Non-Fundamental Loan Renegotiations*

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Abstract

A notable innovation in the private lending market is the growing participation of nonbank institutional lenders. Compared to traditional banks, nonbank lenders have a higher demand for secondary market liquidity due to their fragile funding source. An important question is how the demand for liquidity by nonbank lenders affects private lending. In this paper, we examine this question by exploiting a novel setting of Morningstar LSTA US Leveraged Loan 100 Index weekly rebalances as an exogenous shock to a loan's liquidity. Consistent with liquidity improvement, we show that following the index inclusion, loans experience lower bid-ask spread, a higher number of market makers, higher price, and higher CLO trading volume. Importantly, we also observe a notable increase in interest rate–reducing loan renegotiations closely aligned with the timing of index inclusion. Jointly, these results are consistent with the transfer of nonbank liquidity demand to loan financing costs through renegotiation. We further show that the interest rate reduction is more pronounced when the threat of borrowers refinancing their loans is higher: when there is a greater aggregate credit supply by nonbanks and when borrowers' prior lending transactions facilitate refinancing. Overall, we provide causal evidence that nonbank lenders' demand for liquidity is a salient non-fundamental determinant of loan renegotiation and the cost of loan financing.

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1 Introduction

Private commercial lending capital is increasingly provided by nonbank lenders, such as hedge funds, mutual funds, and collateralized lending vehicles.[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., Goldstein et al., 2017; Ma et al., 2022; Fleckenstein et al., 2023; Hanson et al., 2015). This distinction highlights the importance of secondary market liquidity as nonbank lenders finance a growing fraction of private lending.

Despite this importance, relatively little is known about how nonbank lenders' demand for secondary market liquidity affects private lending. The primary challenge in identifying a causal relation between liquidity and loan terms is that many borrower fundamental characteristics affect both of these constructs. 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) weekly rebalance as an exogenous shock to loan liquidity. Utilizing this shock, we study how secondary market liquidity influences borrowers' cost of debt in the private lending market.

We use the LSTA 100 weekly index rebalance as a shock to identify the effect of loan liquidity on private borrowing for two reasons–the exogeneity of inclusion relative to borrower fundamentals and the magnitude of the potential liquidity improvement upon inclusion. With respect to exogeneity, the LSTA 100 index undergoes weekly rebalance to maintain a consistent composition of 100 loans. During this rebalance, loans that have been repaid or no longer meet the index inclusion criteria are substituted with the largest qualified loan

[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).

outside the index, according to the par (loan amount) value rank. This weekly inclusion acts as an exogenous shock for several reasons. First, a loan's weekly inclusion cannot be accurately predicted by both borrowers and lenders, at least not until a short period ahead of the inclusion, as it is unknown whether index constituent loans will be repaid early or receive a maturity extension (and remain in the index). Furthermore, because loans are frequently issued in the syndicated loan market, a loan under consideration may not be large enough to meet the size threshold for inclusion when a spot opens up in the index because a larger loan can be issued at any time. Second, borrowers are unlikely to be able to manipulate a loan's inclusion because the inclusion threshold is unknown ex ante, and ex post loan upsizing is costly as it requires a loan renegotiation. Third, the eligibility for inclusion relies solely on a loan's par value ranking, which is not time-varying, rather than on its market value (i.e., secondary market price). This rules out the possibility that changes in a borrower's fundamentals can affect index inclusion, or that changes in omitted correlated variables can affect both the inclusion of a loan and the fundamentals of the borrower.

LSTA 100 index inclusion should also provide a meaningful improvement in liquidity for constituent loans. The LSTA 100 index serves as an important benchmark for institutional investors in the private lending market.[3] For example, a majority of loan exchange–traded funds (ETFs) (84.3% of total assets under management) use the LSTA 100 as a benchmark for their performance.[4] Prior research in other asset markets also finds that index inclusion significantly improves the liquidity of the underlying securities.[5]

We focus on these exogenous improvements in loan liquidity to examine how nonbank liquidity demand influences the cost of syndicated loan financing. To do so, we explore loan

[3]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

[4]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.

[5]See Cao et al. (2019); Marta (2024); Shim and Todorov (2022); Koont et al. (2022); Bretscher et al. (2023b) among others. These studies find improvements in liquidity attributable to ownership and demand.

renegotiations around LSTA 100 inclusions, since the renegotiation is the *only* mechanism through which loan terms can be modified after a loan origination. It is important to note that renegotiations around index inclusion are distinct from *fundamental* renegotiations driven by changes in a borrower's creditworthiness or macroeconomic conditions, which are examined extensively by prior research.[6] In contrast to these fundamental renegotiations, the renegotiations we explore are attributable solely to changes in loan liquidity due to a random index inclusion, thus representing *non-fundamental* renegotiations.

Two important presumptions underlie our focus on loan renegotiations around index inclusions. First, an increase in loan liquidity due to its index inclusion leads to a surplus for nonbank lenders. Because loan liquidity is a significant risk factor for nonbank lenders due to their need to liquidate assets in a timely manner, it is reasonable to expect that they require lower compensation (e.g., a lower interest rate) when investing in more liquid loans. Thus, when a loan's liquidity increases with index inclusion following loan origination, nonbank lenders benefit from liquidity cost savings (i.e., liquidity-related surplus). Second, lenders are willing to share this liquidity surplus with borrowers. Although there is no contractual obligation for lenders to share any ex post surplus with borrowers, borrowers are aware of the index inclusion of their loans and are likely to demand that the liquidity surplus be shared through loan renegotiations.[7] 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 increase in the loan's liquidity. Therefore, we expect an increase in a loan's liquidity due to LSTA 100 inclusion to be associated with interest rate–reducing loan renegotiation.

Using novel data on the weekly LSTA 100 index constituency, we are able to identify 239 traded term loans added during the weekly rebalancing of the LSTA 100 over our sample

[6]See Roberts and Sufi (2009b); Roberts (2015); Nikolaev (2018); Amiraslani et al. (2023) among others.

[7]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.

period from January 2014 to August 2023. We start our analyses by verifying that the index inclusion indeed increases a loan's secondary market liquidity. We create a panel of loan trading day observations from the 8 weeks prior to the index inclusion week to 8 weeks after the index inclusion week for treatment loans (i.e., loans added to the index) and their control loans. For each treatment loan, we identify ten control loans that (1) are just below the index inclusion size threshold in the inclusion week, and (2) have not been added to or excluded from the index over the ± 8 weeks window around the index inclusion week. Control loans should not exhibit any systematic liquidity changes around the treatment loan's index inclusion, and thus serve as a counterfactual had the treatment loan never been included in the index.

Relying on common liquidity measures, including the loan's bid-ask spread and the number of market makers, we find a substantial improvement in liquidity for loans added to the LSTA 100 index through weekly rebalances. Specifically, we find that the bid-ask spread of the treated loans decline by 8.9 bps relative to control loans, which represents 14.0% of the sample mean of this variable. Similarly, treatment loans experience an increase in the number of market makers that translates to 12% relative to the sample mean of this variable. We supplement these analyses with loan price and CLO trading volume as additional measures that reflect on both a loan's liquidity and the demand of nonbank lenders following the index inclusion. We expect the loan price to increase due to lower liquidity costs as well as a higher nonbank lender demand, as index inclusion typically increases institutional demand (Cao et al., 2019; Marta, 2024; Shim and Todorov, 2022; Koont et al., 2022). We also expect CLO trading volume to increase following the index inclusion. CLOs are one of the primary investors in the secondary loan market and hold nearly 50% of leveraged loans, suggesting that their trading volume proxies for market-wide trading depth. Consistent with our expectations, we find that index inclusion increases loan price and CLO trading volume, complementing our evidence based on the bid-ask spread and the number of market makers measures. Furthermore, we demonstrate that there is no clear pre-trend for the bid-ask

spread, the number of market makers, loan price, and CLO trading volume prior to the index inclusion, and that for all these measures the increase in liquidity is sustained after the inclusion.

We next examine whether nonbank lenders' demand for liquidity affects borrowers' financing costs. If borrowers benefit from an increased liquidity of their loans due to the index inclusion, we should observe non-fundamental loan renegotiations around the LSTA 100 inclusions that reduce the interest rate. We start by exploring whether the renegotiation pattern differs for treatment loans included in the index through weekly rebalancing and their control loans (ten loans that are just below the index inclusion size threshold in the treatment loan's inclusion week). We plot the Kaplan-Meier cumulative hazard functions for loans with a renegotiation within the ± 180-day window of index inclusion. We provide evidence of a drastic increase in the probability of renegotiation prior to index inclusion, while the control loans have a uniform cumulative hazard function of the probability of renegotiation. Next, we test whether the probability of renegotiation of the treatment loans is statistically different from that of control loans by focusing on renegotiations closely aligned with the inclusion timing, as these renegotiations are more likely to be triggered by the index inclusion. Using three alternative windows around the inclusion week (±8 weeks, ±4 weeks, and ±2), we document that treatment loans are more likely to be renegotiated (i.e., amended) around the index inclusion. In terms of economic significance, depending on the renegotiation window we examine, treatments loans have between 32.5% to 39.9% higher probability of being amended relative to control loans; these differences represent 1.5 to 2.05 times higher renegotiation probability relative to the sample mean of the probability of renegotiation.

Having established that the increase in liquidity due to LSTA 100 index inclusion leads to non-fundamental loan renegotiations, we further examine the nature of these renegotiations. We find that treated loans have 37% higher probability of receiving a reduction in the interest rate after index inclusion relative to control loans, which translates into index inclusion loans being 2.81 times more likely to receive an interest rate–reducing renegotiation relative to

the sample mean value of this probability. We also show that treatment loans experience a considerable reduction in the interest spread by about 21 bps relative to control loans, which represents 5.9% of the mean interest rate of the sample.

The interest rate reduction findings hold in an alternative specification where we perform a *within-loan package* analysis. It is common for term loans to be packaged in a deal with other loans, such as a revolving credit facility. We exploit this institutional feature to modify the control group to include loans from the same deal (i.e., package) as the treatment loan but that are *not* included in the index. Our findings are similar. These analyses mitigate the concern that a contemporaneous 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 all other loans in the same loan package. In additional analyses, we focus on the sample of loans that experience an amendment and compare amendments triggered by the index inclusion with other amendments around the same time. These analyses allow us to rule out that index inclusions coincide with macroeconomic factors that affect amendments across the loan market. Our findings continue to hold. Furthermore, although we expect the lower liquidity premium to be reflected primarily in the loan interest spread, we also examine changes in a loan's size and maturity to address a concern that the changes in the interest spread may be attributable to changes in these terms. We do not find evidence that this is the case. Overall, we show that the secondary market liquidity of a loan has a causal effect on the borrower's interest rate through non-fundamental renegotiations triggered by the LSTA 100 inclusions.

Building on these findings, we next provide supporting evidence for our hypothesis that the threat of refinancing compels lenders to share liquidity cost savings 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 when there is a greater reduction in the Federal Funds Rate, which is typically

indicative of a credit expansion in the economy. More importantly, we find greater surplus sharing during periods of higher aggregate credit supply by nonbanks, as measured by the higher volume of institutional loans, higher CLO issuance, and higher issuance of non-financial corporate loans by nonbank institutions (Becker and Ivashina, 2014, 2016).

We further conjecture that in addition to aggregate credit conditions that may facilitate loan refinancing, borrower idiosyncratic characteristics may be associated with the threat of refinancing. We expect borrowers that have established relationships with a higher number of lead arrangers through prior lending transactions to have a greater flexibility with refinancing their loans. Borrowers with a greater extent of syndicated loan financing should also be able to refinance their loans more easily because they are valuable clients for lead arrangers that benefit from high loan origination fees. We find evidence consistent with these predictions, further supporting the threat of refinancing as the reason lenders share the liquidity savings with borrowers through non-fundamental renegotiations.

We also examine whether frictions associated with renegotiations of syndicated loans diminish the extent of liquidity savings sharing. Lenders face considerable coordination costs when engaging in renegotiation due to their heterogeneous preferences (Gertner and Scharfstein, 1991; Caskey et al., 2022), which is particularly salient for interest rate renegotiations that require unanimous approval from all syndicate lenders. Measuring the coordination cost within the syndicate by the number of syndicate lenders and the extent of syndicate participants' prior relationship with the borrower, we show that higher coordination costs diminish the extent of liquidity-related surplus that lenders share with borrowers.

Finally, we conduct two important tests to further support the robustness of our findings. First, we employ an alternative control group, where for each treated loan, we identify ten control loans that are just above the index inclusion size threshold in the inclusion week. All of our findings continue to hold, suggesting that they are not sensitive to the choice of control loans. Second, we conduct placebo analyses using the period *prior* to the introduction of the LSTA 100 index to create a hypothetical LSTA 100 index and identify loans that would

qualify for weekly inclusion had the index existed. We find that these hypothetical index inclusions are unrelated to loan liquidity changes, the probability of renegotiation around the inclusions, and the changes in the interest rate associated with these renegotiations. This evidence further suggests that our results are not driven by omitted factors correlated with loan size, loan liquidity, or interest rate–reducing amendments.

Our findings advance four important literatures. First, we add to the literature on the secondary loan market trading. Prior studies examine trading costs in this market and identify borrower and lead arranger characteristics that diminish these costs (e.g., Wittenberg-Moerman, 2008; Phillips, 2023). In addition, Gupta et al. (2008), Santos and Nigro (2009) and Kamstra et al. (2014) find a negative association between the secondary loan market liquidity and the interest rate at loan origination. Although these studies provide initial evidence of the importance of secondary market liquidity, they cannot establish a causal relation between liquidity and the interest rate due to the lack of exogenous variation in loan liquidity in their settings.[8] Our use of the exogenous LSTA 100 index inclusions allows us to overcome this challenge and demonstrate a causal effect of liquidity on the cost of loan financing. Furthermore, these 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, we highlight the importance of the demand for liquidity by nonbank institutional lenders that are the primary traders in the secondary loan market. This nonbank demand mechanism behind the causal relationship between liquidity and the cost of loan financing also allows us to identify non-fundamental renegotiations as the channel through which liquidity savings are shared with borrowers.

[8]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 clearly endogenous as they relate to a borrower's fundamentals and thus loan pricing. A lead arranger's reputation is associated with a higher borrower's quality at loan origination (e.g., Bushman and Wittenberg-Moerman, 2012). A lead arranger's reputation also affects syndicate structure, which is related to loan pricing (Sufi, 2007; Ivashina, 2009). Having public financial statements indicates that these borrowers have publicly traded equity or debt and are thus substantially different from private borrowers. Leuz et al. (2008) also find that firms with poor future prospects are more likely to go "dark" and cease reporting public information, suggesting a strong link between public status and fundamentals.

Second, our paper also contributes to the rapidly growing literature on the impact of institutional investor demand, pioneered by Basak and Pavlova (2013) and Koijen and Yogo (2019). These studies show that non-fundamental demand shocks have long-lasting price effects and subsequently affect firms' real activities (e.g., Hartzmark and Solomon, 2021; Bretscher et al., 2023b; Zhu, 2021; Adelino et al., 2023; Kubitza, 2021). To the best of our knowledge, our study is the first to examine the non-fundamental investor demand in the private debt market and to document the real effect of this demand on loan renegotiations and the cost of loan financing.[9]

Third, we add to the growing literature on index membership. The 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. Index inclusions and ETF ownership are documented to affect equity and bond pricing, volatility, and liquidity (e.g., Chang et al., 2015; Ben-David et al., 2018; Koont et al., 2022; Sikorskaya, 2023; Marta, 2024). There is also evidence that index constituency not only influences passive index funds but also affects active funds through benchmarking behavior, and that benchmarking benefits these constituents (e.g., Kashyap et al., 2021; Pavlova and Sikorskaya, 2023). We extend prior studies by documenting that the constituency in the private loan index increases secondary loan market liquidity and decreases loan pricing via non-fundamental renegotiations.

Fourth, we contribute to the literature on loan renegotiations, which emphasizes the critical role of renegotiations in improving contracting efficiency (e.g., Bolton, 1990; Aghion and Bolton, 1992; Roberts and Sufi, 2009a). Prior work examines primarily renegotiations driven by the arrival of new information on fundamentals, such as a borrower's performance and macroeconomic conditions, and the violations of financial covenants (e.g., Garleanu and Zwiebel, 2008; Roberts and Sufi, 2009a,b; Roberts, 2015; Nikolaev, 2018; Amiraslani et al., 2023). Our work extends this literature by demonstrating the importance of *non-fundamental*

[9]It is important to note that our focus on non-fundamental liquidity demand of nonbank lenders is different from Ivashina and Sun (2011) that examine institutional demand pressure in the primary loan market, as measured by the number of days a loan remains in syndication and which proxies for the institutional fund flow.

forces in compelling renegotiation. As far as we know, our study is the first to document that changes in secondary market liquidity, driven by a loan's index inclusion, is a central determinant of loan renegotiations.

