive coefficient on $\mathbb{1}_{Rank_{i,t}\geq 0}$ signifies a higher likelihood of reducing this spread among index-included loans; but again, the interaction term reverses the effect and the sum of the coefficients is not statistically different from zero (untabulated p-value 0.70).

[37] In our sample, 1,211 loans have call protection while 587 do not. Among the loans that have call protection, the median protection period is 182 days after origination, while the average is 231 days after origination. The median call price for the call protection is 101, and the average is 101.02. The call price represents the amount the borrower would have to pay the lenders (in terms of par) to settle the loan.

In column (4), we find a weaker offsetting result for the interaction term, but a negative interaction effect nonetheless.

Collectively, these results highlight that call protection effectively cancels out the surplus-sharing advantage conferred by index inclusion. This finding is consistent with our proposed mechanism: borrowers benefit from improved secondary market conditions only when they can credibly threaten to refinance. Once that option is restricted by call protection, lenders are less compelled to share the surplus, thereby neutralizing the benefits of index inclusion.

7 Conclusion

In this paper, we explore the non-fundamental forces affecting lenders and borrowers in the context of private commercial lending, a sector increasingly dominated by hedge funds, mutual funds, and collateralized lending vehicles. This study is rooted in the importance of renegotiations for efficient provision of private debt capital due to an incomplete nature of loan contracts Garleanu and Zwiebel (2008); Roberts and Sufi (2009b); Aghion and Bolton (1992). It also builds on increasingly relevant dynamics of the secondary loan market, which is critical for nonbank lenders who depend on it to meet the redemption demands of their fragile funding sources.

Leveraging novel data from the weekly rebalancing of the LSTA 100 Index, we observe that traded term loans just above the index inclusion threshold experience meaningfully lower bid-ask spreads, higher secondary market prices, and greater mutual fund holdings, relative to control loans that are just below the threshold required to be added to the index. These results are consistent with index inclusion causally improving the secondary market conditions of included loans through higher loan liquidity and greater nonbank lender demand. We next examine whether lenders share with borrowers the surplus associated with this non-fundamental improvement in the trading environment. We posit that if this is the case, we should observe a higher frequency of loan renegotiations that result in a reduction in the interest rate spread charged to the borrower for loans in the index versus those outside of

the index. Consistent with this prediction, we find a substantial increase in the probability of interest-reducing renegotiation for loans just above the index inclusion threshold versus those just below. Importantly, we find no evidence that other loan terms are modified in a way that explains the interest rate reduction. Various tests, including within the same loan package and placebo analyses, reinforce our evidence that the higher incidence of interest rate-reducing loan renegotiations is not attributable to changes in borrower fundamentals.

The evidence we provide advances our understanding of the multifaceted and intricate nature of loan renegotiations, which may be driven by non-fundamental forces unrelated to changes in borrower fundamentals or macroeconomic conditions, two primary determinants of renegotiations suggested by prior research (Roberts and Sufi, 2009b; Roberts, 2015; Roberts and Sufi, 2009a; Christensen et al., 2016). It also demonstrates the critical role of secondary market conditions for nonbank lenders, which funded the majority of leveraged loans over the last two decades (Aldasoro et al., 2022; Cordell et al., 2023). By highlighting the importance of non-fundamental investor demand in determining the cost of loan financing and loan renegotiation, we also add to the growing literature on investor demand and the impact of index membership.

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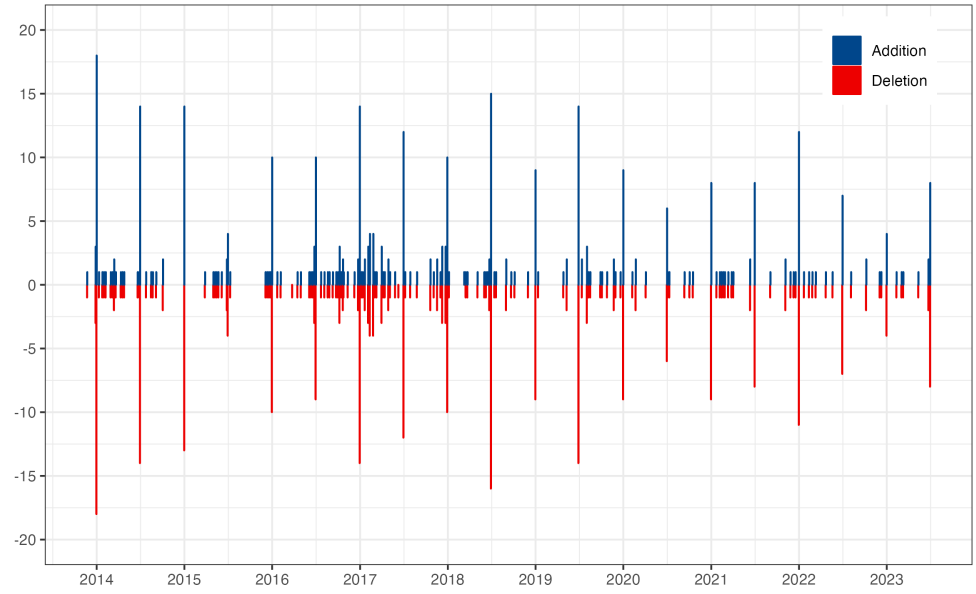
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Panel A: Inclusions and Exclusions Over Time



Panel B: Index Weights Around the Index Inclusion Threshold

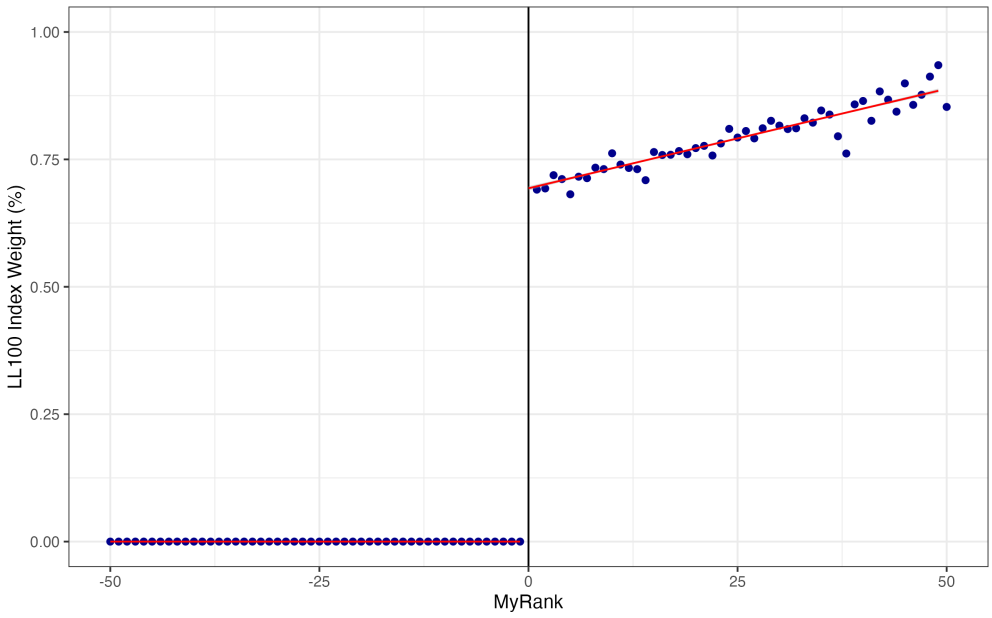


Figure 1: LSTA 100 Index

Figure A plots the LSTA 100 index inclusions and exclusions over our sample period. Figure B plots the weight of the LSTA 100 index constituents based on the par value rank. The rank of 0 represents the 100th ranked loan.