2 Related Literature

The rapid growth of the syndicated loan market features increasing participation of nonbank institutional lenders. 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.[10] 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).[11] 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 (2023) finds that a loan's lead arrangers' participation as market makers reduce trading costs for the loan, and that this effect is concentrated in periods of low liquidity.

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)

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

[11] 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).

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. Our use of the exogenous LSTA 100 index inclusions allows us to significantly advance this literature by establishing a causal relation between the secondary loan liquidity and the cost of debt. Furthermore, our study identifies the economic mechanism behind this causal relationship: the demand for liquidity by the primary traders in the secondary loan market–nonbank institutional lenders.

Our focus on institutional lenders' demand for liquidity is tightly linked to the growing literature on the impact 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. Hartzmark and Solomon (2021) show that anticipated demand shocks caused by dividend payment have a significant and lasting price effect. 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 the primary market. 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. We extend this research by examining how non-fundamental demand from nonbank lenders in the private debt market influences loan

renegotiations and borrowing costs.

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. Chang et al. (2015) find positive (negative) price effect 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 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. Sikorskaya (2023) also shows that higher institutional ownership can improve liquidity by increasing the supply of securities lending. We extend these studies by examining how a private loan index affects secondary loan market liquidity and debt contracting.

Last, 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 contact efficiency (Aghion and Bolton, 1992).[12] 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 for adjusting 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

[12]With its central role and extensive implications for contracting, renegotiation has been widely examined in the theoretical literature (e.g., Bolton, 1990; Aghion and Bolton, 1992; Bolton and Scharfstein, 1996).

information about the borrower's credit quality, investment opportunities, collateral value, and macroeconomic conditions. Complementing these studies, Nikolaev (2018) demonstrates that renegotiations are a strategic tool for creditors to adjust to new information and manage relationships with borrowers. 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. 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 concessions from nonbank lenders.

3 Institutional Setting

The vast majority of loans traded on the secondary loan market are leveraged, that is, loans issued to borrowers with high debt compared to their earnings. Traded leveraged loans mostly have 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. Banks are unlikely to hold loans that attract institutional lenders because of these loans' riskiness and non-amortizing term structure, which is counted heavily against banks' capital ratios (Nandy and Shao, 2008; Irani et al., 2021). Instead, banks are more likely to hold revolving or amortizing term loans.

The liquidity risk faced by nonbanks that invest in leveraged loans is nontrivial (Wittenberg-Moerman, 2008; Elkamhi and Nozawa, 2022; Phillips, 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.[13] Moreover, only qualified institutional buyers (QIB) can participate in the secondary loan market because

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

private loans are not considered securities for the purposes of registration with the Securities and Exchange Commission (SEC) (Saunders et al., 2024). 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.[14] 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.[15]

To examine how nonbank demand for secondary loan market liquidity affects 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. It serves as a vital tool for financial 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. Thus, the LSTA 100 represents one of the most significant benchmarks for investors who track the performance of the US leveraged loan market.

The LSTA 100 index undergoes weekly rebalancing to maintain a consistent composition of 100 loans. During weekly rebalance, 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.[16] This vacancy is filled by the largest loan facility outside the index in terms of par value of the outstanding amount (i.e., size).[17] Maintenance of the weekly index rebalancing happens every Friday based on information available at the end of each Wednesday. Note

[14]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.

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

[16]Eligibility criteria for the 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).

[17]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%.

that, for each weekly rebalance, we focus on index inclusions rather than exclusions because weekly exclusions are primarily caused by repayment (i.e., retirement) of the loan.

As we discuss in the introduction, the weekly inclusion process of the LSTA 100 index provides a unique setting to causally identify the impact of liquidity on loan-related outcomes. To start with, borrowers and lenders cannot accurately predict a loan's weekly inclusion, at least not until a short period ahead of the inclusion. Furthermore, manipulating a loan's inclusion by borrowers is unlikely because the inclusion threshold is unknown ex ante, and increasing the loan size ex post requires a loan to be renegotiated. In addition, a loan's eligibility for inclusion is determined by its par value and not its market value, suggesting that changes in a borrower's fundamentals cannot affect the index inclusion, as well as the changes in omitted correlated variables cannot influence both a loan's inclusion and a borrower's fundamentals. Figure 1 plots the weekly index rebalances: the number of both weekly inclusions and deletions over time. Importantly, weekly inclusions are not clustered over the sample period, providing further support for the validity of their exogenous nature.

These advantages of the weekly rebalancing in the LSTA 100 motivated us to use this setting to examine the role of loan liquidity in debt contracting. However, it is important to note that, in addition to the weekly rebalance, the LSTA 100 also has a semi-annual reconstitution on the last day of June and December. During the semi-annual reconstitution, the index is fully rebalanced such that the 100 largest loans by the par value are selected into the index. This semi-annual reconstitution has several disadvantages relative to the weekly rebalancing setting. First, the date of the semi-annual reconstitution is prescheduled, which makes it easier for the market to predict inclusions and exclusions. As a result, the pre-trend assumption of a difference-in-differences empirical approach may be violated. Second, the timing of the semi-annual reconstitution coincides with many corporate events at the mid-year (e.g., Q2 earnings) and the end-year (e.g., annual earnings) that may affect loan trading attributes as well as renegotiation probability. Such seasonality is likely to systematically contaminate the identification.

Third, while the semi-annual reconstitution might be suitable to use in conjunction with a regression discontinuity design (RDD), there are two limitations. The first limitation is that the assumption that loans are comparable around the cutoff for index inclusion is likely to be violated. The LSTA 100 index has an inclusion cutoff that is determined by the loan's par value rank, while the index weight rank is determined by the loan's market value. As par value and market value can vary, this undermines the validity of the RDD assumption. For instance, it is possible for a loan to be ranked high by par value but low by the market value when the loan is underperforming (i.e., the price is low). Thus, loan ranks within the index (by market value) may not be comparable to loan ranks outside the index (by par value). The second limitation is that loans just above the cutoff are not necessarily newly added to the index, which makes it unlikely that we would observe any debt contracting changes (i.e., renegotiations) at the semi-annual rebalance, and even if we did, we could not convincingly tie these renegotiations to the loan's inclusion in the index. Thus, both the semi-annual reconstitution and the RDD empirical approach are not well suited for our research questions. Nonetheless, in supplementary analyses, we study index *exclusions* during the semi-annual reconstitution and document these tests in Section 8.3.

4 Data and Sample

We rely on a variety of data sources for our analysis, including (1) Morningstar for LSTA 100 constituents data, (2) the Refinitiv LPC database of the daily secondary market loan pricing data and CLO trading data, and (3) the DealScan database for loan characteristics and amendment information. Because we focus on weekly rebalance of the LSTA 100 index, our sample is at a weekly frequency. We start our sample construction with the LSTA 100 index constituents data. We identify 347 weekly index inclusions for the period from January 2014 to August 2023.[18] We then merge the included loans with the Refinitiv LPC database for the secondary market loan pricing data and trading information. This procedure results

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

in 333 loans. We then merge this sample with DealScan data to obtain loan characteristics and loan amendment information. We end up with 239 loans that are added to the LSTA 100 index during the weekly rebalance.

In the next step, we construct a control group of loans. For each treatment loan, we identify ten control loans that are just below the index inclusion size threshold as of the inclusion week and have not been added to or excluded from the index over the 8 weeks before and 8 weeks after the index inclusion week. Note that a loan can serve as the control for more than one loan included in the index. We have 1,408 loans in our control sample, which together with 239 treatment loans results in a final sample of 1,647 loans. For our analyses of the characteristics of the secondary loan market trading, where we do not need DealScan data, we employ a larger sample of 2,051 loans (333 treatment loansand 1,718 control loans). [19] We then create a panel of loan-week observations from the 8 weeks prior to the index inclusion week to 8 weeks after. This sample includes 34,867 observations. Table 1 reports the summary statistics. Detailed variable definitions are reported in Appendix A Table A1.

5 Index Inclusion and Loan Liquidity Improvements

As discussed in Section 4, to examine the changes in loan liquidity around the index inclusion, we construct a panel of loan-week observations from the 8 weeks prior to the index inclusion week to 8 weeks after the index inclusion for the treated loans (i.e., loans added to the index) and control loans. For each treatment loan, we identify ten control loans that are just below the index inclusion size threshold in the inclusion week and have not been added to or excluded from the index over the ± 8 weeks window around the index inclusion week. We do not expect control loans to exhibit any systematic liquidity changes around the treatment loan's index inclusion, thus allowing them to serve as a counterfactual had the treatment loan never been included in the index.

[19] Our findings are robust when these analyses are performed for the sample of 1,647 loans used in all other tests.

We adopt a difference-in-differences (DID) strategy and use the exogenous timing of the weekly rebalancing in LSTA 100 to examine the effect of index inclusion on loan liquidity. We estimate the following regression model:

$$LoanTradingAttribute_{i,t} = \beta Inclusion_i \times Post_t + Controls_{i,t} + LoanFE + WeekFE + \epsilon_{i,t} \quad (1)$$

where *Inclusion* is an indicator variable equal to one for the loans added to the LSTA 100 during a weekly rebalance, and zero otherwise, and *Post* is an indicator variable equal to one for weeks after the treated loan is included in the index, and zero otherwise. The main variable of interest is the DID estimate β, which reflects relative changes in the dependent variables between the treated and control loans before and after the index inclusion. The first two dependent variables in Model (1) we explore are commonly used liquidity measures: the bid-ask spread and the number of market makers. Prior studies that examine the secondary loan market rely on these measures to proxy for liquidity-related transaction costs and market depth because of the absence of publicly available market-wide loan trading data (Wittenberg Moerman, 2009; Phillips, 2023). We expect β to be negative (positive) for the bid-ask spread (the number of market makers). We include loan and week fixed effects in all specifications to isolate within-loan variations and eliminate any time trends. In some specifications, we further control for time-varying volatility. Standard errors are clustered at the week and loan levels.

As is evident from Columns (1) and (2), the coefficients on the interaction term *Inclusion*$\times$ *Post* (the DID estimate) are negative and significant. Based on the specification in Column (2), the bid-ask spreads on the treated loans declines by around 9 bps, which is substantial as it represents around 14% relative to the sample average. With respect to the market depth, the positive and significant coefficients on $Inclusion \times Post$ in Columns (3) and (4) indicate an increase in the number of market makers after the index inclusion of treatment loans relative to control loans. Based on the specification in Column (4), the number of market

makers increases by around 0.6, which represents 10% relative to the sample average of this variable. These findings provide strong support for our proposition that the inclusion in the LSTA 100 index increases the secondary market liquidity for the included loans.

To test the parallel trend assumption and see the effect dynamics, we estimate a dynamic DID model as specified in Equation (2):

$$\begin{aligned} LoanTradingAttribute_{i,t} = & \sum_{s=-8, s\neq -1}^{s=8} \beta_s Inclusion_i \times EventTime_s + \sum_{s=-8, s\neq -1}^{s=8} EventTime_s \\ & + Controls_{i,t} + WeekFE + LoanFE + \epsilon_{i,t}, \end{aligned} \tag{2}$$

where $EventTime_s$ are event time indicator variables, with s representing the number of weeks relative to the inclusion week, ranging from -8 to $+8$. Note that s=-1 (i.e., one week before inclusion) is omitted as the benchmark. Panels A and B of figure 2 plot β_s for the bid-ask spread and the number of market makers, respectively. We do not observe any pre-trend for both measures, supporting the parallel trend assumption. Additionally, the increase in the bid-ask spread and the number of market makers are persistent with no evidence of reversal, with both coefficient estimates remaining significant 8 weeks after the index inclusion. Hence, these findings strongly support our reliance on the weekly rebalancing of the LSTA 100 index being an exogenous shock that improves the liquidity.

In the analyses presented in Columns (5) through (8) of Table 2, we examine two additional measures of the secondary loan market activity that shed light on changes in loan liquidity and the demand of nonbank lenders following the index inclusion. We reestimate model (1) with the price ($Price$) and the natural log of CLO trading volume (CLO_Volume) as the dependent variables. 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. In Columns (5) and (6), as expected, we find a positive and significant coefficient on $Inclusion \times Post$. Based on the specification in Column (6), the price increases by 0.58% following the index inclusion, which represents .59% of the sample mean price. With respect

to CLO trading volume, this measure reflects a market-wide trading depth because CLOs hold nearly 50% of leveraged loans and are the only institutional investor that publicly reports their loan trades. Consistent with our expectations, we find a positive and significant coefficient on $Inclusion \times Post$ in Columns (7) and (8). Regarding the economic magnitude, the coefficient estimate in Column (8) suggests that the average CLO trading volume is around five times higher following the index inclusion. Furthermore, we plot the dynamic effects on price and CLO trading volume in Panels C and D of Figure 2 for the ± 8 weeks window around the index inclusion week. Similar to our findings for the bid-ask spread and the number of market makers, we do not observe any indication of pre-trends. Furthermore, the effects are persistent, with both coefficient estimates remaining significant 8 weeks after the index inclusion.

6 Loan Renegotiation

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 around the LSTA 100 inclusion that reduce the interest rate spread. We start our analyses by presenting descriptive evidence of renegotiations for loans recently added to the LSTA 100 index. We next examine in a multivariate setting whether renegotiation rates are higher for the treatment loans included in the LSTA 100 relative to a control loans. Finally, we investigate the changes in the interest rate for loans renegotiated around the LSTA 100.

6.1 Loan Renegotiation Probability

Figure 3 provides descriptive evidence on the distribution of the timing of loan renegotiations around index inclusion. We plot the distribution for the number of days between the most recent renegotiation (i.e., amendment) and weekly LSTA 100 index inclusion, conditional on a loan being renegotiated at least once within the 180-day window before and after the inclusion. Interestingly, there is a single peak in the distribution with an irregularity before

the zero-day threshold, which is consistent with an intense cluster of loan renegotiations within 30 days ahead of a loan's index inclusion. Descriptively, we observe that 108 of the 239 loans included via weekly LSTA 100 rebalancing are renegotiated within 30 days of index inclusion, suggesting that the index inclusion prompts non-fundamental renegotiation of the leveraged loans.

Motivated by the descriptive evidence that loan amendments are clustered prior to the index inclusion, we visually examine the evolution patterns for the cumulative renegotiation probability between the treatment and control loans. Specifically, we estimate the survivor function using a nonparametric maximum likelihood method as in Kaplan and Meier (1958). Figure 4 presents the cumulative hazard functions within the ±180-day window of index inclusion. The treatment group (red line) includes loans added to the LSTA 100 index during the weekly rebalance. Consistent with prior analyses, the control group (blue line) comprises the ten loans below the index inclusion threshold. The shaded area represents the 95% confidence interval. We document a drastic increase in the renegotiation probability ahead of the index inclusion, while the control loans have a uniform cumulative hazard function of the renegotiation probability around the treatment loan's liquidity shock.

Next, we formally test whether the renegotiation probability of the treatment loans is statistically different from that of control loans using the following linear probability model:

$$Amendment_i = \beta Inclusion_i + Controls_i + WeekFE + \epsilon_i \tag{3}$$

$Amendment_i$ takes a value equal to one if a loan is renegotiated within a window centered around the index inclusion, and zero otherwise. Because renegotiations closely aligned with the inclusion timing are more likely to be triggered by the index inclusion, we use three alternative windows around the inclusion week: ±8 weeks, ±4 weeks, and ±2 weeks. The treatment and control groups are the same as in Table 2. Accordingly, $Inclusion_i$ takes a value equal to one for the loans that are added to the LSTA 100 index during the weekly

rebalances. Please note that, unlike the analyses in Table 2, the analyses here are not a panel because the dependent variable reflects whether a loan is amended within the time window around the index inclusion. Although the lack of a panel prevents us from being able to use loan fixed effects, importantly, our identification strategy still holds as the timing of inclusion is exogenous. Nevertheless, to further mitigate the concern that the difference in loan characteristics may drive our results, we use several covariates that can affect amendment probability, including the loan size (*Size*), time-to-maturity (*Maturity*), interest rate (*InterestRate*), secondary market price (*Price*), as well as past 90-day rolling returns (*Return*) and volatility (*Volatility*). All variables are measured at the 8 weeks prior to the index inclusion week. It is important to note that only the size of the loan affects index inclusion, so the other covariates are intended to explain the potential variation in the dependent variable rather than the variation in the independent variable of interest. Standard errors are clustered at the week level.

We present the results of these analyses in Table 3. The odd columns show the estimates for the models that do not include controls, while the even columns include controls. Across all time window lengths, we find positive and significant coefficients on $Inclusion$, which indicates that a loan is more likely to be renegotiated around the index inclusion relative to control loans. The coefficients on $Inclusion$ are fairly consistent (a) across the different windows and (b) across specifications both with and without controls, further confirming that our treatment variable is unlikely to be affected by a correlated omitted variable. In terms of economic significance, the coefficients on $Inclusion$ in Columns (2), (4) and (6) indicate that loans included in the index have between 32.5% to 39.9% higher probability of being amended relative to control loans. This difference in probabilities translates to index inclusion loans being 1.5 to 2.05 times more likely to be renegotiated relative to the sample mean of this variable.[20] Overall, these findings strongly support our proposition that the increase in liquidity due to LSTA 100 index inclusion leads to non-fundamental loan renegotiations.