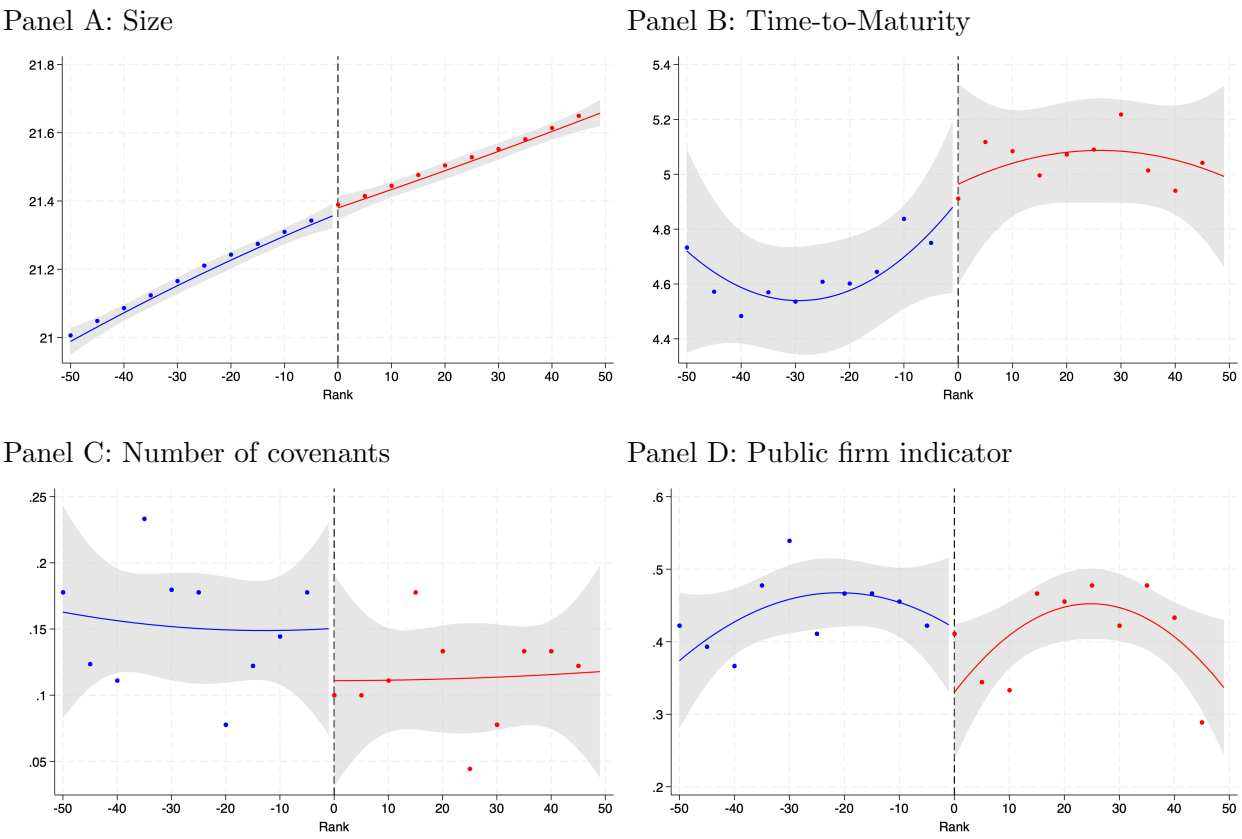
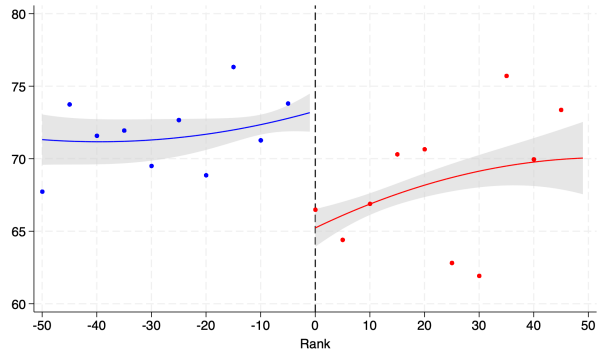


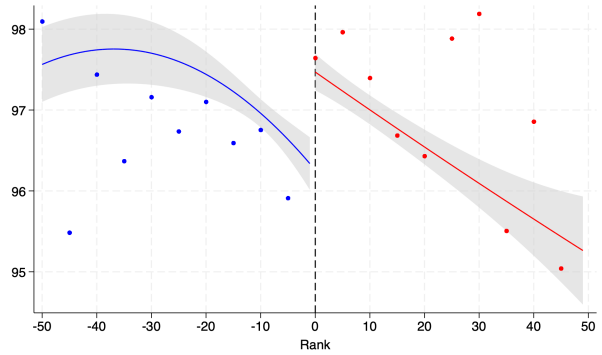
Figure 2: Loan Characteristics around the Index Inclusion Threshold

This figure reports loan characteristics around the LSTA 100 index inclusion threshold. The vertical line denotes the 100th rank. Index included loans are to the right of the vertical line and loans below the threshold are to the left of the vertical line. From Panel A to D, the Y-axis represents the loan size (*Size*), time-to-maturity (*Maturity*), number of covenants (*N_Covenant*), and indicator variable that equals to one if the borrower is a public company (*Public*). The shaded area represents the 95% confidence interval.

Panel A: Bid-Ask Spread



Panel B: Price



Panel C: Mutual Fund Holdings

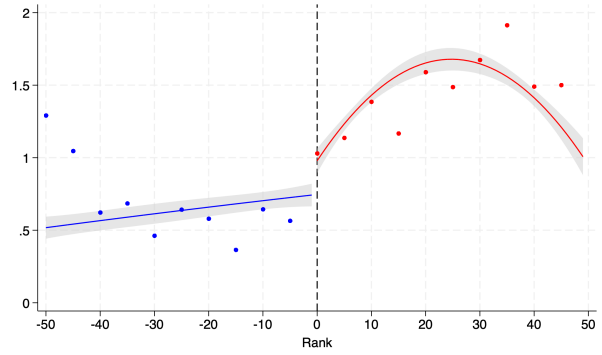
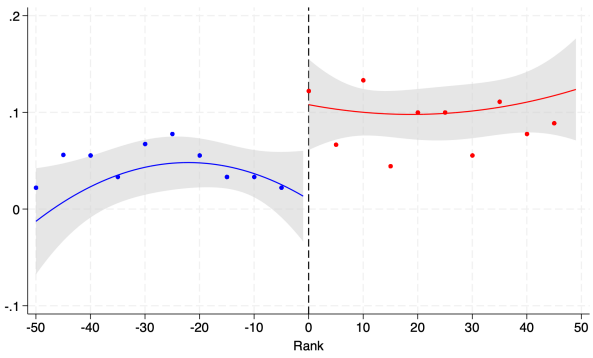


Figure 3: Loan Trading Attributes around the Index Inclusion Threshold

This figure reports loan trading attributes around the LSTA 100 index inclusion threshold. The vertical line denotes the 100th rank. Index included loans are to the right of the vertical line and loans below the threshold are to the left of the vertical line. The lines are fitted after controlling for loan size, time-to-maturity, public firm indicator, and the number of financial covenants. In Panel A the Y-axis represents the bid-ask spread ($BidAsk$). In Panel B the Y-axis represents the secondary market price ($Price$). In Panel C the Y-axis represents the level of mutual fund holdings of the loan ($MF_Holdings$). The shaded area represents the 95% confidence interval.

Panel A: Rate Reducing Amendment



Panel B: Rate Changes

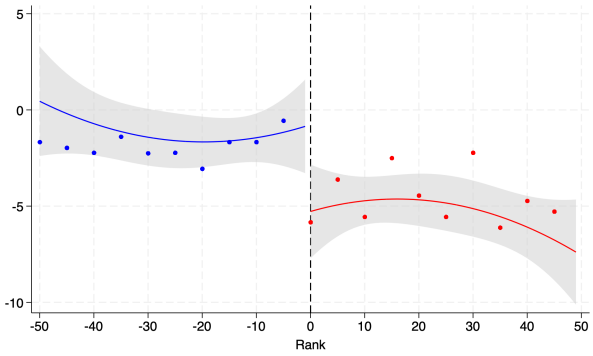
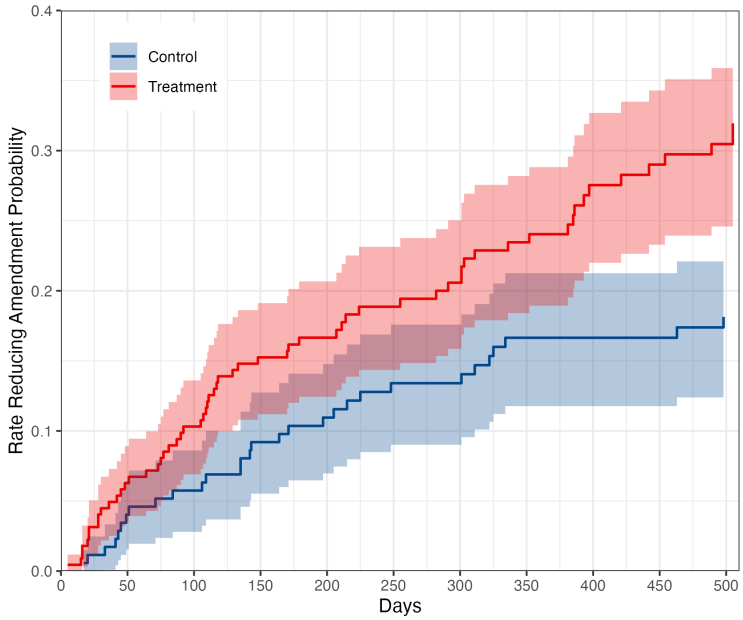


Figure 4: Loan Amendments around the Index Inclusion Cutoff

This figure reports loan renegotiation rates and amounts around the LSTA 100 index inclusion threshold. The vertical line denotes the 100th rank. Index included loans are to the right of the vertical line and loans below the threshold are to the left of the vertical line. The lines are fitted after controlling for loan size, time-to-maturity, public firm indicator, and the number of financial covenants. In Panel A the Y-axis represents whether the loan has an interest rate reducing amendment in the 90 day period following the semi-annual rebalance ($Interest_Reduce$). In Panel B the Y-axis represents the change in the interest rate over the 90-day period after the semi-annual rebalance ($\Delta InterestRate$). The shaded area represents the 95% confidence interval.