[20]This is calculated by dividing the maximum and minimum coefficients on *Incl* in Columns (2), (4) and (6) (.325 and .399, respectively) by the sample mean likelihood of renegotiation (.210).

6.2 Renegotiation Outcomes

Our findings so far suggest that loans are more likely to be renegotiated following the liquidity shock. As such, we further explore whether lenders share the liquidity benefits with borrowers by reducing their cost of debt. Despite the lack of a contractual obligation for lenders to share with borrowers any surplus originated post-loan issuance, we expect lenders to share some liquidity savings to reduce the threat of borrowers refinancing their loans. Following a loan's inclusion in the index, borrowers may be able to refinance with other lenders at the lower interest spread as lenders now require a lower liquidity premium.

Specifically, we estimate the following model:

$$\Delta ContractTerm_{i,t} = \beta Inclusion_{i,t} + Controls_{i,t} + WeekFE + \epsilon_{i,t} \tag{4}$$

where our primary dependent variables reflect the change in loan contractual terms. The first variable is an indicator equal to one if there is a reduction in the loan's interest rate from the 8 weeks before to the 8 weeks after the index inclusion, and zero otherwise (*Interest_Reduce*). This window corresponds to the ±8 weeks window around the index inclusion we rely on in Columns (1) and (2) in Table 3. The second variable reflects the magnitude of the interest rate change over the same period, which is calculated as the interest rate at the end of the 8 weeks post the inclusion week minus the interest rate at the beginning of the 8 weeks prior to the inclusion ($\Delta InterestRate$). If a loan is not renegotiated, this variable takes the value of zero. Consistent with our prior tests, treatment loans are those included in the index and we use the next ten loans that are below the index inclusion size threshold as control loans. In line with this composition of the sample, $Inclusion_i$ takes a value equal to one for the loans that are added to the LSTA 100 index during the weekly rebalance, and zero otherwise. Control variables include loan size (*Size*), time-to-maturity (*Maturity*), interest rate (*InterestRate*), secondary market price (*Price*), returns (*Return*), and volatility (*Volatility*). All variables are measured at the 8 weeks prior to the index inclusion week. We

also include week fixed effects and cluster standard errors at the week level.

Although we expect the lower liquidity premium to be reflected primarily in the loan interest spread, we also test whether non-fundamental renegotiations around index inclusions benefit borrowers through other key loan terms, such as loan amount and maturity. Because a loan's size and maturity are typically tailored to the borrower's investments or working capital needs, when borrowers renegotiate following a shock to their loans' liquidity, we expect that they are more likely to demand interest rate concessions rather than changes in these contractual terms.[21] Nevertheless, we conduct the analyses of a loan's size and maturity because they may help us address a concern that the changes in the interest spread due a loan's index inclusion and the corresponding increase in liquidity are attributable to changes in these terms. For example, a decrease in the interest rate may correspond to the reduction in a loan's size or maturity. Thus, as additional dependent variables, we employ the change in the loan size ($\Delta Size$) and change in maturity ($\Delta Maturity$) over the same window from the 8 weeks before to the 8 weeks after the index inclusion.

We report these analyses in Panel A of Table 4. The positive and significant coefficient on *Interest_Reduce* in Column (1) suggests that treated loans have 37% higher probability to receive a reduction in the interest rate after index inclusion relative to control loans. This difference in probabilities translates into index inclusion loans being 2.81 times more likely to receive an interest rate–reducing renegotiation relative to the sample mean probability of an interest-rate reducing renegotiation.[22] Furthermore, Column (2) shows that treatment loans experience a meaningful reduction in the interest rate by about 21 bps more relative to control loans. This reduction represents 5.9% of the sample mean interest rate of 323 bps.

Figure 5 visualizes this interest rate reduction. We first create a panel of loan-week observations and record the level of the interest rate for each week. The level of the interest

[21]This presumption is consistent with the loan syndication process when the lead arranger solicits bids from participant lenders conditional on a loan's non-price contractual terms and conditions that are already negotiated with the borrower. The interest rate is then determined based on the funding supply that lenders are willing to provide given these terms and conditions (Ivashina and Sun, 2011).

[22]This is calculated by taking the coefficient on *Incl* (.366) and dividing it by the sample mean of *Interest_Reduce* (.130).

rate will change if there is an amendment. We then plot the coefficient of $Inclusion$ interacted with a count variable ($EventTime$) that represents the week of the observation relative to the inclusion week. For example, if a loan-day observation occurs 8 weeks prior to (post) index inclusion, $EventTime$ would take a value of -8 (8). We omit period $EventTime = -8$ as the benchmark period. Week and loan fixed effects are used given the panel structure of the data. Standard errors are clustered at the time and loan levels, and the error bars represent the 95% confidence interval. Consistent with loan renegotiations being clustered within 30 days of the index inclusion, we observe the reduction in the interest rate starting from around 4 weeks prior to the index inclusion week and it is sustained through 8 weeks after inclusion. As expected, there are also no additional changes in the interest rate post-index inclusion.

With respect to other contractual terms, we find no evidence of changes in loan size around the index inclusion. The coefficient on $Inclusion_i$ is insignificant in Columns (3), which indicates that there is no change in the loan size. However, the coefficient on this variable is significant in Column (4), suggesting an increase in loan maturity. Although this finding is not in line with our prediction that non-fundamental renegotiations are unlikely to be associated with changes in non-price contractual terms, an increase in loan maturity cannot explain the reduction in the interest (i.e., if the change in loan pricing compensates for the increase in maturity, we should expect an increase rather than a decrease in the interest rate when maturity increases).

In Panel B, to further support our inference that non-fundamentals renegotiations lead to a decrease in the loan interest spread, we exploit a variation within loan deal (Ivashina and Sun, 2011). Specifically, we modify the control group and use loans from the same deal as the loan included in the LSTA 100 (i.e., arranged as part of the same loan package to the same borrower) but that are not traded or included in the index as control loans (for example, a revolving credit facility). This research design allows us to use both time and deal fixed effects. If there is some contemporaneous shock to the borrower at the time of a loan's inclusion that affects its cost of debt, it should affect the cost of debt for all other loans in

the same loan package. We continue to find that index inclusion significantly increases the likelihood of interest rate reduction and causes a greater reduction in the interest rate. At the same time, inclusion does not influence loan size or maturity. This evidence is consistent with our proposition that non-fundamental renegotiations due to a liquidity shock benefit borrowers primarily through the interest rate reduction and not non-price contractual terms. More importantly, the analyses in Panel B 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.

In Panel C, we explore an additional alternative specification, where we focus on the sample of loans that experience an amendment and estimate the treatment effect of the index inclusion conditional on having an amendment. Specifically, the treatment group includes loans with an amendment that occurs within the ± 8 weeks window of the index inclusion ($Inclusion\_Amend = 1$). The control group includes other loan amendments that happen in the same month as the amendment of the treated loan. Effectively, in these analyses, we compare amendments triggered by the index inclusion with other amendments around the same time to rule out that index inclusions happen to coincide with macroeconomic factors that affect amendments across the loan market. We use industry-by-month fixed effects to control for industry-specific time-varying trends. We find in Columns (1) and (2) consistent directional associations with those reported in Panels A and B, although the coefficient estimates are smaller in magnitude by about half. The drop in magnitude is expected because we are conditioning on all loans in the sample having an amendment, which mechanically increases the probability that control loans will have interest rate–reducing amendments. We also continue to find no change in other loan terms in Columns (3) and (4). Taken together, our analyses in Table 4 demonstrate that the secondary market liquidity has a causal effect on loan pricing through non-fundamental renegotiations triggered by the LSTA 100 inclusions.

7 Exploring the Mechanisms

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 both aggregate credit conditions and cross-sectional variation in borrower and syndicate characteristics to explore this mechanism. Although these analyses focus on the intensive margin of cost savings shared with borrowers (the extent of the interest rate reduction), we also examine the extensive margin (the likelihood of an interest rate–reducing amendment). As we report in Appendix B, the findings for the extensive margin-related analyses are similar to those discussed below.

7.1 Aggregate Credit Supply

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 a greater bargaining power when negotiating with lenders during index-inclusion-related renegotiations.

In Table 5, we explore a set of variables that proxy for the cyclicality of aggregate credit available for private lending and estimate the following model:

$$\Delta InterestRate_i = \alpha + \beta_1 Inclusion_i \times Z_t + \beta_2 Inclusion_i + \beta_3 Z_t + Controls_i + \epsilon_i, \quad (5)$$

where $\Delta InterestRate_i$ is defined as in prior tests. Consistent with these tests, treatment loans are those included in the index and the ten loans that are below the index inclusion size threshold serve as control loans. Z_t are variables that reflect fluctuations in aggregate credit conditions in the US. Neg_FFR is the inverse of the three-month moving average of the

Federal Fund Rates. The reduction in the FFR is typically indicative of an expansion of credit in the economy. We also specifically examine the credit supply by nonbank lenders. $Inst\_Volume$ is the volume of quarterly institutional loans (i.e., loans that are structured for institutional investors) and indicates periods of high institutional investor demand and a potential overheating in the secondary loan market (Becker and Ivashina, 2016). $CLO\_Issuance$ is the quarterly new CLO issuance. Because CLOs are such a large percentage of private loan purchasers, this greater issuance also indicates periods of higher availability of institutional lending capital (Becker and Ivashina, 2016). The next variables follow Becker and Ivashina (2014). $\Delta CorpLoan\_NonBank$ is 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). The higher values of this variable reflect higher institutional demand for private loans. We also consider $\Delta CorpLoan\_Bank$, which is the quarterly change of non-financial corporate loans issued by banks from the US Flow of Funds Accounts (BLNECLBSNNCB - Nonfinancial Corporate Business; Depository Institution Loans N.E.C.; Liability, Level), but expect the availability of funds from banking institutions to be less relevant for the ease of refinancing of leveraged term loans. The coefficient of interest is β_1, which captures the differential effect of *Inclusion* on $\Delta InterestRate$ during periods of stronger and weaker credit conditions. Model (4) includes the same control variables as Model (3) except that we omit week fixed effects because the variation in our interaction terms is time-based.

Table 5 reports our findings. We find evidence consistent with our expectation that credit availability facilitates refinancing around the LSTA 100 index inclusion. The coefficient on the interaction term $Inclusion \times Neg\_FFR$ in Column (1) is negative and significant, suggesting that the effect of index inclusion on the interest rate reduction is more pronounced during periods of credit expansion. Specifically, with respect to nonbank lender credit supply, Columns (2) and (3) report negative and significant coefficients on the interactions terms $Inclusion \times Inst\_Volume$ and $Inclusion \times CLO\_Issuance$, providing evidence that the

interest rate reduction is more pronounced when institutional trading volume and collateralized loan issuance (CLO) are higher. These findings are consistent with the growing threat of refinancing in an overheated institutional credit market. In Columns (4) and (5), we focus on the aggregate corporate lending based on the Flow of Funds Accounts. We find that the coefficient on $Inclusion \times \Delta CorpLoan\_NonBank$ is negative and significant, demonstrating that our findings are particularly salient at times when institutional demand is stronger. This evidence reinforces our findings in Columns (2) and (3) that also indicate a greater sharing of liquidity savings when the supply of funds from nonbank is higher. As expected, we find that the coefficient on $Inclusion \times \Delta CorpLoan\_Bank$ is not significant, suggesting that there is no evidence of a greater sharing of liquidity savings when there is an increase in non-financial corporate loans issued by banks.

7.2 Borrower and Syndicate Characteristics

In addition to aggregate credit conditions that may facilitate loan refinancing, it is possible that the idiosyncratic borrower characteristics affect the relation between the index inclusion and the sharing of liquidity savings in loan renegotiation. We expect to find a greater sharing for borrowers that can more easily refinance their loans with other lenders and thus have stronger bargaining power when renegotiating around LSTA 100 inclusions.

Table 6 Panel A reports these analyses. We reestimate Model (4) by replacing aggregate credit conditions that facilitate refinancing with the borrower-specific proxies for the ease of refinancing. Because these variables are not time-based, we also include in the model time fixed effects.[23] We explore two complementary variables that capture the ease of refinancing at the borrower level. First, we expect borrowers that have an established relationships with a higher number of lead arrangers through prior lending transactions to be able to refinance more easily. $High\_PastLeadArranger$ equals one if the number of lead arrangers with whom the borrower has worked over the past five years exceeds the sample median, and zero otherwise.

[23]We use year FE, instead of week FE as in Panel A of Table 4, to have a richer cross-sectional variation to test the mechanism behind the sharing of liquidity savings. Because only one or two loans are included in the index for each weekly rebalance, it is not possible to test cross-sectional variation in the threat of refinancing when we employ week FE.

Second, borrowers with a greater extent of syndicated loan financing are more valuable clients to lenders and should therefore have a greater flexibility with refinancing their loans. Importantly, this variable also reflects an opportunity costs of losing a business-generating borrower for an existing lead arranger, further enhancing this borrower's bargaining power. Lead arrangers typically charge high loan origination fees and thus significantly benefit from borrowers that rely extensively on the syndicated loan financing.[24] $High\_PastDeal$ equals to one if the number of the borrower's deals over the past five years exceeds the sample median, and zero otherwise.[25] In line with our predictions, we find negative and significant coefficients on $High\_PastLeadArranger$ and $High\_PastDeal$, further supporting our proposition that the threat of refinancing compels lenders to share the liquidity savings with borrowers through non-fundamental renegotiations.

Although borrowers are interested in renegotiating their loans after the index inclusions and lenders are likely to share some liquidity savings with borrowers to reduce the threat of borrowers refinancing their loans, we acknowledge that frictions associated with renegotiations of syndicated loans may diminish this sharing (e.g., Dyreng et al., 2023). Prior research has demonstrated that lenders face coordination costs when engaging in renegotiation due to the heterogenous preferences of different lenders (Gertner and Scharfstein, 1991; Aghion et al., 1992; Caskey et al., 2022). This is particularly salient for the interest rate–reducing renegotiations because amendments to the interest rate require unanimous approval from all syndicate lenders. Therefore, we expect that higher coordination costs will reduce the extent of liquidity cost savings shared with a borrower through renegotiation. We use two proxies for the coordination costs within the syndicate. First, syndicates with a higher number of lenders typically face higher coordination costs during loan renegotiations (Asquith et al., 2005; Saavedra, 2018). We define $High\_NumLender$ to be equal to one if the number of syndicate participants exceeds the sample median. Second, we expect coordination costs

[24]As S&P Syndicated Loan Primer notes, leveraged loans typically carry high loan origination fees ranging from 1% to 5% of the total loan commitment, depending on the complexity of a loan deal

[25]Our findings are similar when we rely on the total loan amount over the past 5 years.

associated with interest rate renegotiations to be higher when participant lenders are less familiar with the borrower and should rely to a greater extent on the information provided by the lead arranger. To capture this construct, we define $NonRelation\_Participants$ as the percentage of lenders with whom the borrower has not worked over the past five years (i.e., the percentage of non-relationship syndicate participants). Panel B of Table 6 reports the results of these analyses. The coefficients on $High\_NumLender$ and $NonRelation\_Participants$ are positive and significant, in line with higher coordination costs within the syndicates reducing the extent of liquidity-related surplus that lenders share with the borrower.

8 Robustness Analyses

8.1 Alternate Control Group

As we demonstrate in Figure 2, control loans in our analyses–those that are just below the inclusion size threshold–do not exhibit any clear pre-trends relative to the treatment loans. Nevertheless, to address a concern that these control loans are somewhat different from treatment loans, we employ an alternative control group. For each treated loan, we identify ten control loans that are just above the index inclusion size threshold in the inclusion week and have not been added to the index over the ± 8 weeks window around the index inclusion week.

We report the results of these analyses in Table 7 Panels A-C. As is evident from Table 7 Panel A, the coefficients on the interaction term $Inclusion \times Post$ are negative and significant in the bid-ask spread specification and positive and significant in the number of market makers, the price and CLO volume specifications, reaffirming our inference that index inclusion increases a loan's liquidity. In line with our primary analyses, we also do not observe any pre-trend in Appendix C Figure C1. In addition, we continue to find positive and significant coefficients on $Inclusion_i$ in Table 7 Panel B, further supporting our primary findings of a higher probability of loan renegotiation around index inclusion. Appendix C Figure C2 that plots the Kaplan-Meier cumulative hazard functions once again reaffirms

this inference. Furthermore, in line with our primary analyses, Table 7 Panel C reports a positive and significant coefficient for *Interest_Reduce* in Column (1) and a negative and significant coefficient for $\Delta InterestRate$ in Column (2), indicating that treated loans have a higher probability to receive a reduction in the interest rate and that they experience a meaningful reduction in the interest rate after the index inclusion. Appendix C Figure C3 further supports the latter inference. Finally, the results reported in Appendix C Tables C1 and C2 are consistent with the threat of refinancing compelling lenders to share liquidity cost savings with borrowers. Overall, the analyses reported in Table 7 and Appendix C suggest that our inferences are not sensitive to the choice of the control sample of loans.

8.2 Placebo Tests: Hypothetical LSTA 100 Index Inclusions

Our results so far provide causal evidence that non-fundamental liquidity shocks have substantial effects on borrowers' debt renegotiation and borrowing costs. To enhance the validity of our findings, we conduct placebo tests using the period *prior* to the introduction of the LSTA 100 index. The LSTA 100 was introduced in October of 2008, so we use the period from 2001 to 2007 to create a hypothetical LSTA 100 index and identify loans that would qualify for weekly inclusion had the index existed. This procedure allows us to rerun our main analyses using hypothetical weekly inclusions to verify that our results are not spurious or driven by some unknown factor correlated with weekly index inclusion (e.g., loan size), loan liquidity, or interest rate-reducing amendments. Specifically, we do not expect to observe that our placebo treatment for weekly 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 (Tables 2 - 4) and present them in Table 8 Panels A-C. Treatment loans are those included in the hypothetical index during weekly rebalancing. As in our previous tests, we identify 10 loans just below the inclusion size threshold as control loans for each loan included in the index. *Placebo_Inclusion* is an indicator variable equal to one for the loans added to the hypothetical LSTA 100 during a weekly rebalance, and

zero otherwise. Our sample includes 157 treatment loans and 793 control loans. In Panel A, we observe that there are no changes in the bid-ask spread, the number of market makers, or the price following index inclusion. Please note that we are unable to examine CLO trading volume because we do not have CLO trading data for this period. These results are inconsistent with placebo inclusion loans experiencing any improvement in liquidity. We also replicate Figure 2 for our placebo tests and report the graphs in Appendix D Figure D1. We do not observe clear patterns of liquidity changes around the index inclusion.

Furthermore, we replicate the hazard model figure (Figure 4) for our placebo tests in Appendix D Figure D2. The confidence interval for the treated loans is much larger, indicating a considerable error in the estimate of the probability of renegotiation for the treated group. The cumulative hazard rates are statistically indistinguishable between the treated and control groups, clearly contrasting with Figure 4, where we document a drastic jump in the probability of renegotiation for the treated group right before the index inclusion. In Panel B, we also find no evidence of an increase in a loan's renegotiation probability around the inclusion in the hypothetical index. Almost all coefficients of the placebo tests are statistically insignificant, and the magnitudes are much smaller than the effect we documented in Table 3. The only marginally significant coefficient is in Column (2) when we use the ± 8 weeks window. However, this coefficient becomes insignificant for tighter testing windows. Therefore, we conclude that there is no systematic wave of renegotiations around our hypothetical index inclusion, which supports our argument that the renegotiation pattern we observed is indeed caused by the liquidity improvement due to the LSTA 100 index inclusion.

In Columns (1) and (2) of Panel C, we find no evidence of associations between hypothetical index inclusion and interest rate–reducing loan amendments or the magnitude of the interest rate changes. We also re-create Figure 5 for the hypothetical index inclusion and present the graph in our Appendix D Figure D3. There is no clear pattern of interest rate reductions around index inclusion. We also find no change in the magnitude of the loan size, but we do find a marginally significant negative association between $Placebo\_Inclusion$ and $\Delta Maturity$.

This is inconsistent with the positive association we observe in Table 4 Panel A and the insignificant association we observe in Table 4 Panels B and C. Overall, the evidence from our placebo tests reinforces the validity of the LSTA 100 weekly index inclusion as a shock to secondary loan market liquidity that prompts non-fundamental renegotiation.

8.3 Exclusion from the LSTA 100 Index and Loan Liquidity

Our main analyses use the weekly index rebalancing to show the liquidity benefits of loan inclusions into the LSTA 100 index. An alternative way to showcase the liquidity benefits of index inclusion is to look at loans that were in the index but are subsequently *excluded*. It is not possible to use the weekly rebalance to study the effect of index exclusion because exclusion in the weekly rebalance only happens when a loan gets repaid or no longer qualifies for the index. Hence, we switch our focus to semi-annual reconstitution. During each semi-annual reconstitution, the LSTA 100 constituency is fully rebalanced such that the 100 largest loans are selected for the index. As a result, some loans at the bottom of the index will be excluded from the LSTA 100. We focus on these loans to examine whether loans experience a reduction in liquidity after exclusion from the index.

To perform these tests, we use the same specification as Model (1) except that the treated loans are now those excluded from the LSTA 100 index as a result of the semi-annual rebalance ($Exclusion$). The control group consists of loans that are just below the index inclusion size threshold that have not been added to or excluded from the index over the ± 8 weeks window around the index exclusion week. We present the results in Appendix E Table E1. We largely find evidence consistent with excluded loans experiencing a liquidity deterioration following the index exclusion. Specifically, we find a significant increase in the bid-ask spread and a significant reduction in both price and CLO trading volume for excluded loans relative to control loans following the index exclusion. Compared with Table 2, and consistent with Cao et al. (2019), the magnitudes of liquidity declines upon index exclusion are generally lower than the liquidity gains upon inclusion. This asymmetric effect suggests that index inclusion has some longer-term liquidity benefits for a loan. Interestingly, we do not find any significant

changes in the number of market makers, suggesting that market makers are not inclined to stop coverage of loans previously included in the index. One potential explanation is that market makers have high upfront costs when starting to cover a loan (e.g., learning about the borrower, the loan terms, and potentially purchasing an interest in the loan), while market makers' cost of maintaining the coverage is low. As a result, market makers can maintain the coverage even after a loan is excluded from the index.

We also repeat the same dynamic DID tests and report the results in Appendix E Figure E1. Consistent with semi-annual rebalance being less exogenous and more predictable, as we discussed in Section 3, we observe some pre-trends for bid-ask spread, price, as well as CLO trading volume. This reemphasizes the importance of focusing on weekly rebalance as an exogenous liquidity shock in our main analysis. Nevertheless, the exclusion analyses' findings further support that inclusion in the index results in meaningful improvements in liquidity with longer-term benefits.

9 Conclusion

In this paper, we explore the dynamics of liquidity risk management by nonbank lenders in the context of private commercial lending, a sector increasingly dominated by entities such as hedge funds, mutual funds, and collateralized lending vehicles. This study is rooted in the increasingly relevant dynamics of the secondary market, which is critical for nonbank lenders who depend on the liquidity it provides due to their fragile sources of funding.

Leveraging novel data from the weekly rebalancing of the LSTA 100 Index, we observe that loans newly added to the index experience meaningfully lower bid-ask spread, larger market making interest, higher secondary market prices, and greater CLO trading volume, relative to control loans that are just below the size threshold required to be added to the index. These results are consistent with index inclusion causally improving loan liquidity and increasing nonbank lender demand. We next examine whether the liquidity-related surplus associated with this improvement in the trading environment is shared with borrowers. We

posit that if this is the case, we should observe loan renegotiations around the index inclusion that result in a reduction in the interest rate spread charged to the borrower. Indeed, we find a substantial increase in the renegotiation probability around loan index inclusions. Moreover, these renegotiations are more likely to be associated with interest rate reductions and with the greater extent of these reductions. Importantly, we find no evidence that other loan terms are modified in a way that explains the interest rate reduction. We also conduct analyses with an alternative control group and a hypothetical index placebo test that support the robustness of our findings. We then attempt to understand why lenders opt to share liquidity-related savings with borrowers through renegotiation in the absence of any contractual mandate to do so. Our findings suggest that the threat of borrowers refinancing with other lenders compels lenders to share these savings. Specifically, we find that the sharing of liquidity savings is more pronounced when economic conditions indicate a high supply of institutional funds and when borrowers can more easily refinance their loans due to their prior syndicated loan experience, with both conditions indicating borrowers' greater bargaining power in loan renegotiations.

These findings advance our understanding of the role of secondary loan market liquidity in private lending. They also demonstrate the importance of nonbank lenders' demand for liquidity in debt contracting. The identification of a non-fundamental force that affects renegotiations further highlights the multifaceted and intricate nature of loan renegotiations.

References

Adelino, Manuel, Sophia Chiyoung Cheong, Jaewon Choi, and Ji Yeol Jimmy Oh, 2023, Mutual fund flows and the supply of capital in municipal financing, *Working Paper* .

Aghion, Philippe, and Patrick Bolton, 1992, An incomplete contracts approach to financial contracting, *The Review of Economic Studies* 59, 473–494.

Aghion, Philippe, Oliver D Hart, and John Moore, 1992, The economics of bankruptcy reform, *Working Paper* .

Amiraslani, Hami, John Donovan, Matthew A Phillips, and Regina Wittenberg-Moerman, 2023, Contracting in the dark: The rise of public-side lenders in the syndicated loan market, *Journal of Accounting and Economics* 101586.

Asquith, Paul, Anne Beatty, and Joseph Weber, 2005, Performance pricing in bank debt contracts, *Journal of Accounting and Economics* 40, 101–128.

Basak, Suleyman, and Anna Pavlova, 2013, Asset Prices and Institutional Investors, *American Economic Review* 103, 1728–1758.

Becker, Bo, and Victoria Ivashina, 2014, Cyclicality of credit supply: Firm level evidence, *Journal of Monetary Economics* 62, 76–93.

Becker, Bo, and Victoria Ivashina, 2016, Covenant-light contracts and creditor coordination, *Working Paper* .

Behn, Markus, Rainer Haselmann, and Paul Wachtel, 2016, Procyclical capital regulation and lending, *The Journal of Finance* 71, 919–956.

Ben-David, Itzhak, Francesco Franzoni, and Rabih Moussawi, 2018, Do etfs increase volatility?, *The Journal of Finance* 73, 2471–2535.

Berger, Allen N, and Gregory F Udell, 2004, The institutional memory hypothesis and the procyclicality of bank lending behavior, *Journal of Financial Intermediation* 13, 458–495.

Bolton, Patrick, 1990, Renegotiation and the dynamics of contract design, *European Economic Review* 34, 303–310.

Bolton, Patrick, and David S Scharfstein, 1996, Optimal debt structure and the number of creditors, *Journal of Political Economy* 104, 1–25.

Bretscher, Lorenzo, Lukas Schmid, Ishita Sen, and Varun Sharma, 2023a, Institutional Corporate Bond Pricing, *Working Paper* .

Bretscher, Lorenzo, Lukas Schmid, and Tiange Ye, 2023b, Passive demand and active supply: Evidence from maturity-mandated corporate bond funds, *Working Paper* .

Bushman, Robert M, and Regina Wittenberg-Moerman, 2012, The role of bank reputation in "certifying" future performance implications of borrowers' accounting numbers, *Journal of Accounting Research* 50, 883–930.

Cao, Charles, Matthew Gustafson, and Raisa Velthuis, 2019, Index membership and small firm financing, *Management Science* 65, 4156–4178.

Caskey, Judson, Kanyuan Kevin Huang, and Daniel Saavedra, 2022, Amendment thresholds and voting rules in debt contracts, *Working Paper* .

Chakraborty, Indraneel, Elia Ferracuti, John Heater, and Matthew A Phillips, 2023, The consequences of fund-level liquidity requirements, *Working Paper* .

Chang, Yen-Cheng, Harrison Hong, and Inessa Liskovich, 2015, Regression Discontinuity and the Price Effects of Stock Market Indexing, *The Review of Financial Studies* 28, 212–246.

Chernenko, Sergey, and Adi Sunderam, 2016, Liquidity transformation in asset management: Evidence from the cash holdings of mutual funds, *Working Paper* .

Christensen, Hans B, Valeri V Nikolaev, and Regina Wittenberg-Moerman, 2016, Accounting information in financial contracting: The incomplete contract theory perspective, *Journal of Accounting Research* 54, 397–435.

Dyreng, Scott, Elia Ferracuti, and Arthur Morris, 2023, Renegotiation costs and contract design, *Working Paper* .

Elkamhi, Redouane, and Yoshio Nozawa, 2022, Fire-sale risk in the leveraged loan market, *Journal of Financial Economics* 146, 1120–1147.

Fabozzi, Frank J, Sven Klingler, Pia Mølgaard, and Mads Stenbo Nielsen, 2021, Active loan trading, *Journal of Financial Intermediation* 46, 100868.

Fleckenstein, Quirin, Manasa Gopal, German Gutierrez Gallardo, and Sebastian Hillenbrand, 2023, Nonbank lending and credit cyclicality, *Working Paper* .

Gabaix, Xavier, and Ralph SJ Koijen, 2022, In search of the origins of financial fluctuations: The inelastic markets hypothesis, *Working Paper* .

Garleanu, Nicolae, and Jeffrey Zwiebel, 2008, Design and renegotiation of debt covenants, *The Review of Financial Studies* 22, 749–781.

Gertner, Robert, and David Scharfstein, 1991, A theory of workouts and the effects of reorganization law, *The Journal of Finance* 46, 1189–1222.

Goldstein, Itay, Hao Jiang, and David T. Ng, 2017, Investor flows and fragility in corporate bond funds, *Journal of Financial Economics* 126, 592–613.

Gupta, Anurag, Ajai K. Singh, and Allan A. Zebedee, 2008, Liquidity in the pricing of syndicated loans, *Journal of Financial Markets* 11, 339–376.

Haddad, Valentin, Paul Huebner, and Erik Loualiche, 2021, How competitive is the stock market? Theory, evidence from portfolios, and implications for the rise of passive investing, *Working Paper* .

Hanson, Samuel G, Andrei Shleifer, Jeremy C Stein, and Robert W Vishny, 2015, Banks as patient fixed-income investors, *Journal of Financial Economics* 117, 449–469.

Hartzmark, Samuel M, and David H Solomon, 2021, Predictable price pressure, *Working Paper* .

Irani, Rustom M, Rajkamal Iyer, Ralf R Meisenzahl, and Jose-Luis Peydro, 2021, The rise of shadow banking: Evidence from capital regulation, *The Review of Financial Studies* 34, 2181–2235.

Ivashina, Victoria, 2009, Asymmetric information effects on loan spreads, *Journal of Financial Economics* 92, 300–319.

Ivashina, Victoria, and Zheng Sun, 2011, Institutional stock trading on loan market information, *Journal of Financial Economics* 100, 284–303.

Kamstra, Mark J, Gordon S Roberts, and Pei Shao, 2014, Does the secondary loan market reduce borrowing costs?, *Review of Finance* 18, 1139–1181.

Kaplan, E. L., and Paul Meier, 1958, Nonparametric Estimation from Incomplete Observations, *Journal of the American Statistical Association* 53, 457–481.

Kashyap, Anil K, Natalia Kovrijnykh, Jian Li, and Anna Pavlova, 2021, The benchmark inclusion subsidy, *Journal of Financial Economics* 142, 756–774.

Koijen, Ralph S. J., and Motohiro Yogo, 2019, A Demand System Approach to Asset Pricing, *Journal of Political Economy* 127, 1475–1515.

Koont, Naz, Yiming Ma, Lubos Pastor, and Yao Zeng, 2022, Steering a ship in illiquid waters: Active management of passive funds, *Working Paper* .

Kubitza, Christian, 2021, Investor-driven corporate finance: Evidence from insurance markets, *Working Paper* .

Leuz, Christian, Alexander Triantis, and Tracy Yue Wang, 2008, Why do firms go dark? causes and economic consequences of voluntary sec deregistrations, *Journal of Accounting and Economics* 45, 181–208.

Ma, Yiming, Kairong Xiao, and Yao Zeng, 2022, Mutual Fund Liquidity Transformation and Reverse Flight to Liquidity, *The Review of Financial Studies* 35, 4674–4711.

Marta, Thomas, 2024, Corporate bond ETFs, bond liquidity, and ETF trading volume, *Working Paper* .

Nandy, Debarshi K, and Pei Shao, 2008, Institutional investment in syndicated loans, *Working Paper* .

Nikolaev, Valeri V, 2018, Scope for renegotiation in private debt contracts, *Journal of Accounting and Economics* 65, 270–301.

Pavlova, Anna, and Taisiya Sikorskaya, 2023, Benchmarking Intensity, *The Review of Financial Studies* 36, 859–903.

Phillips, Matthew A, 2023, Originate-to-distribute lending relationships and market making in the secondary loan market, *Working Paper* .

Roberts, Michael R, 2015, The role of dynamic renegotiation and asymmetric information in financial contracting, *Journal of Financial Economics* 116, 61–81.

Roberts, Michael R, and Amir Sufi, 2009a, Financial contracting: A survey of empirical research and future directions, *Annu. Rev. Financ. Econ.* 1, 207–226.