Panel A: Interest Rate-Reducing Amendment



Panel B: Other Amendment

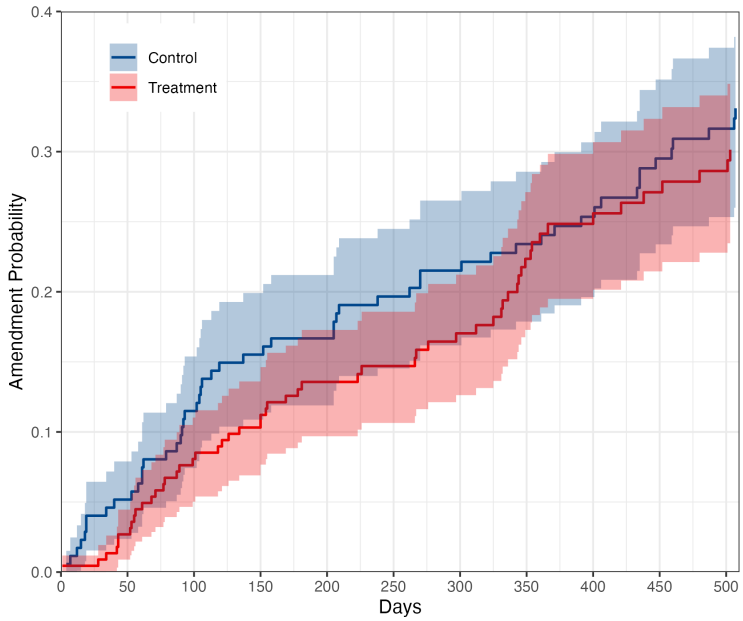
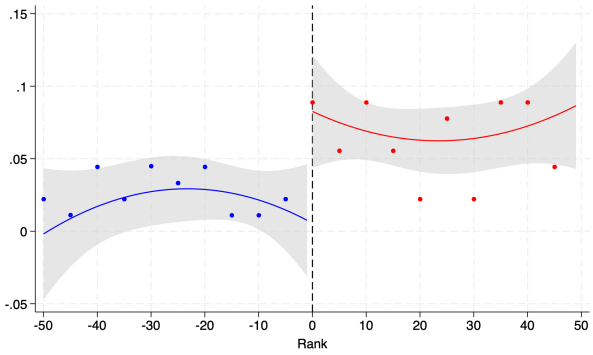


Figure 5: Survival Analysis

The figure plots the Kaplan-Meier cumulative renegotiation probability curve between the treatment and control groups. Panel A shows the results for rate-reducing renegotiation and panel B presents the results for all other renegotiation. The treatment group (red line) includes loans added to the LSTA 100 index for the first time. The control group (blue line) includes the 50 loans below the index inclusion threshold at the time of each inclusion for the treatment loans. The shaded area represents the 90% confidence interval.

Panel A: RateDiff Reducing Amendment



Panel B: RateDiff Change

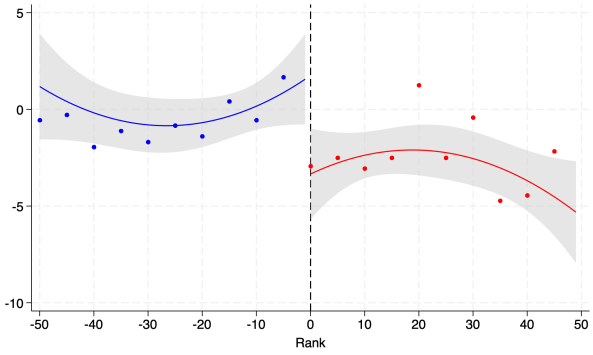


Figure 6: Within-Deal Loan Rate Differences around the Index Inclusion Cutoff

This figure reports changes in the interest rate of traded loans with non-traded revolving credit facilities of the same borrower around the LSTA 100 index inclusion threshold. The vertical line denotes the 100th rank. Index included loans are to the right of the vertical line and loans below the threshold are to the left of the vertical line. The lines are fitted after controlling for loan size, time-to-maturity, public firm indicator, and the number of financial covenants. In Panel A the Y-axis represents whether the rate difference between the traded loan and revolving credit facility of the loan package decreases over the 90-day period after the semi-annual rebalance and zero otherwise. In Panel B the Y-axis represents the rate change difference between the traded loan and the revolving credit facility over the 90-day period after the semi-annual rebalance. The shaded area represents the 95% confidence interval.

Table 1: Summary Statistics

This table reports descriptive statistics for the sample, which includes the 50 loans above and below the inclusion threshold as of each semi-annual rebalance date. All variables are defined in Appendix A.

	N	Mean	Std	P25	Median	P75
$BidAsk$	33650	70.00	47.63	41.66	52.50	81.26
$Price$	33650	96.86	8.00	97.65	99.53	100.27
$MF_Holdings$	7516	1.14	1.21	0.11	0.75	1.85
$InterestRate$	1798	316.21	104.60	250.00	300.00	375.00
$Size$	1798	21.35	0.24	21.18	21.36	21.53
$Maturity$	1798	4.84	1.41	3.84	4.97	5.94
$N_Covenants$	1798	0.13	0.43	0.00	0.00	0.00
$Public$	1798	0.43	0.49	0.00	0.00	1.00
$Interest_Reduce$	1798	0.07	0.25	0.00	0.00	0.00
$\Delta InterestRate$	1798	-3.23	13.06	0.00	0.00	0.00
$RateDiff_Reduce$	1798	0.05	0.21	0.00	0.00	0.00
$\Delta RateDiff$	1798	-1.51	12.54	0.00	0.00	0.00
$RevolverRate_Decrease$	1798	0.02	0.14	0.00	0.00	0.00
$\Delta RevolverRate$	1798	-0.78	24.75	0.00	0.00	0.00
$High_InstVolume$	1798	0.56	0.50	0.00	1.00	1.00
$High_ChangeNonBank$	1798	0.50	0.50	0.00	0.00	1.00
$Call_Protection$	1798	0.11	0.31	0.00	0.00	0.00

Table 2: Loan Properties Around the Index Inclusion Threshold

This table examines whether there are discontinuities in observable loan terms for loans above versus below the index inclusion threshold. Any observable loan term discontinuities would violate the assumptions of 'like random' treatment assignment for loans around the index inclusion threshold. We estimate the following model:

$$DependentVariable_{i,t} = \beta \mathbb{1}_{Rank_{i,t}>=0} + f(Rank_{i,t}) + \epsilon_{i,t}$$

The treated group of the sample includes the fifty loans just above the index inclusion threshold and that have not been excluded in the 90-day window after the index inclusion. The control group of the sample includes the fifty loans just below the index inclusion threshold and that have not been included in or excluded from the index in the 90-day window after the index rebalance. $Rank_{i,t}$ is the par-value rank as of each semi-annual rebalance date. The rank variable is centered around the inclusion threshold by subtracting 50 from each rank. $\mathbb{1}_{Rank_{i,t}\geq 0}$ is equal to one if the loan is above the loan inclusion cutoff (i.e., a treated loan) and zero otherwise. $f(Rank_{i,t})$ is a function of the loan ranking in each semiannual rebalancing, with an order of 2, defined based on the next trading day after the semiannual rebalancing. The quadratic terms of $Rank_{i,t}$ are interacted with $\mathbb{1}_{Rank_{i,t}\geq 0}$ to fit a local polynomial both above and below the index inclusion threshold. In Column (1) the dependent variable is the loan size ($Size$). In Column (2) the dependent variable is the loan maturity ($Maturity$). Each dependent variable is measured as of the day immediately following the semi-annual rebalance date. Standard errors are clustered at the rebalance level and are presented in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	$Size$	$Maturity$	$N_Covenant$	$Public$
	(1)	(2)	(3)	(4)
$\mathbb{1}_{Rank_{it}>=0}$	0.018	0.059	-0.035	-0.088
	(0.051)	(0.167)	(0.067)	(0.062)
$Rank \times \mathbb{1}_{Rank_{it}>=0}$	Yes	Yes	Yes	Yes
$Rank^2 \times \mathbb{1}_{Rank_{it}>=0}$	Yes	Yes	Yes	Yes
Observations	1,798	1,798	1,798	1,798
Adjusted R^2	0.625	0.022	−0.001	0.002

Table 3: Size Manipulation Test

This table examines whether borrowers and lenders of loans above the index inclusion threshold are more likely to engage in size-increasing renegotiations prior to the semi-annual rebalance. The purpose of this test is to examine whether lenders and borrowers manipulate the size of the loan to increase the probability of being included in the index and violate the RDD assumption of lenders' and borrowers' imprecise ability to influence treatment. We estimate the following model:

$$DependentVariable_{i,t} = \beta \mathbb{1}_{Rank_{it}>=0} + f(Rank_{i,t}) + Controls_{i,t} + \epsilon_{i,t}$$

The treated group of the sample includes the fifty loans just above the index inclusion threshold and that have not been excluded in the 90-day window after the index inclusion. The control group of the sample includes the fifty loans just below the index inclusion threshold and that have not been included in or excluded from the index in the 90-day window after the index rebalance. The sample is restricted to the 30 days prior to each index rebalance. $Rank_{i,t}$ is the par-value rank as of each semi-annual rebalance date. The rank variable is centered around the inclusion threshold by subtracting 50 from each rank. $\mathbb{1}_{Rank_{i,t}\geq 0}$ is equal to one if the loan is above the loan inclusion cutoff (i.e., a treated loan) and zero otherwise. $f(Rank_{i,t})$ is a function of the loan ranking in each semiannual rebalancing, with an order of 2, defined based on the next trading day after the semiannual rebalancing. The quadratic terms of $Rank_{i,t}$ are interacted with $\mathbb{1}_{Rank_{i,t}\geq 0}$ to fit a local polynomial both above and below the index inclusion threshold. In Column (1) the dependent variable is equal to one if there is a size increasing loan renegotiation in the 30 days prior to an index rebalance ($SizeIncrease$). In Column (2) the dependent variable is the magnitude of the change in the size of the loan from the beginning of the 30 day period prior to the rebalance to the rebalance date ($\Delta Size$). Control variables include loan size, time-to-maturity, public firm indicator, and the number of financial covenants. Standard errors are clustered at the rebalance level and are presented in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	$SizeIncrease$	$\Delta Size$
	(1)	(2)
$\mathbb{1}_{Rank_{it}>=0}$	−0.004	−0.009
	(0.005)	(0.014)
$Rank \times \mathbb{1}_{Rank_{it}>=0}$	Yes	Yes
$Rank^2 \times \mathbb{1}_{Rank_{it}>=0}$	Yes	Yes
Controls	Yes	Yes
Observations	1,756	1,756
Adjusted R^2	−0.001	0.006