Roberts, Michael R, and Amir Sufi, 2009b, Renegotiation of financial contracts: Evidence from private credit agreements, *Journal of Financial Economics* 93, 159–184.

Rodano, Giacomo, Nicolas Serrano-Velarde, and Emanuele Tarantino, 2018, Lending standards over the credit cycle, *The Review of Financial Studies* 31, 2943–2982.

Saavedra, Daniel, 2018, Syndicate size and the choice of covenants in debt contracts, *The Accounting Review* 93, 301–329.

Santos, João AC, and Peter Nigro, 2009, Is the secondary loan market valuable to borrowers?, *The Quarterly Review of Economics and Finance* 49, 1410–1428.

Saunders, Anthony, Pei Shao, and Yuchao Xiao, 2024, Private information disclosure in the secondary loan market and its impact on equity market trading costs, *Journal of Financial Markets* 67, 100867.

Shim, John J, and Karamfil Todorov, 2022, ETFs, illiquid assets, and fire sales, *Working Paper* .

Sikorskaya, Taisiya, 2023, Institutional investors, securities lending and short-selling constraints, *Working Paper* .

Sufi, Amir, 2007, Information asymmetry and financing arrangements: Evidence from syndicated loans, *The Journal of Finance* 62, 629–668.

Wittenberg-Moerman, Regina, 2008, The role of information asymmetry and financial reporting quality in debt trading: Evidence from the secondary loan market, *Journal of Accounting and Economics* 46, 240–260.

Wittenberg Moerman, Regina, 2009, The impact of information asymmetry on debt pricing and maturity, *Working Paper* .

Zhu, Qifei, 2021, Capital supply and corporate bond issuances: Evidence from mutual fund flows, *Journal of Financial Economics* 141, 551–572.

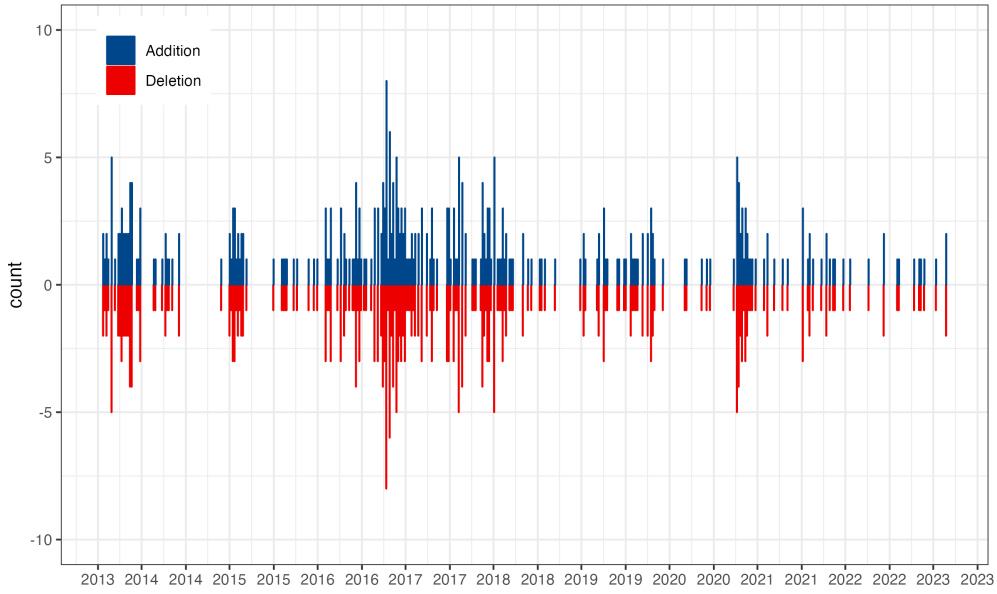


Figure 1: LSTA 100 Index Weekly Additions and Deletions Over Time

This figure plots the LSTA 100 weekly index rebalancing activity over our sample period.

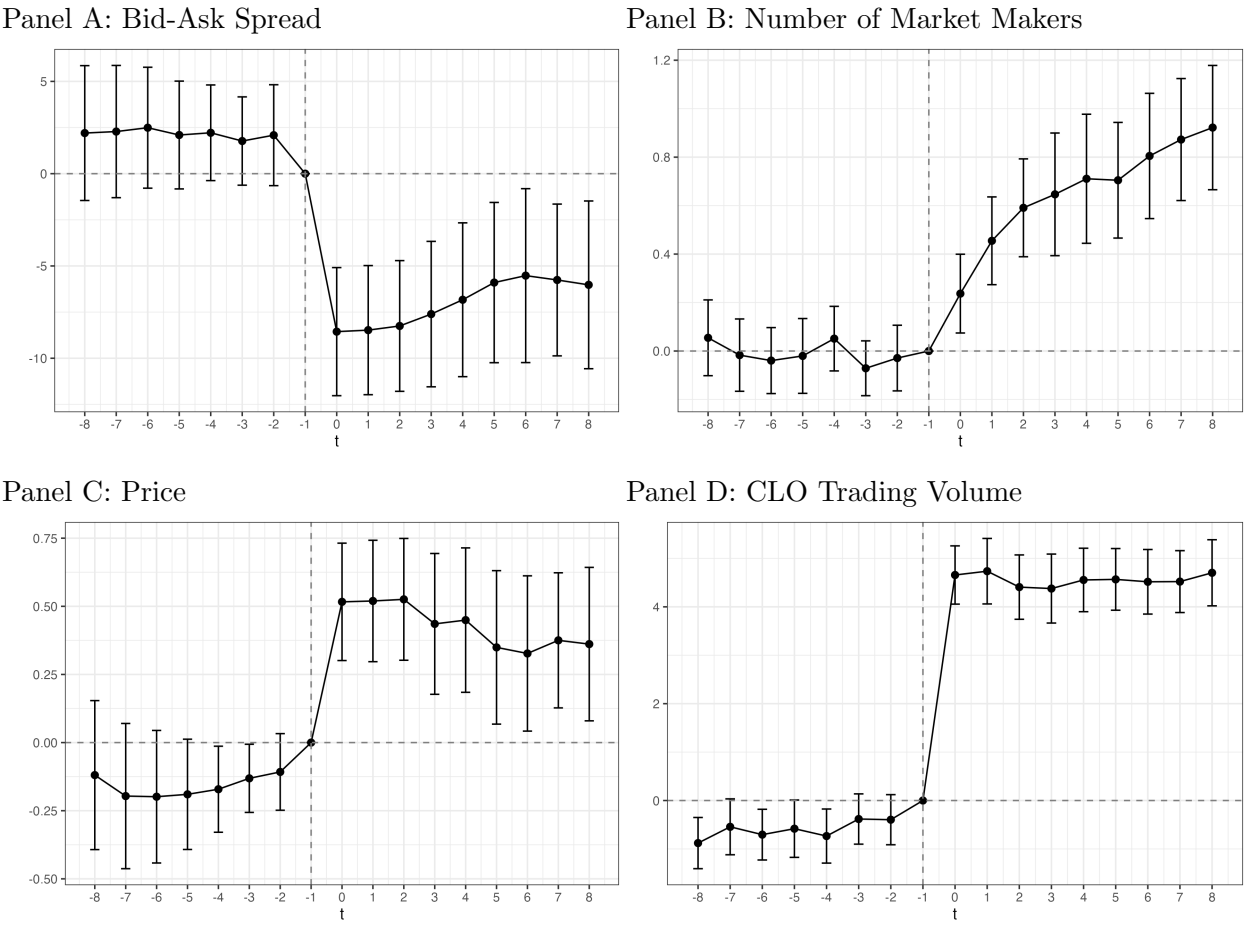


Figure 2: Index Inclusion Effects on Loan Trading Attributes

This figure plots the effect of LSTA 100 weekly index inclusion on loan trading attributes. We estimate the following regression model:

$$LoanTradingAttribute_{i,t} = \sum_{s=-8, s\neq -1}^{s=8} \beta_s Inclusion_i \times EventTime_s + \sum_{s=-8, s\neq -1}^{s=8} EventTime_s + Controls_{i,t} + WeekFE + LoanFE + \epsilon_{i,t}$$

Panels A through D show the effect of weekly index inclusion on the bid-ask spread, the number of market makers, the price, and the CLO trading volume relative to one week before the index inclusion. $Inclusion_i = 1$ for loans added to the LSTA 100 during a weekly rebalance. The control group includes ten loans just below the index inclusion threshold and that have not been included or excluded within the test window (± 8 weeks). $EventTime_s$ are time dummies relative to the inclusion week, where $t = 0$ is the inclusion week. Period $t = -1$ (i.e., one period prior to the inclusion week) is omitted as the benchmark. We plot β_s for s from $t - 8$ to $t + 8$. We include week and loan fixed effects and control for 90 days of rolling price volatility. Week and loan fixed effects are included. Standard errors are clustered at the week and loan levels. Error bars represent the 95% confidence interval.

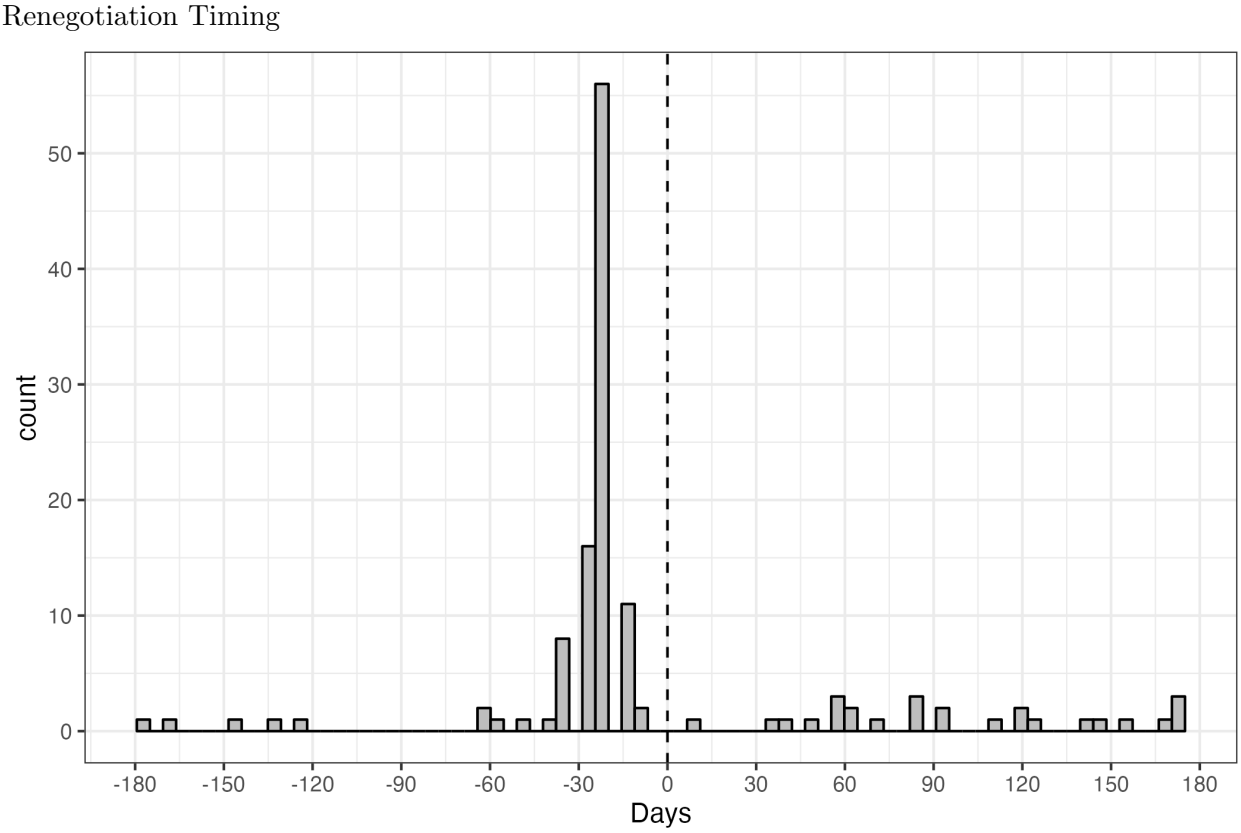


Figure 3: Renegotiation Timing

The figure plots the histogram of the number of days between the most recent amendment and weekly LSTA 100 index inclusion, conditional on the loan being amended once within 180 days pre or post index inclusion.

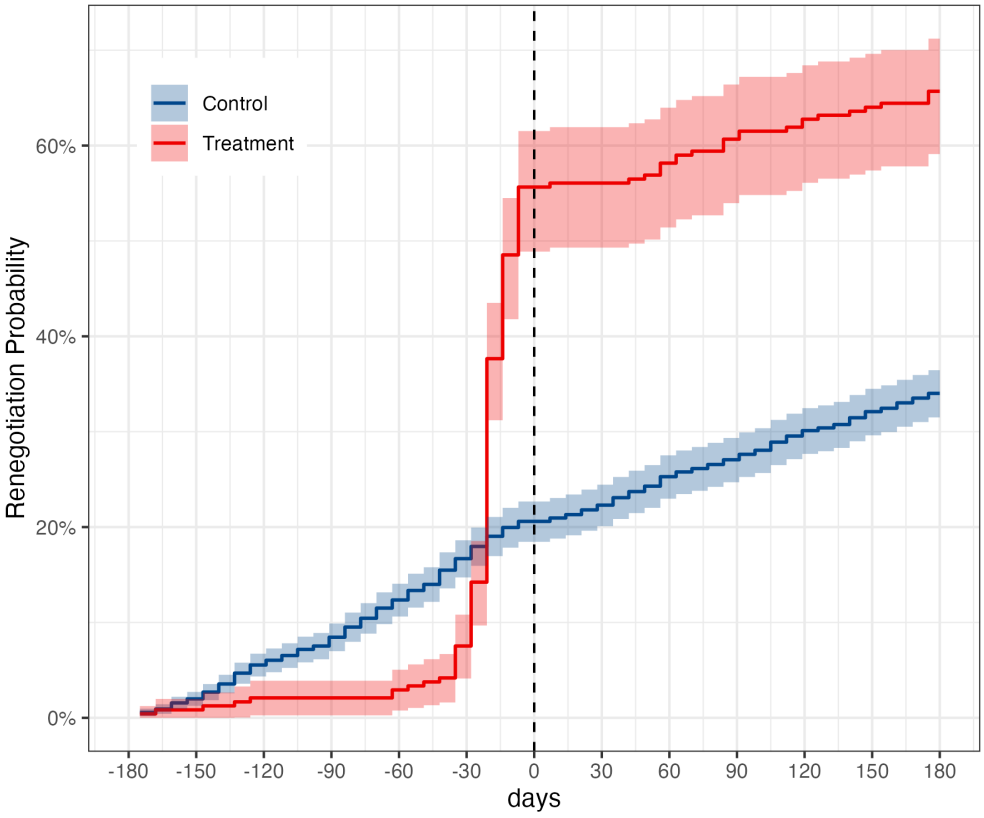


Figure 4: Renegotiation Likelihood: Hazard Model

The figure plots the Kaplan-Meier cumulative hazard functions for having a renegotiation within the ± 180 days window of index inclusion. The treatment group (red line) includes loans added to the LSTA 100 index during the weekly rebalance. The control group (blue line) includes the ten loans just below the index inclusion threshold and that have not been included or excluded within the test window (±8 weeks). The shaded area represents the 95% confidence interval.

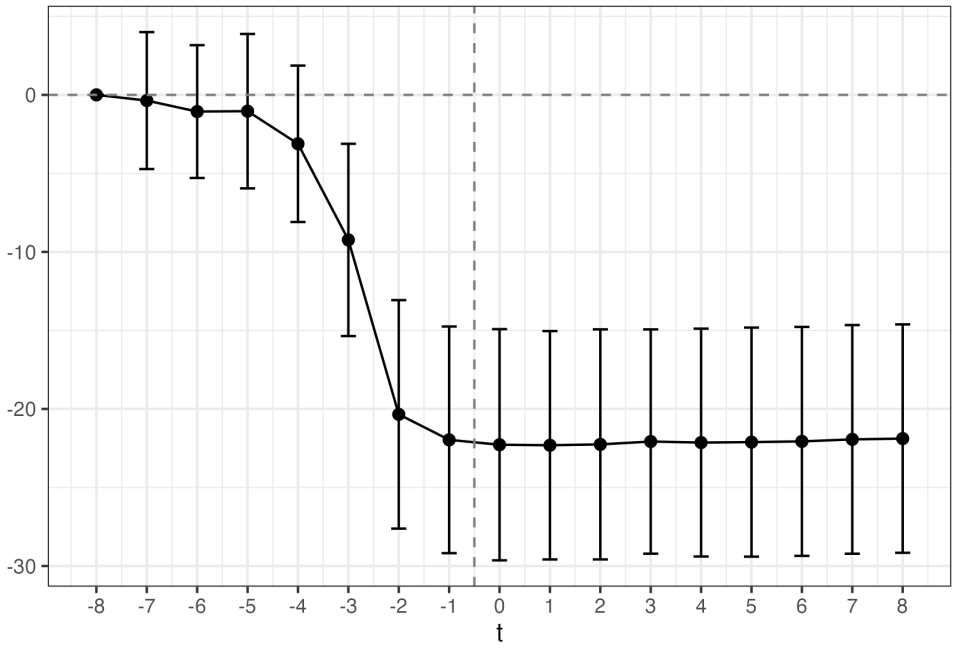


Figure 5: Interest Rate Reduction

This figure plots the estimated effect of index inclusion on the interest rate spread. We estimate the following regression models:

$$InterestRate_{i,t} = \sum_{s=-7}^{s=8} \beta_s Inclusion_i \times EventTime_s + \sum_{s=-7}^{s=8} EventTime_s + Controls_{i,t} + WeekFE + LoanFE + \epsilon_{i,t}$$

$Inclusion_i = 1$ for loans added to the LSTA 100 during weekly rebalance. The control group includes ten loans just below the index inclusion threshold and that have not been included or excluded within the test window (± 8 weeks). $EventTime_s$ are time dummies relative to the inclusion week, where $s = 0$ is the inclusion week. Period $s = -8$ (i.e., 8 weeks prior to the inclusion week) is omitted as the benchmark period. The figure plots β_s for s from -8 to $+8$. Week and loan fixed effects are used. Control variables include loan size, maturity, interest rate, price, past 90 days rolling window return and volatility. Week and loan fixed effects are included. Standard errors are clustered at the week and loan levels. Error bars represent the 95% confidence interval.

Table 1: Summary Statistics

This table reports descriptive statistics for the full sample, as well as the inclusion (treatment) and control samples. All variables are defined in Appendix A.

	Full sample						**Inclusion Sample**			**Control Sample**		
	N	Mean	Std	P25	Median	P75	N	Mean	Std	N	Mean	Std
BidAsk	34867	63.52	44.47	40.00	50.00	71.88	5661	53.54	38.12	29206	65.46	45.35
N_MarketMaker	34867	5.93	2.28	4.00	6.00	7.40	5661	6.18	2.59	29206	5.88	2.21
Volatility	34867	87.39	149.91	16.44	32.62	84.97	5661	64.87	149.07	29206	91.76	149.68
Price	34867	97.97	6.84	98.35	99.88	100.41	5661	99.27	4.24	29206	97.72	7.21
CLO_Volume	34867	5.97	3.83	0.00	7.82	8.78	5661	5.11	4.32	29206	6.14	3.71
InterestRate	1647	329.54	98.01	275.00	325.00	375.00	239	306.85	81.37	1408	333.39	100.07
Size	1647	7.46	0.40	7.32	7.50	7.65	239	7.79	0.44	1408	7.40	0.37
Maturity	1647	5.12	1.45	4.06	5.39	6.27	239	5.89	1.26	1408	4.99	1.45
Amendment	1647	0.21	0.41	0.00	0.00	0.00	239	0.59	0.49	1408	0.15	0.36
Interest_Reduce	1647	0.13	0.33	0.00	0.00	0.00	239	0.51	0.50	1408	0.06	0.24
$\Delta InterestRate$	1647	-6.00	21.84	0.00	0.00	0.00	239	-26.36	33.62	1408	-2.54	16.87
$\Delta Size$	1647	0.01	0.10	0.00	0.00	0.00	239	0.02	0.20	1408	0.01	0.08
$\Delta Maturity$	1647	0.07	0.49	0.00	0.00	0.00	239	0.23	0.77	1408	0.04	0.42
Neg_FFR	1647	-0.88	0.83	-1.55	-0.66	-0.09	239	-0.99	0.78	1408	-0.86	0.83
Inst_Volume	1647	68.05	30.87	48.23	67.23	93.15	239	70.49	30.71	1408	67.63	30.89
CLO_Issuance	1647	21.39	6.05	16.91	20.09	26.01	239	21.55	5.69	1408	21.36	6.11
$\Delta CorpLoan\_Bank$	1647	0.94	4.40	-1.38	0.54	2.25	239	0.80	4.18	1408	0.97	4.43
$\Delta CorpLoan\_NonBank$	1647	3.20	3.40	0.84	2.70	4.79	239	3.48	3.06	1408	3.15	3.45
High_PastLeadArranger	1647	0.63	0.48	0.00	1.00	1.00	239	0.69	0.46	1408	0.62	0.49
High_PastDeal	1647	0.55	0.50	0.00	1.00	1.00	239	0.64	0.48	1408	0.54	0.50
High_NumLender	1647	0.61	0.49	0.00	1.00	1.00	239	0.59	0.49	1408	0.62	0.49
NonRelation_Participants	1647	0.42	0.37	0.00	0.40	0.75	239	0.44	0.40	1408	0.41	0.36

Table 2: The Effect of Index Inclusion on Loan Trading Attributes

This table reports the results of the analyses of the effect of LSTA 100 index inclusion on loan trading attributes that reflect loan liquidity. We estimate the following model:

$$LoanTradingAttribute_{i,t} = \beta Inclusion_i \times Post_t + Post_t + Controls_{i,t} + LoanFE + WeekFE + \epsilon_{i,t}$$

$Inclusion_i = 1$ if the loan is added to the LSTA 100 during a weekly rebalance (i.e., treated loan), and zero otherwise. $Post_t = 1$ if the loan-week observation occurs after the treated loan is added to the LSTA 100 index, and zero otherwise. The control group includes ten loans just below the index inclusion threshold and that have not been included or excluded within the ±8 weeks window of the index inclusion. Columns (1) and (2) report results for the bid-ask spread ($BidAsk$), columns (3) and (4) report results for the number of market markers ($N\_MarketMaker$), columns (5) and (6) report results for the secondary market price ($Price$), columns (7) and (8) report results for CLO trading volume (CLO_Volume). The even columns include the control variable, which is the 90 days rolling price volatility ($Volatility$). All specifications include week and loan fixed effects. Standard errors clustered at the week and loan levels are presented in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10%, respectively.

	$BidAsk$		$N\_MarketMaker$		$Price$		CLO_Volume	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$Inclusion \times Post$	−9.153***	−8.871***	0.665***	0.667***	0.582***	0.567***	5.071***	5.075***
	(1.663)	(1.651)	(0.104)	(0.104)	(0.135)	(0.131)	(0.227)	(0.228)
$Post$	−0.012	−0.052	−0.023	−0.024	0.007	0.009	0.026	0.025
	(0.360)	(0.381)	(0.021)	(0.021)	(0.028)	(0.027)	(0.068)	(0.068)
$Volatility$		0.059***		0.0004		−0.003		0.001
		(0.017)		(0.0003)		(0.003)		(0.001)
Week FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Loan FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	34,867	34,867	34,867	34,867	34,867	34,867	34,867	34,867
Adjusted R^2	0.828	0.831	0.842	0.842	0.952	0.952	0.335	0.335

Table 3: The Effect of Index Inclusion on Renegotiation Probability

This table reports the results of the analyses of the effect of LSTA 100 index inclusion on renegotiation probability. We estimate the following model:

$$Amendment_i = \beta Inclusion_i + Controls_i + WeekFE + \epsilon_i$$

$Amendment_i = 1$ if the loan is renegotiated within the test window centered around the treatment loan's index inclusion, and zero otherwise. $Inclusion_i = 1$ if the loan is added to the LSTA 100 index during a weekly rebalance (treated loan), and zero otherwise. The control group includes ten loans just below the index inclusion threshold and that have not been included or excluded within the ±8 weeks window of the index inclusion. Columns (1) to (2) use a ±8 weeks window, Columns (3) to (4) use a ±4 weeks window, and Columns (5) to (6) use a ±2 weeks window. Control variables include loan size (*Size*), time-to-maturity (*Maturity*), interest rate (*InterestRate*), secondary market price (*Price*), as well as past 90 day rolling returns (*Return*) and volatility (*Volatility*). All specifications include week fixed effects. Standard errors clustered at the week level are presented in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10%, respectively.

	Amendment ±8 weeks window		*Amendment* ±4 weeks window		*Amendment* ±2 weeks window	
	(1)	(2)	(3)	(4)	(5)	(6)
Inclusion	0.382***	0.395***	0.431***	0.423***	0.341***	0.331***
	(0.043)	(0.047)	(0.045)	(0.048)	(0.043)	(0.044)
Controls	No	Yes	No	Yes	No	Yes
Week FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,647	1,647	1,647	1,647	1,647	1,647
Adjusted R^2	0.233	0.259	0.300	0.313	0.320	0.323

Table 4: The Effect of Index Inclusion on Renegotiation Outcomes

This table reports the results of the analyses of the effect of weekly LSTA 100 index inclusion on renegotiation outcomes. We estimate the following model:

$$\Delta\ ContractTerm_{i,t} = \beta Inclusion_{i,t} + Controls_{i,t} + WeekFE + \epsilon_{i,t}$$

$Inclusion_i = 1$ if the loan is added to the LSTA 100 index during a weekly rebalance (treated loan), and zero otherwise. The dependent variables are the change in contract terms from $t-8$ to $t+8$, i.e., changes over the ± 8 weeks window around the index inclusion. The dependent variable of Columns (1) and (2) are an indicator variable of whether the loan has an interest rate reducing amendment ($Interest\_Reduce$) and the magnitude of the interest rate reduction ($\Delta InterestRate$), respectively. The dependent variables in Columns (3) and (4) are the changes in loan size ($\Delta\ Size$) and maturity ($\Delta\ Maturity$), respectively. Panel A shows the baseline results where the control group includes ten loans just below the index inclusion threshold and that have not been included or excluded within the ± 8 weeks window of the index inclusion. The specifications in this panel include week fixed effects. Panel B uses loans from the same lending deal (i.e., from the same borrower and within the same package, such as a revolving credit facility) but that are *not experiencing index inclusion* as the control group. The specifications in this panel include week and deal fixed effects. In Panel C, we estimate the treatment effect conditional on having an amendment, and compare the amendment outcomes around index inclusions with amendments in the same month of loans not experiencing inclusion in the index. Specifically, the treatment group includes loans with an amendment that happens within the ± 8 weeks window of the index inclusion ($Inclusion\_Amend = 1$). The control group includes loans that are amended in the same month as treatment loans but are not added to the index. All specification in this panel include industry-by-month fixed effects. Control variables include loan size (*Size*), time-to-maturity (*Maturity*), the level of interest rate (*InterestRate*), secondary market price (*Price*), as well as past 90 day rolling returns (*Return*) and volatility (*Volatility*). Standard errors clustered at the week level are presented in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10%, respectively.

Table 4: The Effect of Index Inclusion on Renegotiation Outcomes—*Continued*

Panel A: Baseline				
	Interest_Reduce	$\Delta InterestRate$	$\Delta Size$	$\Delta Maturity$
	(1)	(2)	(3)	(4)
Inclusion	0.366***	−21.361***	0.021	0.239***
	(0.048)	(3.160)	(0.016)	(0.063)
Controls	Yes	Yes	Yes	Yes
Week FE	Yes	Yes	Yes	Yes
Observations	1,647	1,647	1,647	1,647
Adjusted R^2	0.344	0.225	0.049	0.049
Panel B: Within Deal Variation				
	Interest_Reduce	$\Delta InterestRate$	$\Delta Size$	$\Delta Maturity$
	(1)	(2)	(3)	(4)
Inclusion	0.359***	−20.180***	0.012	0.102
	(0.087)	(4.551)	(0.028)	(0.062)
Week FE	Yes	Yes	Yes	Yes
Deal FE	Yes	Yes	Yes	Yes
Observations	562	562	562	562
Adjusted R^2	0.490	0.364	−0.074	0.401
Panel C: Conditional on Amendment				
	Interest_Reduce	$\Delta InterestRate$	$\Delta Size$	$\Delta Maturity$
	(1)	(2)	(3)	(4)
Inclusion_Amend	0.180***	−8.710***	0.034	0.012
	(0.037)	(3.123)	(0.022)	(0.113)
Controls	Yes	Yes	Yes	Yes
Ind-by-Month FE	Yes	Yes	Yes	Yes
Observations	3,688	3,688	3,688	3,688
Adjusted R^2	0.141	0.148	0.075	0.224

Table 5: The Effect of Index Inclusion on Renegotiation Outcomes Conditional on Aggregate Credit Conditions

This table reports the results of the analyses of how aggregate credit conditions affect the association between index inclusion and renegotiation outcomes. We estimate the following model:

$$\Delta InterestRate_i = \alpha + \beta_1 Inclusion_t \times Z_t + \beta_2 Inclusion_i + \beta_3 Z_t + Controls_i + \epsilon_i$$

$Inclusion_i = 1$ if the loan is added to the LSTA 100 index during a weekly rebalance (treated loan), and zero otherwise. The control group includes ten loans just below the index inclusion threshold and that have not been included or excluded within the ±8 weeks window of the index inclusion. The dependent variable, $\Delta InterestRate_i$, is the interest rate change from $t-8$ to $t+8$, i.e., changes over the ±8 weeks window around the index inclusion. Z_t are variables capturing the time-series variation of aggregate credit conditions. $Neg_FFR$is the inverse of the three-month moving average of the Federal Fund Rates. $Inst\_Volume$ is the volume of quarterly institutional loans (i.e., loans that are structured for institutional investors). $CLO\_Issuance$ is the quarterly new CLO issuance. $\Delta CorpLoan\_NonBank$ is the quarterly change of non-financial corporate loans issued by non-bank institutions. $\Delta CorpLoan\_Bank$ is the quarterly change of non-financial corporate loans issued by banks. Control variables include loan size (*Size*), time-to-maturity (*Maturity*), the level of interest rate (*InterestRate*), secondary market price (*Price*), as well as past 90 day rolling returns (*Return*) and volatility (*Volatility*). Robust standard errors are presented in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10%, respectively.

	$\Delta InterestRate$				
	(1)	(2)	(3)	(4)	(5)
$Inclusion$	−29.106***	−13.033**	−6.169	−19.563***	−25.094***
	(3.448)	(5.079)	(8.455)	(3.000)	(2.486)
$Inclusion \times Neg\_FFR$	−4.088*				
	(2.335)				
$Inclusion \times Inst\_Volume$		−0.170**			
		(0.067)			
$Inclusion \times CLO\_Issuance$			−0.900**		
			(0.382)		
$Inclusion \times \Delta CorpLoan\_NonBank$				−1.658**	
				(0.664)	
$Inclusion \times \Delta CorpLoan\_Bank$					−0.313
					(0.494)
Controls	Yes	Yes	Yes	Yes	Yes
Observations	1,647	1,647	1,647	1,647	1,647
Adjusted R^2	0.183	0.199	0.188	0.191	0.179
Note:					*p<0.1; **p<0.05; ***p<0.01

Table 6: The Effect of Index Inclusion on Renegotiation Outcomes Conditional on Borrower and Syndicate Characteristics

This table reports the results of the analyses of how borrower bargaining power (Panel A) and renegotiation frictions (Panel B) affect the association between index inclusion and renegotiation outcomes.

$$\Delta InterestRate_i = \alpha + \beta_1 Inclusion_t \times Z_t + \beta_2 Inclusion_i + \beta_3 Z_t + Controls_i + \epsilon_i$$

$Inclusion_i = 1$ if the loan is added to the LSTA 100 index during a weekly rebalance (treated loan), and zero otherwise. The control group includes ten loans just below the index inclusion threshold and that have not been included or excluded within the ±8 weeks window of the index inclusion. The dependent variable $\Delta InterestRate_{i,t}$ is the change in interest rate over the test window (±8 weeks). *High_PastLeadArranger* equals one if the number of lead arrangers with whom the borrower has worked over the last five years exceeds the sample median. *High_PastDeal* equals one if the number of the borrower's deals over the last five years exceeds the sample median. *High_NumLender* equals one if the number of syndicate participants exceeds the sample median. *NonRelation_Participants* is the percentage of syndicate participants with whom the borrower has no prior relationship. Control variables include loan size (*Size*), time-to-maturity (*Maturity*), the level of interest rate (*InterestRate*), secondary market price (*Price*), as well as past 90 day rolling returns (*Return*) and volatility (*Volatility*). All specifications include year fixed effects. Standard errors clustered at the year level are presented in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Borrower Bargaining Power

	$\Delta InterestRate$	
	(1)	(2)
Inclusion	−15.954**	−14.294**
	(5.415)	(4.396)
Inclusion × *High_PastLeadArranger*	−12.073***	
	(3.170)	
Inclusion × *High_PastDeal*		−15.727***
		(2.220)
Year FE	Yes	Yes
Observations	1,647	1,647
Adjusted R^2	0.215	0.221

Panel B: Renegotiation Frictions

	$\Delta InterestRate$	
	(1)	(2)
Inclusion	−32.815***	−32.842***
	(6.498)	(9.061)
Inclusion × *High_NumLender*	15.820***	
	(3.662)	
Inclusion × *NonRelation_Participants*		15.631*
		(7.281)
Year FE	Yes	Yes
Observations	1,647	1,647
Adjusted R^2	0.228	0.215

Table 7: Alternative Control Group

This table repeats the baseline analysis on secondary market activity, renegotiation probability, and renegotiation outcomes using an alternative control group. The alternative control group includes ten loans just *above* the index inclusion threshold and that have not been included or excluded within the ±8 weeks window of the index inclusion. Panel A reports the results on loan trading attributes, corresponding to Table 2. Panel B reports the results on renegotiation probability, corresponding to Table 3. Panel C reports the results on renegotiation outcomes, corresponding to Table 4 Panel A. All model specifications and standard error clustering are the same as the corresponding tables in the baseline analysis.