Table 4: The Effect of Index Inclusion on Loan Trading Attributes

This table examines whether loans above the index inclusion threshold have discontinuously higher liquidity and institutional demand relative to loans just below the threshold. We estimate the following model:

$$DependentVariable_{i,t} = \beta \mathbb{1}_{Rank_{it}>=0} + f(Rank_{i,t}) + Controls_{i,t} + WeekFE + \epsilon_{i,t}$$

The treated group of the sample includes the fifty loans just above the index inclusion threshold and that have not been excluded in the 90-day window after the index inclusion. The control group of the sample includes the fifty loans just below the index inclusion threshold and that have not been included in or excluded from the index in the 90-day window after the index rebalance. $Rank_{i,t}$ is the par-value rank as of each semi-annual rebalance date. The rank variable is centered around the inclusion threshold by subtracting 50 from each rank. $\mathbb{1}_{Rank_{i,t}\geq 0}$ is equal to one if the loan is above the loan inclusion cutoff (i.e., a treated loan) and zero otherwise. $f(Rank_{i,t})$ is a function of the loan ranking in each semiannual rebalancing, with an order of 2, defined based on the next trading day after the semiannual rebalancing. The quadratic terms of $Rank_{i,t}$ are interacted with $\mathbb{1}_{Rank_{i,t}\geq 0}$ to fit a local polynomial both above and below the index inclusion threshold. In Column (1) the dependent variable is the bid-ask spread ($BidAsk$). In Column (2) the dependent variable is the secondary market price ($Price$). In Column (3) the dependent variable is the level of mutual fund holdings of the loan ($MF_Holdings$). All columns include week fixed effects and controls. Control variables include loan size, time-to-maturity, public firm indicator, and the number of financial covenants. Standard errors are clustered at the week level and are presented in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	$BidAsk$	$Price$	$MF_Holdings$
	(1)	(2)	(3)
$\mathbb{1}_{Rank_{it}>=0}$	-6.329^{***}	1.013^{***}	0.212^{***}
	(0.955)	(0.194)	(0.072)
$Rank \times \mathbb{1}_{Rank_{it}>=0}$	Yes	Yes	Yes
$Rank^2 \times \mathbb{1}_{Rank_{it}>=0}$	Yes	Yes	Yes
Controls	Yes	Yes	Yes
Week FE	Yes	Yes	Yes
Observations	33,650	33,650	7,516
Adjusted R^2	0.492	0.123	0.161

Table 5: The Effect of Index Inclusion on Loan Renegotiation Outcomes

This table examines whether index inclusion increases the probability of interest-rate-reducing loan renegotiations. We estimate the following model:

$$DependentVariable_{i,t} = \beta \mathbb{1}_{Rank_{it}>=0} + f(Rank_{i,t}) + Controls_{i,t} + \epsilon_{i,t}$$

The treated group of the sample includes the fifty loans just above the index inclusion threshold and that have not been excluded in the 90-day window after the index inclusion. The control group of the sample includes the fifty loans just below the index inclusion threshold and that have not been included in or excluded from the index in the 90-day window after the index rebalance. $Rank_{i,t}$ is the par-value rank as of each semi-annual rebalance date. The rank variable is centered around the inclusion threshold by subtracting 50 from each rank. $\mathbb{1}_{Rank_{i,t}\geq 0}$ is equal to one if the loan is above the loan inclusion cutoff (i.e., a treated loan) and zero otherwise. $f(Rank_{i,t})$ is a function of the loan ranking in each semiannual rebalancing, with an order of 2, defined based on the next trading day after the semiannual rebalancing. The quadratic terms of $Rank_{i,t}$ are interacted with $\mathbb{1}_{Rank_{i,t}\geq 0}$ to fit a local polynomial both above and below the index inclusion threshold. In Column (1) the dependent variable is equal to one if the loan has an interest rate reducing amendment in the 90 day period following the semi-annual rebalance ($Interest_Reduce$). In Column (2) the dependent variable is the change in the interest rate over the 90-day period after the semi-annual rebalance ($\Delta InterestRate$). Control variables include loan size, time-to-maturity, public firm indicator, and the number of financial covenants. Standard errors are clustered at the rebalance level and are presented in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	$Interest_Reduce$	$\Delta InterestRate$
	(1)	(2)
$\mathbb{1}_{Rank_{it}>=0}$	0.098**	−4.509**
	(0.040)	(1.769)
$Rank \times \mathbb{1}_{Rank_{it}>=0}$	Yes	Yes
$Rank^2 \times \mathbb{1}_{Rank_{it}>=0}$	Yes	Yes
Controls	Yes	Yes
Observations	1,798	1,798
Adjusted R^2	0.024	0.026

Table 6: Within Deal Test

This table examines whether index inclusion affects interest rate reducing renegotiations by comparing changes in the interest rate of traded loans with non-traded revolving credit facilities of the same borrower. If the renegotiations are attributable to the index inclusion of traded loans, then we should not also observe changes in the interest rate for revolving credit facilities that are not in the index. We estimate the following model:

$$DependentVariable_{i,t} = \beta \mathbb{1}_{Rank_{it}>=0} + f(Rank_{i,t}) + Controls_{i,t} + \epsilon_{i,t}$$

The treated group of the sample includes the fifty loans just above the index inclusion threshold and that have not been excluded in the 90-day window after the index inclusion. The control group of the sample includes the fifty loans just below the index inclusion threshold and that have not been included in or excluded from the index in the 90-day window after the index rebalance. $Rank_{i,t}$ is the par-value rank as of each semi-annual rebalance date. The rank variable is centered around the inclusion threshold by subtracting 50 from each rank. $\mathbb{1}_{Rank_{i,t}\geq 0}$ is equal to one if the loan is above the loan inclusion cutoff (i.e., a treated loan) and zero otherwise. $f(Rank_{i,t})$ is a function of the loan ranking in each semiannual rebalancing, with an order of 2, defined based on the next trading day after the semiannual rebalancing. The quadratic terms of $Rank_{i,t}$ are interacted with $\mathbb{1}_{Rank_{i,t}\geq 0}$ to fit a local polynomial both above and below the index inclusion threshold. We define $RateDiff$ as the interest rate difference between the treated loan and the revolver tranche of the same deal. Specifically, $RateDiff_{i,t} = InterestRate_{i,t} - RevolverRate_{i,t}$. In Column (1) the dependent variable is equal to one if the $RateDiff_{i,t}$ decreases over the 90 day period after the semi-annual rebalance and zero otherwise. In Column (2) the dependent variable is amount of the rate change difference over the 90-day period after the semi-annual rebalance. In Column (3) the dependent variable is equal to one if the $RevolverRate_{i,t}$ decreases over the 90 day period after the semi-annual rebalance and zero otherwise. In Column (4) the dependent variable is the change in the revolver rate over the 90-day period after the semi-annual rebalance. Control variables include loan size, time-to-maturity, public firm indicator, and the number of financial covenants. Standard errors clustered at the rebalance level are presented in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10%, respectively.

	$RateDiff_Reduce$	$\Delta RateDiff$	$RevolverRate_Decrease$	$\Delta RevolverRate$
	(1)	(2)	(3)	(4)
$\mathbb{1}_{Rank_{it}>=0}$	0.077**	−5.092***	0.016	−1.297
	(0.033)	(1.717)	(0.020)	(3.245)
$Rank \times \mathbb{1}_{Rank_{it}>=0}$	Yes	Yes	Yes	Yes
$Rank^2 \times \mathbb{1}_{Rank_{it}>=0}$	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
Observations	1,798	1,798	1,798	1,798
Adjusted R^2	0.018	0.023	−0.001	−0.001

Table 7: The Effect of Index Inclusion on Other Loan Renegotiation Outcomes

This table examines whether renegotiations for index-included loans affect non-price terms. If index-included loan renegotiations also affect non-price terms, then the renegotiations are likely attributable to fundamental changes in the borrower. We estimate the following model:

$$DependentVariable_{i,t} = \beta \mathbb{1}_{Rank_{it}>=0} + f(Rank_{i,t}) + Controls_{i,t} + \epsilon_{i,t}$$

The treated group of the sample includes the fifty loans just above the index inclusion threshold and that have not been excluded in the 90-day window after the index inclusion. The control group of the sample includes the fifty loans just below the index inclusion threshold and that have not been included in or excluded from the index in the 90-day window after the index rebalance. $Rank_{i,t}$ is the par-value rank as of each semi-annual rebalance date. The rank variable is centered around the inclusion threshold by subtracting 50 from each rank. $\mathbb{1}_{Rank_{i,t}\geq 0}$ is equal to one if the loan is above the loan inclusion cutoff (i.e., a treated loan) and zero otherwise. $f(Rank_{i,t})$ is a function of the loan ranking in each semiannual rebalancing, with an order of 2, defined based on the next trading day after the semiannual rebalancing. The quadratic terms of $Rank_{i,t}$ are interacted with $\mathbb{1}_{Rank_{i,t}\geq 0}$ to fit a local polynomial both above and below the index inclusion threshold. In Column (1) the dependent variable is the change in loan size over the 90-day period after the semi-annual rebalance ($\Delta Size$). In Column (2) the dependent variable is the change in loan maturity over the 90-day period after the semi-annual rebalance ($\Delta Maturity$). Control variables include loan size, time-to-maturity, public firm indicator, and the number of financial covenants. Standard errors clustered at the rebalance level are presented in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10%, respectively.

	$\Delta Size$	$\Delta Maturity$	$\Delta N_Covenant$
	(1)	(2)	(3)
$\mathbb{1}_{Rank_{it}>=0}$	0.003	0.020	0.005
	(0.015)	(0.024)	(0.005)
$Rank \times \mathbb{1}_{Rank_{it}>=0}$	Yes	Yes	Yes
$Rank^2 \times \mathbb{1}_{Rank_{it}>=0}$	Yes	Yes	Yes
Controls	Yes	Yes	Yes
Observations	1,798	1,798	1,798
Adjusted R^2	0.022	0.001	0.001

Table 8: Placebo Analysis Using Alternative Index Inclusion Threshold

This table reports the results of the placebo analyses of the effect of index inclusion on loan trading attributes and renegotiation outcomes. We estimate the following model:

$$DependentVariable_{i,t} = \beta \mathbb{1}_{RankPlacebo_{it}} + f(RankPlacebo_{i,t}) + Controls_{i,t} + WeekFE + \epsilon_{i,t}$$

The treated group of the sample includes the fifty loans just above the placebo index inclusion threshold and that would not have not been excluded in the 90-day window after the placebo index inclusion. The control group of the sample includes the fifty loans just below the placebo index inclusion threshold and that would not have not been included in or excluded from the index in the 90-day window after the index rebalance. $RankPlacebo_{i,t}$ is the par-value rank as of each semi-annual rebalance date. The rank variable is centered around the placebo inclusion threshold by subtracting 50 from each rank. $\mathbb{1}_{RankPlacebo_{i,t} \geq 0}$ is equal to one if the loan is above the placebo loan inclusion cutoff which is rank 50 (i.e., a treated loan) and zero otherwise. $f(RankPlacebo_{i,t})$ is a function of the loan ranking in each semiannual rebalancing, with an order of 2, defined based on the next trading day after the semiannual rebalancing. The quadratic terms of $RankPlacebo_{i,t}$ are interacted with $\mathbb{1}_{RankPlacebo_{i,t} \geq 0}$ to fit a local polynomial both above and below the index inclusion threshold. Panel A reports the market tests. In Panel A Column (1) the dependent variable is the bid-ask spread ($BidAsk$). In Panel A Column (2) the dependent variable is the secondary market price ($Price$). In Panel A Column (3) the dependent variable is the level of mutual fund holdings of the loan ($MF_Holdings$). Panel B reports the renegotiation tests. In Panel B Column (1) the dependent variable is equal to one if the loan has an interest rate reducing amendment in the 90 day period following the semi-annual rebalance ($Interest_Reduce$). In Panel B Column (2) the dependent variable is the change in the interest rate over the 90-day period after the semi-annual rebalance ($\Delta InterestRate$). In Panel B Column (3) the dependent variable is equal to one if the rate difference between the traded loan and revolving credit facility of the loan package decreases over the 90 day period after the semi-annual rebalance and zero otherwise. In Panel B Column (4) the dependent variable is amount of the rate change difference between the traded loan and the revolving credit facility over the 90-day period after the semi-annual rebalance. Panel A includes week fixed effects. Both panels control for loan size, time-to-maturity, public firm indicator, and the number of financial covenants. Standard errors clustered at the week level for the market-based tests and at the rebalance level for the contracting tests are presented in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10%, respectively.

Panel A: Market			
	$BidAsk$	$Price$	$MF_Holdings$
	(1)	(2)	(3)
$\mathbb{1}_{Rank_{it}>=0}$	4.902	−1.000	0.063
	(6.172)	(1.677)	(0.292)
$Rank \times \mathbb{1}_{Rank_{it}>=0}$	Yes	Yes	Yes
$Rank^2 \times \mathbb{1}_{Rank_{it}>=0}$	Yes	Yes	Yes
Controls	Yes	Yes	Yes
Week FE	Yes	Yes	Yes
Observations	33,621	33,621	9,383
Adjusted R^2	0.527	0.157	0.143
Panel B: Amendment			
	$Interest_Reduce$	$\Delta InterestRate$	$RateDiff_Reduce$	$\Delta RateDiff$
	(1)	(2)	(3)	(4)
$\mathbb{1}_{Rank_{it}>=0}$	0.004	−0.493	0.015	−0.837
	(0.036)	(2.101)	(0.031)	(1.995)
$Rank \times \mathbb{1}_{Rank_{it}>=0}$	Yes	Yes	Yes	Yes
$Rank^2 \times \mathbb{1}_{Rank_{it}>=0}$	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
Observations	1,772	1,772	1,772	1,772
Adjusted R^2	0.012	0.013	0.006	0.013

Table 9: Placebo Analysis Using Pre-Index Sample

This table reports the results of the placebo analyses of the effect of index inclusion on loan trading attributes and renegotiation outcomes. In this case, we simulate the LSTA 100 index *prior* to the establishment of the index. We rank each loan based on their par value size to simiulate their rank as if the LSTA 100 index been active. We estimate the following model:

$$DependentVariable_{i,t} = \beta \mathbb{1}_{RankPlaceboPre_{it}} + f(RankPlaceboPre_{i,t}) + Controls_{i,t} + WeekFE + \epsilon_{i,t}$$

The treated group of the sample includes the fifty loans just above the placebo index inclusion threshold and that would not have not been excluded in the 90-day window after the placebo index inclusion. The control group of the sample includes the fifty loans just below the placebo index inclusion threshold and that would not have not been included in or excluded from the index in the 90-day window after the index rebalance. $RankPlaceboPre_{i,t}$ is the par-value rank as of each semi-annual rebalance date. The rank variable is centered around the placebo inclusion threshold by subtracting 50 from each rank. $\mathbb{1}_{RankPlaceboPre_{i,t} \geq 0}$ is equal to one if the loan is above the placebo loan inclusion cutoff which is rank 100 (i.e., a treated loan) and zero otherwise. $f(RankPlaceboPre_{i,t})$ is a function of the loan ranking in each semiannual rebalancing, with an order of 2, defined based on the next trading day after the semiannual rebalancing. The quadratic terms of $RankPlaceboPre_{i,t}$ are interacted with $\mathbb{1}_{RankPlaceboPre_{i,t} \geq 0}$ to fit a local polynomial both above and below the index inclusion threshold. Panel A reports the market tests. In Panel A Column (1) the dependent variable is the bid-ask spread ($BidAsk$). In Panel A Column (2) the dependent variable is the secondary market price ($Price$). Panel B reports the renegotiation tests. In Panel B Column (1) the dependent variable is equal to one if the loan has an interest rate reducing amendment in the 90 day period following the semi-annual rebalance ($Interest_Reduce$). In Panel B Column (2) the dependent variable is the change in the interest rate over the 90-day period after the semi-annual rebalance ($\Delta InterestRate$). In Panel B Column (3) the dependent variable is equal to one if the rate difference between the traded loan and revolving credit facility of the loan package decreases over the 90-day period after the semi-annual rebalance and zero otherwise. In Panel B Column (4) the dependent variable is amount of the rate change difference between the traded loan and the revolving credit facility over the 90-day period after the semi-annual rebalance. Panel A includes week fixed effects. Both panels control for loan size, time-to-maturity, public firm indicator, and the number of financial covenants. Standard errors clustered at the week level for the market-based tests and at the rebalance level for the contracting tests are presented in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10%, respectively.

Panel A: Market

	BidAsk	*Price*
	(1)	(2)
$\mathbb{1}_{Rank_{it}>=0}$	1.902	0.324
	(5.724)	(0.303)
$Rank \times \mathbb{1}_{Rank_{it}>=0}$	Yes	Yes
$Rank^2 \times \mathbb{1}_{Rank_{it}>=0}$	Yes	Yes
Controls	Yes	Yes
Week FE	Yes	Yes
Observations	17,741	17,741
Adjusted R^2	0.223	0.162

Panel B: Amendment

	Interest_Reduce	$\Delta InterestRate$	*RateDiff_Reduce*	$\Delta RateDiff$
	(1)	(2)	(3)	(4)
$\mathbb{1}_{Rank_{it}>=0}$	0.005	−0.701	0.000	0.000
	(0.004)	(0.494)	(0.000)	(0.000)
$Rank \times \mathbb{1}_{Rank_{it}>=0}$	Yes	Yes	Yes	Yes
$Rank^2 \times \mathbb{1}_{Rank_{it}>=0}$	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
Observations	1,540	1,540	1,540	1,540
Adjusted R^2	−0.001	−0.004	−0.006	−0.007

Table 10: Mechanism Tests Using Aggregate Credit Conditions

This table examines whether aggregate credit conditions affect the association between index inclusion and renegotiation outcomes. If interest rate-reducing loan renegotiations are attributable to the liquidity supply effects of index inclusion, then we would expect that the association would be higher when there are favorable institutional credit investment conditions. We estimate the following model:

$$DependentVariable_{i,t} = \beta \mathbb{1}_{Rank_{it}>=0} \times CreditConditions + f(Rank_{i,t}) + Controls_{i,t} + \epsilon_{i,t}$$