Panel A: Secondary Market Activity

	BidAsk		*N_MarketMaker*		*Price*		*CLO_Volume*	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Inclusion × *Post*	−8.231***	−8.215***	0.671***	0.670***	0.564***	0.563***	5.125***	5.125***
	(1.690)	(1.673)	(0.099)	(0.098)	(0.141)	(0.140)	(0.230)	(0.230)
Post	−0.310	−0.285	−0.020	−0.021	0.021	0.019	0.060	0.061
	(0.345)	(0.351)	(0.024)	(0.024)	(0.027)	(0.028)	(0.068)	(0.068)
Volatility		0.031**		−0.001***		−0.002		0.001
		(0.012)		(0.0003)		(0.002)		(0.001)
Week FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Loan FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	34,391	34,391	34,391	34,391	34,391	34,391	34,391	34,391
Adjusted R^2	0.857	0.858	0.858	0.859	0.955	0.955	0.367	0.367

Panel B: Renegotiation Probability

	Amendment ±8 weeks window		*Amendment* ±4 weeks window		*Amendment* ±2 weeks window	
	(1)	(2)	(3)	(4)	(5)	(6)
Inclusion	0.413***	0.393***	0.429***	0.414***	0.326***	0.312***
	(0.038)	(0.038)	(0.040)	(0.040)	(0.038)	(0.037)
Controls	No	Yes	No	Yes	No	Yes
Week FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,658	1,658	1,658	1,658	1,658	1,658
Adjusted R^2	0.286	0.303	0.352	0.364	0.331	0.338

Panel C: Renegotiation Outcomes

	Interest_Reduce	Δ*InterestRate*	Δ*Size*	Δ*Maturity*
	(1)	(2)	(3)	(4)
Inclusion	0.389***	−21.063***	0.009	0.267***
	(0.041)	(2.686)	(0.015)	(0.060)
Controls	Yes	Yes	Yes	Yes
Week FE	Yes	Yes	Yes	Yes
Observations	1,658	1,658	1,658	1,658
Adjusted R^2	0.410	0.348	0.111	0.096

Table 8: Placebo Tests

This table reports the placebo test results where we construct a hypothetical LSTA 100 index prior to the actual introduction of the LSTA 100 index. *Placebo_Inclusion* = 1 for the loans added to the our hypothetical index during a weekly rebalance, and zero otherwise. the control group includes ten loans just below the hypothetical index inclusion threshold and that have not been included or excluded within the ±8 weeks window of the index inclusion.. Panel A reports the results for loan trading attributes, corresponding to Table 2. Panel B reports the results for renegotiation probability, corresponding to Table 3. Panel C reports the results on renegotiation outcomes, corresponding to Table 4 Panel A. All model specifications and standard error clustering are the same as the corresponding tables in the baseline analysis.

Panel A: Secondary Market Activity

	BidAsk		*N_MarketMaker*		*Price*	
	(1)	(2)	(3)	(4)	(5)	(6)
Placebo_Inclusion × *Post*	−7.282	−5.096	0.115	0.118	0.538	0.416
	(12.276)	(11.764)	(0.143)	(0.142)	(0.709)	(0.764)
Post	−0.151	−0.371	0.005	0.004	−0.067	−0.054
	(2.361)	(2.309)	(0.017)	(0.017)	(0.100)	(0.105)
Volatility		12.602***		0.016*		−0.702***
		(3.554)		(0.009)		(0.231)
Week FE	Yes	Yes	Yes	Yes	Yes	Yes
Loan FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	16,150	16,150	16,150	16,150	16,150	16,150
Adjusted R^2	0.909	0.913	0.957	0.957	0.981	0.983

Panel B: Renegotiation Probability

	Amendment ±8 weeks window		*Amendment* ±4 weeks window		*Amendment* ±2 weeks window	
	(1)	(2)	(3)	(4)	(5)	(6)
Placebo_Inclusion	0.102	0.123*	0.075	0.081	0.049	0.052
	(0.063)	(0.063)	(0.050)	(0.052)	(0.041)	(0.042)
Controls	No	Yes	No	Yes	No	Yes
Week FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	950	950	950	950	950	950
Adjusted R^2	0.046	0.055	0.029	0.029	0.011	0.008

Panel C: Renegotiation Outcomes

	Interest_Reduce	Δ*InterestRate*	Δ*Size*	Δ*Maturity*
	(1)	(2)	(3)	(4)
Placebo_Inclusion	−0.007	0.250	−0.006	−0.170*
	(0.006)	(0.685)	(0.007)	(0.091)
Controls	Yes	Yes	Yes	Yes
Week FE	Yes	Yes	Yes	Yes
Observations	950	950	950	950
Adjusted R^2	−0.008	0.004	0.010	0.091

A Variable Definition

Table A1: Variable Definition

Variable	Definition
$Inclusion$	An indicator variable equal to one if the loan is added to the LSTA 100 index during the weekly rebalance, and zero otherwise.
$Exclusion$	An indicator variable equal to one if the loan is excluded from the LSTA 100 index during the semi-annual rebalance, and zero otherwise.
$BidAsk$	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.
$N\_MarketMaker$	An average of the daily count of the number of brokers (i.e., market makers) who provide price quotes to Refinitiv for the loan-week observation.
$Volatility$	The standard deviation of the 90-day rolling window of price quotes for 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.
CLO_Volume	The natural log of the sum of all of the CLO buy and sell transactions over the week for the loan-week observation.
$InterestRate$	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.
$\Delta InterestRate$	The magnitude of the change of the $Interest\ Rate$ for loans that are amended (the interest rate at $t+8$ minus the interest rate at $t-8$ relative to the weekly rebalance date).
$Interest\_Reduce$	An indicator variable equal to one if the loan was amended and received an interest rate reduction in the period from $t-8$ to $t+8$ (relative to the weekly rebalance date), and zero otherwise.
$\Delta Size$	The magnitude of the change of the $Size$ for loans that are amended (the loan size at $t+8$ minus the interest rate at $t-8$ relative to the weekly rebalance date).
$\Delta Maturity$	The magnitude of the change of the $Maturity$ for loans that are amended (the maturity at $t+8$ minus the interest rate at $t-8$ relative to the weekly rebalance date).
$Amendment$	An indicator variable equal to one if a loan is amended within the test window centered around the index inclusion, and zero otherwise.
Neg_FFR	The three-month moving average of Fed Funds Rate multiplied by negative one.
$Inst\_Volume$	The quarterly volume of loans syndicated and structured for institutional investors.
$CLO\_Issuance$	The quarterly volume of new CLOs issuances.
$\Delta CorpLoan\_Bank$	The quarterly change of non-financial corporate loans issued by banks from the US Flow of Funds Accounts (BLNECLBSNNCB - Nonfinancial Corporate Business; Depository Institution Loans N.E.C.; Liability, Level).
$\Delta CorpLoan\_NonBank$	The quarterly change of non-financial corporate loan issued by non-bank institutions from the US Flow of Funds Accounts (OLALBSNNCB - Nonfinancial Corporate Business; Other Loans and Advances; Liability, Level).
$High\_PastLeadArranger$	An indicator variable equal to one if the distinct number of lead arrangers with whom the borrower has worked over the past 5 years exceeds the sample median, and zero otherwise.
$High\_PastDeal$	An indicator variable equal to one if the number of the borrower's deals over the past 5 years exceeds the sample median, and zero otherwise.
$High\_NumLender$	An indicator variable equal to one if the number of syndicate participants in a loan's syndicate exceeds the sample median, and zero otherwise.
$NonRelation\_Participants$	The percentage of participants in a loan's syndicate that has not worked with the borrower over the past 5 years.

B Robustness: Extensive Margin

Table B1: The Effect of Index Inclusion on Renegotiation Outcomes Conditional on Aggregate Credit Conditions: Extensive Margin

This table reports the results of the analyses of how aggregate credit conditions affect the association between index inclusion and renegotiation outcomes. We estimate the following model:

$$Interest\_Reduce_i = \alpha + \beta_1 Inclusion_{i,t} \times Z_t + \beta_2 Inclusion_{i,t} + \beta_3 Z_t + Controls_{i,t} + \epsilon_{i,t}$$

$Inclusion_i = 1$ if the loan is added to the LSTA 100 index during a weekly rebalance (treated loan), and zero otherwise. The control group includes ten loans just below the index inclusion threshold and that have not been included or excluded within the ±8 weeks window of the index inclusion. The dependent variable $Interest\_Reduce_{i,t}$ is a indicator variable equal to one if a loan receives interest rate reduction over the test window (±8 weeks) and zero otherwise. Z_t are variables capturing the time-series variation of the aggregate credit condition. Neg_FFR, is the inverse of the three-month moving average of the Federal Fund Rates. $Inst\_Volume$ is the volume of quarterly institutional loans (i.e., loans that are structured for institutional investors). $CLO\_Issuance$ is the quarterly new CLO issuance. $\Delta CorpLoan\_NonBank$ is the quarterly change of non-financial corporate loans issued by non-bank institutions. $\Delta CorpLoan\_Bank$ is the quarterly change of non-financial corporate loans issued by banks. Control variables include the level of loan size, maturity, interest rate, price, past 90 days rolling window return and volatility. Robust standard errors are presented in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10%, respectively.

	Interest_Reduce				
	(1)	(2)	(3)	(4)	(5)
Inclusion	0.516***	0.252***	0.068	0.373***	0.434***
	(0.052)	(0.078)	(0.132)	(0.050)	(0.035)
Inclusion × *Neg_FFR*	0.077*				
	(0.041)				
Inclusion × *Inst_Volume*		0.003***			
		(0.001)			
Inclusion × *CLO_Issuance*			0.018***		
			(0.006)		
Inclusion × Δ*CorpLoan_NonBank*				0.021**	
				(0.011)	
Inclusion × Δ*CorpLoan_Bank*					0.015*
					(0.008)
Controls	Yes	Yes	Yes	Yes	Yes
Observations	1,647	1,647	1,647	1,647	1,647
Adjusted R^2	0.233	0.265	0.246	0.252	0.233
Note:					*p<0.1; **p<0.05; ***p<0.01

Table B2: The Effect of Index Inclusion on Renegotiation Outcomes Conditional on Borrower and Syndicate Characteristics: Extensive Margin

This table reports the results of the analyses of how borrower bargaining power (Panel A) and renegotiation frictions (Panel B) affect renegotiation outcomes. We estimate the following model:

$$Interest\_Reduce_i = \alpha + \beta_1 Inclusion_{i,t} \times Z_t + \beta_2 Inclusion_{i,t} + \beta_3 Z_t + Controls_{i,t} + \epsilon_{i,t}$$

$Inclusion_i = 1$ if the loan is added to the LSTA 100 index during a weekly rebalance (treated loan), and zero otherwise. The control group includes ten loans just below the index inclusion threshold and that have not been included or excluded within the ±8 weeks window of the index inclusion. The dependent variable $Interest\_Reduce_{i,t}$ is a indicator variable equals to one if a loan receives interest rate reduction over the ±8 weeks around the index inclusion week. $High\_PastLeadArranger$ equals one if the number of lead arrangers with whom the borrower has worked over the last five years exceeds the sample median. $High\_PastDeal$ equals one if the number of the borrower's deals over the last five years exceeds the sample median. $High\_NumLender$ equals one if the number of syndicate participants exceeds the sample median. $NonRelation\_Participants$ is the percentage of syndicate participants with whom the borrowers have no prior relationship. Control variables include loan size (*Size*), time-to-maturity (*Maturity*), the level of interest rate (*InterestRate*), secondary market price (*Price*), as well as past 90 day rolling returns (*Return*) and volatility (*Volatility*). All specifications include year fixed effects. Standard errors clustered at the year level are presented in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Borrower Bargaining Power		
	Interest_Reduce	
	(1)	(2)
Inclusion	0.273***	0.234***
	(0.052)	(0.068)
Inclusion × *High_PastLeadArranger*	0.225**	
	(0.071)	
Inclusion × *High_PastDeal*		0.307**
		(0.093)
Year FE	Yes	Yes
Observations	1,647	1,647
Adjusted R^2	0.270	0.281
Panel B: Renegotiation Frictions		
	Interest_Reduce	
	(1)	(2)
Inclusion	0.558***	0.642***
	(0.091)	(0.121)
Inclusion × *High_NumLender*	−0.238*	
	(0.109)	
Inclusion × *NonRelation_Participants*		−0.385**
		(0.165)
Year FE	Yes	Yes
Observations	1,647	1,647
Adjusted R^2	0.275	0.282

C Robustness: Alternative Control Group

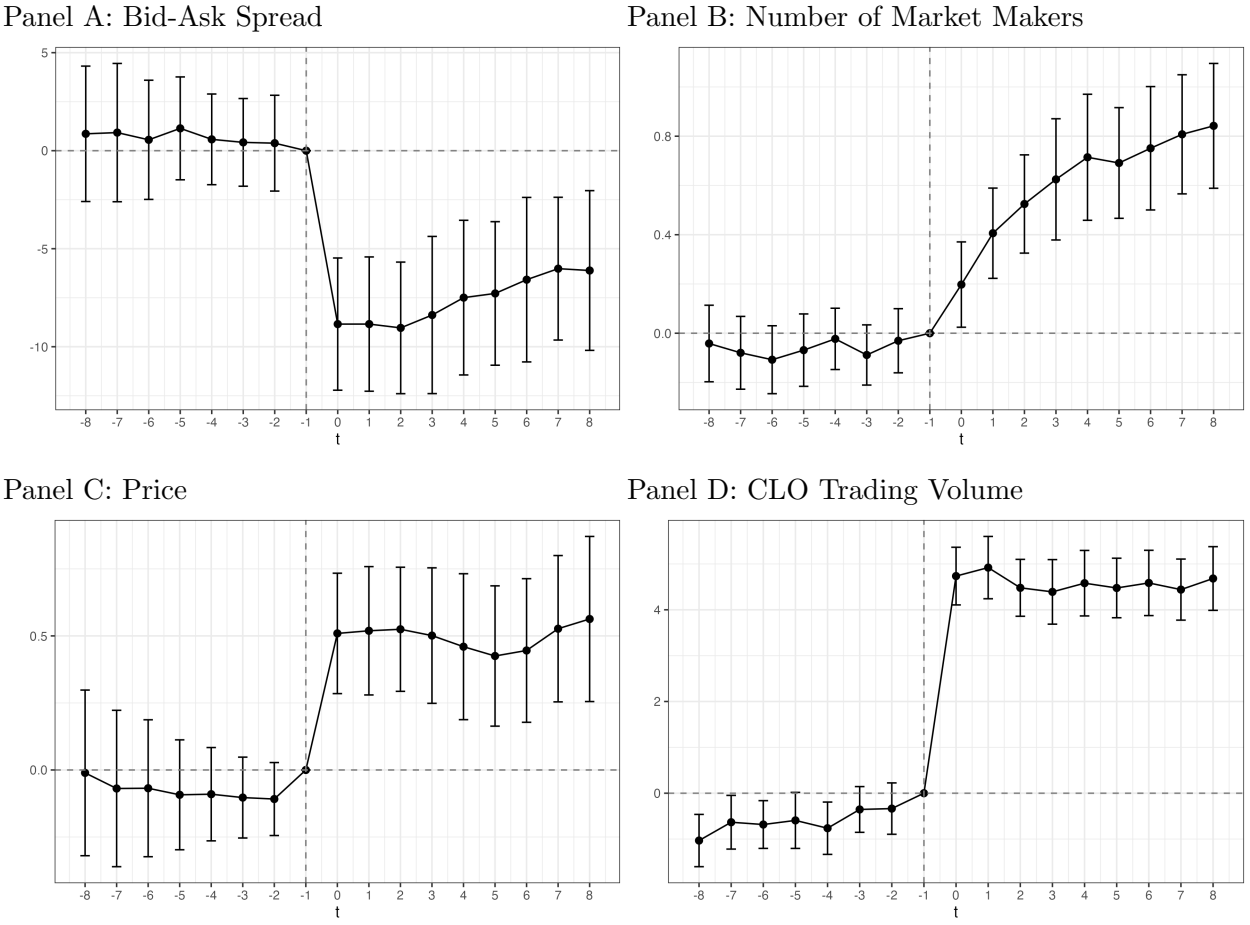


Figure C1: Secondary Market Effects: Alternative Control Group

This figure plots the effect of LSTA 100 weekly index inclusion on loan trading attributes using an alternative control sample. We estimate the following regression model:

$$LoanTradingAttribute_{i,t} = \sum_{s=-8, s\neq -1}^{s=8} \beta_s Inclusion_i \times EventTime_s + \sum_{s=-8, s\neq -1}^{s=8} EventTime_s + Controls_{i,t} + WeekFE + LoanFE + \epsilon_{i,t}$$

Panels A through D show the effect of weekly index inclusion on Bid-Ask spread, number of market makers, price, and CLO trading volume relative to one week before the index inclusion. $Inclusion_i = 1$ for loans added to the LSTA 100 during a weekly rebalance. The control group includes ten loans just above the index inclusion threshold but have not been included or excluded within the test window (± 8 weeks). $EventTime_s$ are time dummies relative to the inclusion week, where $t = 0$ is the inclusion week. Period $t = -1$ (i.e., one week prior to inclusion) is omitted as the benchmark. We plot β_s for s from $t - 8$ to $t + 8$. We include week and loan fixed effects and control for 90 days of rolling price volatility. Week and loan fixed effects are included. Standard errors are clustered at the week and loan levels. Error bars represent the 95% confidence interval.