The treated group of the sample includes the fifty loans just above the index inclusion threshold and that have not been excluded in the 90-day window after the index inclusion. The control group of the sample includes the fifty loans just below the index inclusion threshold and that have not been included in or excluded from the index in the 90-day window after the index rebalance. $Rank_{i,t}$ is the par-value rank as of each semi-annual rebalance date. The rank variable is centered around the inclusion threshold by subtracting 50 from each rank. $\mathbb{1}_{Rank_{i,t}\geq 0}$ is equal to one if the loan is above the loan inclusion cutoff (i.e., a treated loan) and zero otherwise. $f(Rank_{i,t})$ is a function of the loan ranking in each semiannual rebalancing, with an order of 2, defined based on the next trading day after the semiannual rebalancing. The quadratic terms of $Rank_{i,t}$ are interacted with $\mathbb{1}_{Rank_{i,t}\geq 0}$ to fit a local polynomial both above and below the index inclusion threshold. We identify two proxies for credit conditions. $High_InstVolume$ is equal to one if the volume of quarterly institutional loans (i.e., loans that are structured for institutional investors) is above the median and zero otherwise. $High_ChangeNonBank$ is equal to one if the quarterly change in corporate loans issued by non-bank institutions is above the median and zero otherwise. Both panels have the same dependent variables. In Column (1) the dependent variable is equal to one if the loan has an interest rate reducing amendment in the 90 day period following the semi-annual rebalance ($Interest_Reduce$). In Column (2) the dependent variable is the change in the interest rate over the 90-day period after the semi-annual rebalance ($\Delta InterestRate$). In Column (3) the dependent variable is equal to one if the rate difference between the traded loan and revolving credit facility of the loan package decreases over the 90 day period after the semi-annual rebalance and zero otherwise. In Column (4) the dependent variable is amount of the rate change difference between the traded loan and the revolving credit facility over the 90-day period after the semi-annual rebalance. Control variables include loan size, time-to-maturity, public firm indicator, and the number of financial covenants. Standard errors clustered at the rebalance level are presented in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10%, respectively.

Panel A: Institutional Volume

	$Interest_Reduce$	$\Delta InterestRate$	$RateDiff_Reduce$	$\Delta RateDiff$
	(1)	(2)	(3)	(4)
$\mathbb{1}_{Rank_{it}>=0}$	0.056*	−1.861*	0.052**	−3.558***
	(0.029)	(1.050)	(0.025)	(1.362)
$\mathbb{1}_{Rank_{it}>=0} \times High_InstVolume$	0.073***	−4.681***	0.044***	−2.705*
	(0.022)	(1.334)	(0.016)	(1.379)
$High_InstVolume$	0.064***	−2.540***	0.038***	−1.853**
	(0.019)	(0.928)	(0.014)	(0.906)
$Rank \times \mathbb{1}_{Rank_{it}>=0}$	Yes	Yes	Yes	Yes
$Rank^2 \times \mathbb{1}_{Rank_{it}>=0}$	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
Observations	1,798	1,798	1,798	1,798
Adjusted R^2	0.066	0.066	0.039	0.040

Panel B: Change in Nonbank Loan Issuance

	$Interest_Reduce$	$\Delta InterestRate$	$RateDiff_Reduce$	$\Delta RateDiff$
	(1)	(2)	(3)	(4)
$\mathbb{1}_{Rank_{it}>=0}$	0.071**	−2.915**	0.061**	−4.760***
	(0.034)	(1.437)	(0.025)	(1.231)
$\mathbb{1}_{Rank_{it}>=0} \times High_ChangeNonBank$	0.057**	−3.345**	0.035*	−0.763
	(0.027)	(1.681)	(0.019)	(1.629)
$High_ChangeNonBank$	0.064**	−2.870*	0.040*	−2.523**
	(0.029)	(1.532)	(0.021)	(1.262)
$Rank \times \mathbb{1}_{Rank_{it}>=0}$	Yes	Yes	Yes	Yes
$Rank^2 \times \mathbb{1}_{Rank_{it}>=0}$	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
Observations	1,798	1,798	1,798	1,798
Adjusted R^2	0.058	0.058	0.037	0.035

Table 11: Mechanism Tests Using Call Protection Period

This table examines whether call protection influences the association between index inclusion and renegotiation outcomes. If lenders are willing to pass surplus to borrowers primarily due to the threat of refinancing, we would expect the effects to be smaller when loans are within the call protection period, as the cost of refinancing is significantly higher during this time. We estimate the following model:

$$DependentVariable_{i,t} = \beta \mathbb{1}_{Rank_{it}>=0} \times Call_Protection + f(Rank_{i,t}) + Controls_{i,t} + \epsilon_{i,t}$$

The treated group of the sample includes the fifty loans just above the index inclusion threshold and that have not been excluded in the 90-day window after the index inclusion. The control group of the sample includes the fifty loans just below the index inclusion threshold and that have not been included in or excluded from the index in the 90-day window after the index rebalance. $Rank_{i,t}$ is the par-value rank as of each semi-annual rebalance date. The rank variable is centered around the inclusion threshold by subtracting 50 from each rank. $\mathbb{1}_{Rank_{i,t}\geq 0}$ is equal to one if the loan is above the loan inclusion cutoff (i.e., a treated loan) and zero otherwise. $f(Rank_{i,t})$ is a function of the loan ranking in each semiannual rebalancing, with an order of 2, defined based on the next trading day after the semiannual rebalancing. The quadratic terms of $Rank_{i,t}$ are interacted with $\mathbb{1}_{Rank_{i,t}\geq 0}$ to fit a local polynomial both above and below the index inclusion threshold. $Call_Protection$ is an indicator variable equal to one if a loan is within the call protection period 90 days after index inclusion. In Column (1) the dependent variable is equal to one if the loan has an interest rate reducing amendment in the 90 day period following the semi-annual rebalance ($Interest_Reduce$). In Column (2) the dependent variable is the change in the interest rate over the 90-day period after the semi-annual rebalance ($\Delta InterestRate$). In Column (3) the dependent variable is equal to one if the rate difference between the traded loan and revolving credit facility of the loan package decreases over the 90 day period after the semi-annual rebalance and zero otherwise. In Column (4) the dependent variable is amount of the rate change difference between the traded loan and the revolving credit facility over the 90-day period after the semi-annual rebalance. Control variables include loan size, time-to-maturity, public firm indicator, and the number of financial covenants. Standard errors clustered at the rebalance level are presented in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10%, respectively.

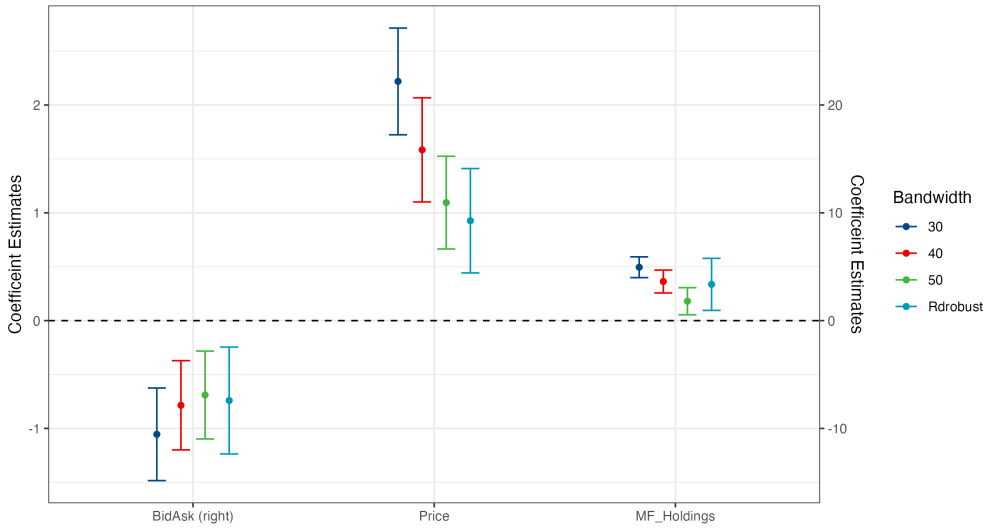
	$Interest_Reduce$	$\Delta InterestRate$	$RateDiff_Reduce$	$\Delta RateDiff$
	(1)	(2)	(3)	(4)
$\mathbb{1}_{Rank_{it}>=0}$	0.112***	−5.096***	0.084**	−5.300***
	(0.043)	(1.949)	(0.035)	(1.813)
$\mathbb{1}_{Rank_{it}>=0} \times Call_Protection$	−0.137***	5.706**	−0.073***	2.132*
	(0.047)	(2.409)	(0.026)	(1.245)
$Call_Protection$	0.045	−2.035	0.011	−0.142
	(0.030)	(1.346)	(0.023)	(0.996)
$Rank \times \mathbb{1}_{Rank_{it}>=0}$	Yes	Yes	Yes	Yes
$Rank^2 \times \mathbb{1}_{Rank_{it}>=0}$	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
Observations	1,798	1,798	1,798	1,798
Adjusted R^2	0.031	0.031	0.021	0.023

A Variable Definition

Variable	Definition
$Rank$	The par-value rank at each semi-annual rebalance. We center the rank variable around the inclusion threshold by subtracting 50 and then reversing it (because we keep 50 loans above and below the threshold). Hence, a non-negative number means loans are included in the index and a negative number indicates that loans are not included in the index. In other words, loans with ranks from 0 to 49 are above the threshold (i.e., included in the index) and loans with ranks from -50 to -1 are below the threshold (i.e., not included in the index). Larger rank means larger size.
$Weight$	The LL100 index weights. If a loan is not included in the LL100 index, weight is zero.
$BidAsk$	The difference between the average bid and average ask price quotes for each loan-week observation (in bps). Prices for loans are similar to those of bonds, where prices are relative to a par (i.e., face) value of 100. If you were to buy a loan at a price of 101, then you would pay 101% of the par value of the loan.
$Price$	The midpoint between the bid and ask price quotes for the loan-week observation. Prices for loans are similar to those of bonds, where prices are relative to a par (i.e., face) value of 100. If you were to buy a loan at a price of 101, then you would pay 101% of the par value of the loan.
$MF_Holdings$	The percentage of shares owned by mutual funds.
$InterestRate$	The all-in-drawn spread of the loan from DealScan.
$Size$	The log of the size (par amount outstanding) of the loan from Dealscan.
$Maturity$	The time-to-maturity remaining for the loan, measured in years.
$N_Covenants$	The number of financial covenants of the loan from Dealscan.
$Public$	An indicator variable equal to one if the borrower is a public firm, and zero otherwise.
$Interest_Reduce$	An indicator variable equal to one if the loan was amended and received an interest rate reduction over the 90-day periods after the semi-annual rebalance, and zero otherwise.
$\Delta InterestRate$	The magnitude of the change of the $Interest\ Rate$ over the 90-day periods after the semi-annual rebalance.
$RateDiff_Reduce$	We define $RateDiff$ as the interest rate difference between the treated loan and the revolver tranche of the same deal. Specifically, $RateDiff_{i,t} = InterestRate_{i,t} - RevolverRate_{i,t}$. $RateDiff_Reduce$ is an indicator variable equal to one if the $RateDiff_{i,t}$ decrease, zero otherwise.
$\Delta RateDiff$	We define $RateDiff$ as the interest rate difference between the treated loan and the revolver tranche of the same deal. Specifically, $RateDiff_{i,t} = InterestRate_{i,t} - RevolverRate_{i,t}$. $\Delta RateDiff$ measures the change of the rate difference.
$RevolverRate_Decrease$	An indicator variable equals to one if the interest rate for the revolver tranche of the same deal has decreased over the 90-day periods after the semi-annual rebalance, zero otherwise.
$\Delta RevolverRate$	The change of the interest rate for the revolver tranche of the same deal over the 90 days periods after the semi-annual rebalance.
$High_InstVolume$	An indicator variable equals to one if the volume of quarterly institutional loans (i.e., loans that are structured for institutional investors) is above the median, zero otherwise.
$High_ChangeNonBank$	An indicator variable equal to one if the quarterly change of non-financial corporate loans issued by nonbank institutions from U.S. Flow of Funds Accounts (OLALBSNNCB - Nonfinancial Corporate Business; Other Loans and Advances; Liability, Level) is above the sample median and zero otherwise.
$High_ChangeNonBank$	An indicator variable equal to one if the quarterly change of non-financial corporate loans issued by nonbank institutions from U.S. Flow of Funds Accounts (OLALBSNNCB - Nonfinancial Corporate Business; Other Loans and Advances; Liability, Level) is above the sample median and zero otherwise.
$Call_Protection$	An indicator variable equal to one if a loan is within the call protection period 90 days following the index inclusion, and zero otherwise. If there are multiple call protection periods (periods where the call price is above 100), we define the call protection period as the beginning of the first period to the end of the last period.

B Additional Robustness Analyses

Panel A: Secondary Market



Panel B: Renegotiation

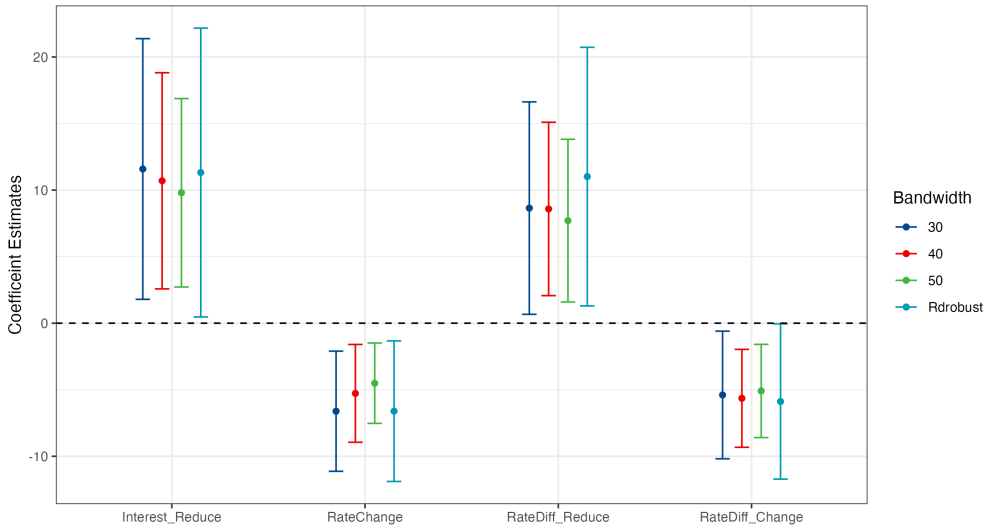


Figure B1: Robustness to Different Bandwidth

This figure plots the coefficient estimates based on a sequence of robustness tests of bandwidths. We use the main specification and only vary alternative bandwidths. Panel A presents the plots of the analyses of the effect of LSTA 100 index inclusion on loan trading attributes. Panel B presents the plots of the analyses of the effect of LSTA 100 index inclusion on loan renegotiation outcomes. The error bars represent the 90% confidence interval.

Table B1: The Effect of Index Inclusion on Realized Transaction Price

This table examines the effect of index inclusion on secondary market prices using realized transaction prices from CLO trading data. Specifically, we construct two price measures: $Trade_Price1$, which is the equal-weighted average of the CLO transaction prices for each loan in each week, and $Trade_Price2$, which is the volume-weighted average of the CLO transaction prices for each loan in each week. If no CLO transaction occurs in a given week, the price is set to the last available transaction price. We estimate the following model:

$$Trade_Price_{i,t} = \beta \mathbb{1}_{Rank_{it}>=0} + f(Rank_{i,t}) + Controls_{i,t} + WeekFE + \epsilon_{i,t}$$

The treated group of the sample includes the fifty loans just above the index inclusion threshold and that have not been excluded in the 90-day window after the index inclusion. The control group of the sample includes the fifty loans just below the index inclusion threshold and that have not been included in or excluded from the index in the 90-day window after the index rebalance. $Rank_{i,t}$ is the par-value rank as of each semi-annual rebalance date. The rank variable is centered around the inclusion threshold by subtracting 50 from each rank. $\mathbb{1}_{Rank_{i,t}\geq 0}$ is equal to one if the loan is above the loan inclusion cutoff (i.e., a treated loan) and zero otherwise. $f(Rank_{i,t})$ is a function of the loan ranking in each semiannual rebalancing, with an order of 2, defined based on the next trading day after the semiannual rebalancing. The quadratic terms of $Rank_{i,t}$ are interacted with $\mathbb{1}_{Rank_{i,t}\geq 0}$ to fit a local polynomial both above and below the index inclusion threshold. In Column (1) the dependent variable is the equal-weighted transaction price ($Trade_Price1$). In Column (2) the dependent variable is the volume-weighted transaction price ($Trade_Price2$). All columns include week fixed effects and controls. Control variables include loan size, time-to-maturity, public firm indicator, and the number of financial covenants. Standard errors are clustered at the week level and are presented in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	$Trade_Price1$	$Trade_Price2$
	(1)	(2)
$\mathbb{1}_{Rank_{it}>=0}$	1.030***	1.259***
	(0.179)	(0.214)
$Rank \times \mathbb{1}_{Rank_{it}>=0}$	Yes	Yes
$Rank^2 \times \mathbb{1}_{Rank_{it}>=0}$	Yes	Yes
Controls	Yes	Yes
Week FE	Yes	Yes
Observations	33,650	33,650
Adjusted R^2	0.125	0.112

Table B2: Main Renegotiation Results with Time Fixed Effect

This table reports the main loan renegotiation results with the time fixed effect included. We estimate the following model:

$$DependentVariable_{i,t} = \beta \mathbb{1}_{Rank_{it}>=0} + f(Rank_{i,t}) + Controls_{i,t} + TimeFE + \epsilon_{i,t}$$

The treated group of the sample includes the fifty loans just above the index inclusion threshold and that have not been excluded in the 90-day window after the index inclusion. The control group of the sample includes the fifty loans just below the index inclusion threshold and that have not been included in or excluded from the index in the 90-day window after the index rebalance. $Rank_{i,t}$ is the par-value rank as of each semi-annual rebalance date. The rank variable is centered around the inclusion threshold by subtracting 50 from each rank. $\mathbb{1}_{Rank_{i,t}\geq 0}$ is equal to one if the loan is above the loan inclusion cutoff (i.e., a treated loan) and zero otherwise. $f(Rank_{i,t})$ is a function of the loan ranking in each semiannual rebalancing, with an order of 2, defined based on the next trading day after the semiannual rebalancing. The quadratic terms of $Rank_{i,t}$ are interacted with $\mathbb{1}_{Rank_{i,t}\geq 0}$ to fit a local polynomial both above and below the index inclusion threshold. In Column (1) the dependent variable is equal to one if the loan has an interest rate reducing amendment in the 90 day period following the semi-annual rebalance ($Interest_Reduce$). In Column (2) the dependent variable is the change in the interest rate over the 90-day period after the semi-annual rebalance ($\Delta InterestRate$). In Column (3) the dependent variable is equal to one if the rate difference between the traded loan and revolving credit facility of the loan package decreases over the 90 day period after the semi-annual rebalance and zero otherwise. In Column (4) the dependent variable is amount of the rate change difference between the traded loan and the revolving credit facility over the 90-day period after the semi-annual rebalance. All columns include time fixed effects and controls. Control variables include loan size, time-to-maturity, public firm indicator, and the number of financial covenants. Standard errors are clustered at the rebalance level and are presented in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	$Interest_Reduce$	$\Delta InterestRate$	$RateDiff_Reduce$	$\Delta RateDiff$
	(1)	(2)	(3)	(4)
$\mathbb{1}_{Rank_{it}>=0}$	0.094**	−4.055**	0.073**	−4.777**
	(0.039)	(1.711)	(0.032)	(1.655)
$Rank \times \mathbb{1}_{Rank_{it}>=0}$	Yes	Yes	Yes	Yes
$Rank^2 \times \mathbb{1}_{Rank_{it}>=0}$	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes
Observations	1,798	1,798	1,798	1,798
Adjusted R^2	0.122	0.135	0.088	0.096

Table B3: The Effect of Index Inclusion on Other (Non Interest Rate Reducing) Amendments

This table examines the effect of index inclusion on amendments other than those that reduce the interest rate. The treated group of the sample includes the fifty loans just above the index inclusion threshold and that have not been excluded in the 90-day window after the index inclusion. The control group of the sample includes the fifty loans just below the index inclusion threshold and that have not been included in or excluded from the index in the 90-day window after the index rebalance. $Rank_{i,t}$ is the par-value rank as of each semi-annual rebalance date. The rank variable is centered around the inclusion threshold by subtracting 50 from each rank. $\mathbb{1}_{Rank_{i,t}\geq 0}$ is equal to one if the loan is above the loan inclusion cutoff (i.e., a treated loan) and zero otherwise. $f(Rank_{i,t})$ is a function of the loan ranking in each semiannual rebalancing, with an order of 2, defined based on the next trading day after the semiannual rebalancing. The quadratic terms of $Rank_{i,t}$ are interacted with $\mathbb{1}_{Rank_{i,t}\geq 0}$ to fit a local polynomial both above and below the index inclusion threshold. In Column (1) the dependent variable is an indicator equal to one if there is any amendment in the 90 day period following the semi-annual rebalance. In Column (2) the dependent variable is an indicator equals to one if there is any non-rate reducing amendment in the 90 day period following the semi-annual rebalance. Control variables include loan size, time-to-maturity, public firm indicator, and the number of financial covenants. Standard errors are clustered at the rebalance level and are presented in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	Amend	*Other_Amend*
	(1)	(2)
$\mathbb{1}_{Rank_{it}>=0}$	0.060	−0.038
	(0.053)	(0.042)
$Rank \times \mathbb{1}_{Rank_{it}>=0}$	Yes	Yes
$Rank^2 \times \mathbb{1}_{Rank_{it}>=0}$	Yes	Yes
Controls	Yes	Yes
Observations	1,798	1,798
Adjusted R^2	0.014	0.005

Table B4: Direct Link Renegotiation Outcomes with Secondary Market Conditions

This table reports the results of models that directly link renegotiation outcomes with secondary market conditions. Specifically, we estimate the following two-stage least squares regression:

$$DependentVariable_{i,t} = \beta \widehat{SecondaryMarket}_{i,t} + f(Rank_{i,t}) + Controls_{i,t} + WeekFE + \epsilon_{i,t}$$
$$SecondaryMarket_{i,t} = \gamma \mathbb{1}_{Rank_{it}>=0} + f(Rank_{i,t}) + Controls_{i,t} + WeekFE + \eta_{i,t}$$

The treated and control groups are defined as in previous tables. In the first stage, we use the index inclusion indicator $\mathbb{1}Ranki, t \geq 0$ as an instrument for secondary market trading conditions, including bid-ask spread, price, and mutual fund holdings. In the second stage, we regress renegotiation outcomes on the fitted secondary market variable from the first stage. Panel A reports the results for the second stage, while Panel B presents the corresponding first-stage results. In columns (1) to (3), the renegotiation outcome variable is an indicator equal to one if the loan undergoes an interest rate-reducing amendment within the 90-day period following the semi-annual rebalance ($Interest_Reduce$). In columns (4) to (6), the renegotiation outcome variable is the change in the interest rate over the same 90-day period ($\Delta InterestRate$). For columns (1) and (4), the secondary market variable is the bid-ask spread ($BidAsk$). For columns (2) and (5), it is the secondary market price ($Price$). For columns (3) and (6), it is mutual fund holdings ($MF_Holdings$). Kleibergen-Paap F-statistics are reported. In both stages, we include week fixed effects and control for loan size, time to maturity, public firm status, and the number of financial covenants. Standard errors are clustered at the week level. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Second Stage

	$Interest_Reduce$			$\Delta InterestRate$		
	(1)	(2)	(3)	(4)	(5)	(6)
$\widehat{BidAsk}$	−0.017***			0.765***		
	(0.003)			(0.140)		
$\widehat{Price}$		0.096***			−4.431***	
		(0.023)			(1.004)	
$\widehat{MF_Holdings}$			0.295***			−16.105***
			(0.101)			(5.723)
$Rank \times \mathbb{1}_{Rank_{it}>=0}$	Yes	Yes	Yes	Yes	Yes	Yes
$Rank^2 \times \mathbb{1}_{Rank_{it}>=0}$	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Week FE	Yes	Yes	Yes	Yes	Yes	Yes
Kleibergen-Paap F-Statistic	38.6	28.3	8.7	38.6	28.3	8.7
Observations	33,426	33,426	7,516	33,426	33,426	7,516

Panel B: First Stage

	$BidAsk$	$Price$	$MF_Holdings$	$BidAsk$	$Price$	$MF_Holdings$
	(1)	(2)	(3)	(4)	(5)	(6)
$\mathbb{1}_{Rank_{it}>=0}$	−6.116***	1.056***	0.212***	−6.116***	1.056***	0.212***
	(0.984)	(0.198)	(0.072)	(0.984)	(0.198)	(0.072)
$Rank \times \mathbb{1}_{Rank_{it}>=0}$	Yes	Yes	Yes	Yes	Yes	Yes
$Rank^2 \times \mathbb{1}_{Rank_{it}>=0}$	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Week FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	33,426	33,426	7,516	33,426	33,426	7,516
Adjusted R^2	0.495	0.123	0.161	0.495	0.123	0.161

Table B5: Direct Link Renegotiation with Secondary Market Conditions: Within Deal Test

This table reports the within-deal test results of models that directly link renegotiation outcomes with secondary market conditions. Specifically, we estimate the following two-stage least squares regression:

$$DependentVariable_{i,t} = \beta \widehat{SecondaryMarket}_{i,t} + f(Rank_{i,t}) + Controls_{i,t} + WeekFE + \epsilon_{i,t}$$
$$SecondaryMarket_{i,t} = \gamma \mathbb{1}_{Rank_{it}>=0} + f(Rank_{i,t}) + Controls_{i,t} + WeekFE + \eta_{i,t}$$

The treated and control groups are defined as in previous tables. In the first stage, we use the index inclusion indicator $\mathbb{1}Ranki, t \geq 0$ as an instrument for secondary market trading conditions, including bid-ask spread, price, and mutual fund holdings. In the second stage, we regress renegotiation outcomes on the fitted secondary market variable from the first stage. Panel A reports the results for the second stage, while Panel B presents the corresponding first-stage results. In columns (1) to (3), the dependent variable is equal to one if the rate difference between the traded loan and revolving credit facility of the loan package decreases over the 90 day period after the semi-annual rebalance and zero otherwise. In columns (4) to (6), the dependent variable is amount of the rate change difference between the traded loan and the revolving credit facility over the 90-day period after the semi-annual rebalance. For columns (1) and (4), the secondary market variable is the bid-ask spread ($BidAsk$). For columns (2) and (5), it is the secondary market price ($Price$). For columns (3) and (6), it is mutual fund holdings ($MF_Holdings$). Kleibergen-Paap F-statistics are reported. In both stages, we include week fixed effects and control for loan size, time to maturity, public firm status, and the number of financial covenants. Standard errors are clustered at the week level. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Second Stage						
	$RateDiff_Reduce$			$\Delta RateDiff$		
	(1)	(2)	(3)	(4)	(5)	(6)
$\widehat{BidAsk}$	−0.012***			0.736***		
	(0.002)			(0.134)		
$\widehat{Price}$		0.078***			−4.595***	
		(0.018)			(1.109)	
$\widehat{MF_Holdings}$			0.191***			−4.434
			(0.073)			(6.105)
$Rank \times \mathbb{1}_{Rank_{it}>=0}$	Yes	Yes	Yes	Yes	Yes	Yes
$Rank^2 \times \mathbb{1}_{Rank_{it}>=0}$	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Week FE	Yes	Yes	Yes	Yes	Yes	Yes
Kleibergen-Paap F-Statistic	43.9	27.3	8.7	43.9	27.3	8.7
Observations	33,650	33,650	7,516	33,650	33,650	7,516
Panel B: First Stage						
	$BidAsk$	$Price$	$MF_Holdings$	$BidAsk$	$Price$	$MF_Holdings$
	(1)	(2)	(3)	(4)	(5)	(6)
$\mathbb{1}_{Rank_{it}>=0}$	−6.329***	1.013***	0.212***	−6.329***	1.013***	0.212***
	(0.955)	(0.194)	(0.072)	(0.955)	(0.194)	(0.072)
$Rank \times \mathbb{1}_{Rank_{it}>=0}$	Yes	Yes	Yes	Yes	Yes	Yes
$Rank^2 \times \mathbb{1}_{Rank_{it}>=0}$	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Week FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	33,650	33,650	7,516	33,650	33,650	7,516
Adjusted R^2	0.492	0.123	0.161	0.492	0.123	0.161