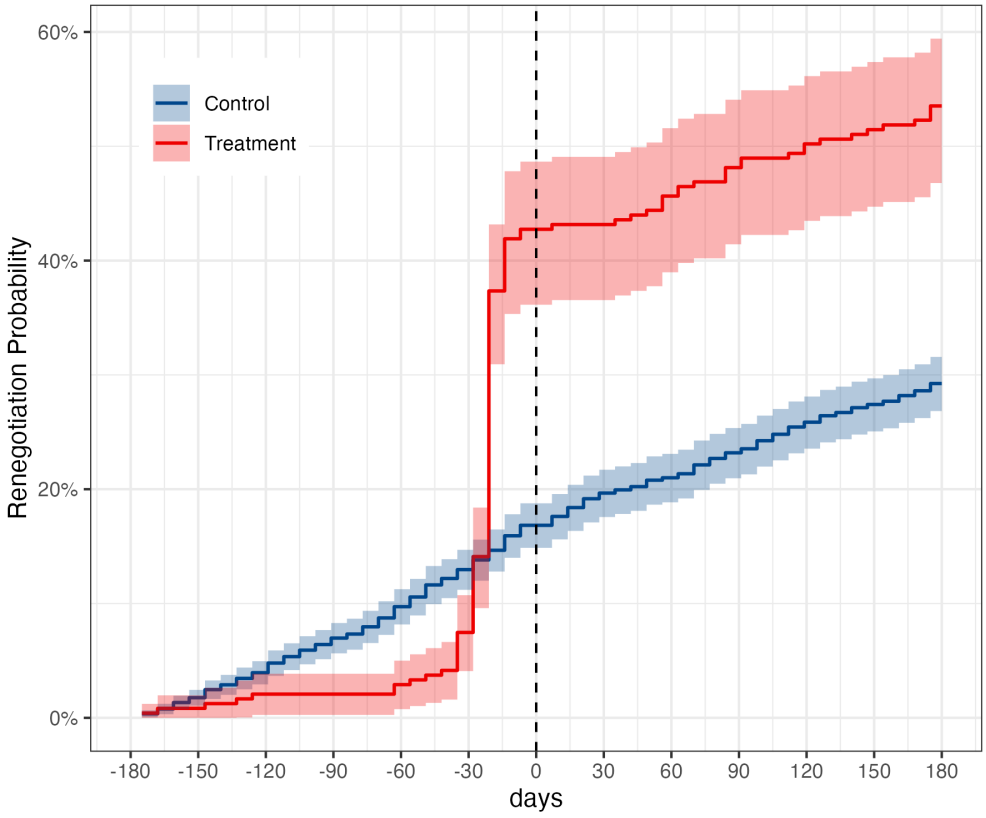


Figure C2: Renegotiation Likelihood: Alternative Control Group

The figure plots the Kaplan-Meier cumulative hazard functions for having a renegotiation within the ± 180 days window of index inclusion. The treatment group (red line) includes loans added to the LSTA 100 index during the weekly rebalance. The control group (blue line) includes the ten loans just above the index inclusion threshold and that have not been included or excluded within the test window (±8 weeks). The shaded area represents the 95% confidence interval.

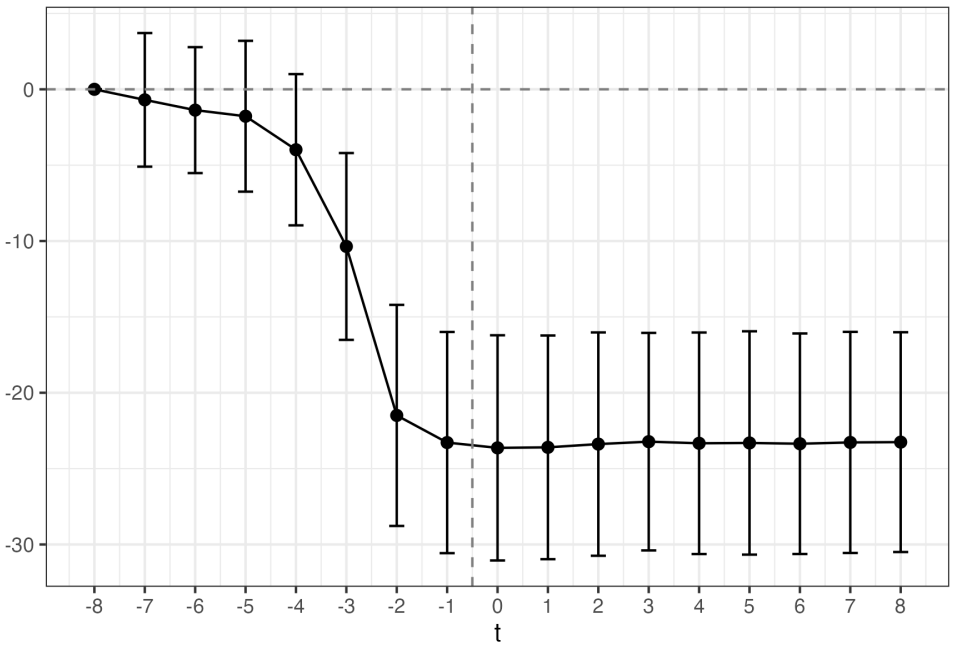


Figure C3: Interest Rate Reduction: Alternative Control Group

This figure plots the effect of index inclusion on the loan's interest rate using an alternative control sample. We then estimate the following regression models:

$$InterestRate_{i,t} = \sum_{s=-7}^{s=8} \beta_s Inclusion_i \times EventTime_s + \sum_{s=-7}^{s=8} EventTime_s + Controls_{i,t} + WeekFE + LoanFE + \epsilon_{i,t}$$

$Inclusion_i = 1$ for loans added to the LSTA 100 during weekly rebalance. The control group includes ten loans just above the index inclusion threshold and that have not been included or excluded within the test window (± 8 weeks). $EventTime_s$ are time dummy relative to the inclusion week, where $s = 0$ is the inclusion week. Period $s = -8$ (i.e., 8 weeks before the inclusion week) is omitted as the benchmark period. The figure plots β_s for s from -8 to $+8$. Control variables include loan size (*Size*), time-to-maturity (*Maturity*), the level of interest rate (*InterestRate*), secondary market price (*Price*), as well as past 90 day rolling returns (*Return*) and volatility (*Volatility*). Week and loan fixed effects are included. Standard errors are clustered at the week and loan levels. Error bars represent the 95% confidence interval.

Table C1: The Effect of Index Inclusion on Renegotiation Outcomes Conditional on Aggregate Credit Conditions: Alternative Control Group

This table reports the results of the analyses of how aggregate credit conditions affect the association between index inclusion and renegotiation outcomes. We estimate the following model:

$$\Delta InterestRate_{i,t} = \alpha + \beta_1 Inclusion_{i,t} \times Z_t + \beta_2 Inclusion_{i,t} + \beta_3 Z_t + Controls_{i,t} + \epsilon_{i,t}$$

$Inclusion_i = 1$ if the loan is added to the LSTA 100 index during a weekly rebalance (treated loan), and zero otherwise. The control group includes ten loans just above the index inclusion threshold and that have not been included or excluded within the ±8 weeks window of the index inclusion. The dependent variable $\Delta InterestRate_{i,t}$ is the interest rate change over the test window (±8 weeks). Z_t are variables capturing the time-series variation of the aggregate credit condition. Neg_FFR, is the inverse of the three-month moving average of the Federal Fund Rates. $Inst\_Volume$ is the volume of quarterly institutional loans (i.e., loans that are structured for institutional investors). $CLO\_Issuance$ is the quarterly new CLO issuance. $\Delta CorpLoan\_NonBank$ is the quarterly change of non-financial corporate loans issued by non-bank institutions. $\Delta CorpLoan\_Bank$ is the quarterly change of non-financial corporate loans issued by banks. Control variables include loan size (*Size*), time-to-maturity (*Maturity*), the level of interest rate (*InterestRate*), secondary market price (*Price*), as well as past 90 day rolling returns (*Return*) and volatility (*Volatility*). Robust standard errors are presented in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10%, respectively.

	$\Delta InterestRate$				
	(1)	(2)	(3)	(4)	(5)
Inclusion	−29.476***	−9.644**	−5.512	−17.848***	−24.205***
	(3.420)	(4.813)	(8.307)	(2.842)	(2.329)
Inclusion × *Neg_FFR*	−5.881***				
	(2.239)				
Inclusion × *Inst_Volume*		−0.203***			
		(0.066)			
Inclusion × *CLO_Issuance*			−0.871**		
			(0.383)		
Inclusion × Δ*CorpLoan_NonBank*				−1.816***	
				(0.671)	
Inclusion × Δ*CorpLoan_Bank*					−0.049
					(0.448)
Controls	Yes	Yes	Yes	Yes	Yes
Observations	1,658	1,658	1,658	1,658	1,658
Adjusted R^2	0.277	0.298	0.282	0.285	0.266
Note:					*p<0.1; **p<0.05; ***p<0.01

Table C2: The Effect of Index Inclusion on Renegotiation Outcomes Conditional on Borrower and Syndicate Characteristics: Alternative Control Group

This table reports the results of the analyses of how borrower bargaining power (Panel A) and renegotiation frictions (Panel B) affect renegotiation outcomes. We estimate the following model:

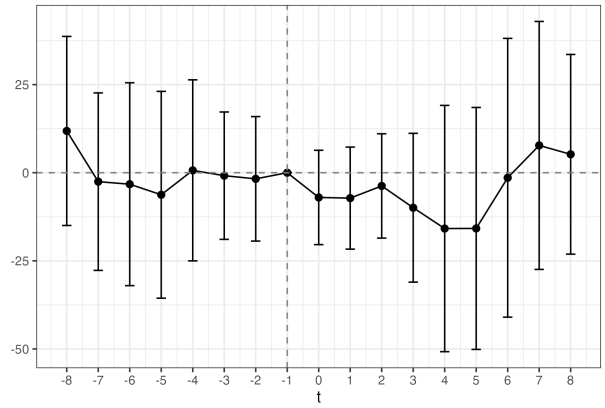
$$\Delta InterestRate_i = \alpha + \beta_1 Inclusion_t \times Z_t + \beta_2 Inclusion_i + \beta_3 Z_t + Controls_i + \epsilon_i$$

$Inclusion_i = 1$ if the loan is added to the LSTA 100 index during a weekly rebalance (treated loan), and zero otherwise. The control group includes ten loans just above the index inclusion threshold and that have not been included or excluded within the ±8 weeks window of the index inclusion. The dependent variable $\Delta InterestRate_{i,t}$ is the change in interest rate over the test window (±8 weeks). $High\_PastLeadArranger$ equals one if the number of lead arrangers with whom the borrower has worked over the last five years exceeds the sample median. $High\_PastDeal$ equals one if the number of the borrower's deals over the last five years exceeds the sample median. $High\_NumLender$ equals one if the number of syndicate participants exceeds the sample median. $NonRelation\_Participants$ is the percentage of syndicate participants with whom the borrower has no prior relationship. Control variables include loan size (*Size*), time-to-maturity (*Maturity*), the level of interest rate (*InterestRate*), secondary market price (*Price*), as well as past 90 day rolling returns (*Return*) and volatility (*Volatility*). All specifications include year fixed effects. Standard errors clustered at the year level are presented in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

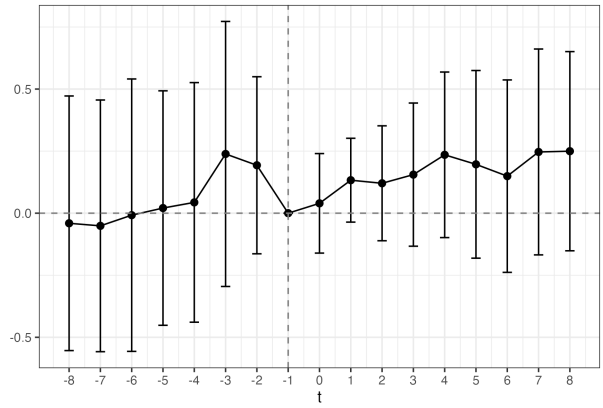
Panel A: Borrower Bargaining Power		
	$\Delta InterestRate$	
	(1)	(2)
$Inclusion$	−16.502***	−15.827***
	(4.371)	(3.095)
$Inclusion \times High\_PastLeadArranger$	−9.829***	
	(1.086)	
$Inclusion \times High\_PastDeal$		−14.098***
		(3.552)
Year FE	Yes	Yes
Observations	1,658	1,658
Adjusted R^2	0.303	0.315
Panel B: Renegotiation Frictions		
	$\Delta InterestRate$	
	(1)	(2)
$Inclusion$	−34.397***	−32.063***
	(6.649)	(7.422)
$Inclusion \times High\_NumLender$	19.012***	
	(5.569)	
$Inclusion \times NonRelation\_Participants$		15.531*
		(7.059)
Year FE	Yes	Yes
Observations	1,658	1,658
Adjusted R^2	0.333	0.310

D Robustness: Placebo Figures

Panel A: Bid-Ask Spread



Panel B: Number of Market Makers



Panel C: Price

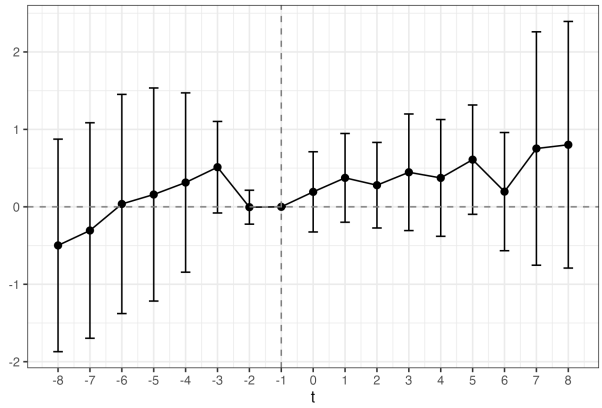


Figure D1: Test of Placebo Inclusion on Loan Trading Attributes

This figure plots the effect of our hypothetical weekly index inclusion on loan trading attributes. We estimate the following regression model:

$$LoanTradingAttribute_{i,t} = \sum_{s=-8, s\neq -1}^{s=8} \beta_s Placebo\_Inclusion_i \times EventTime_s + \sum_{s=-8, s\neq -1}^{s=8} EventTime_s + Controls_{i,t} + WeekFE + LoanFE + \epsilon_{i,t}$$

We construct a hypothetical LSTA 100 index prior to the actual introduction of the index. Panels A through D show the effect of hypothetical weekly index inclusion on Bid-Ask spread, number of market makers, and price relative to one week before the index inclusion. We are unable to examine CLO trading volume because we do not have CLO trading data during the placebo period. $Placebo\_Inclusion_i = 1$ for loans added to our hypothetical index during a weekly rebalance, and zero otherwise. The control group includes ten loans just below the index inclusion threshold and that have not been included or excluded within the $\pm$ 8 week test window. $EventTime_s$ are time dummies relative to the inclusion week, where $t = 0$ is the inclusion week. Period $t = -1$ (i.e., one period prior to inclusion) is omitted as the benchmark. We plot β_s for s from $t - 8$ to $t + 8$. We include week and loan fixed effects and control for 90 days of rolling price volatility ($Volatility$). Week and loan fixed effects are included. Standard errors are clustered at the week and loan levels. Error bars represent the 95% confidence interval.

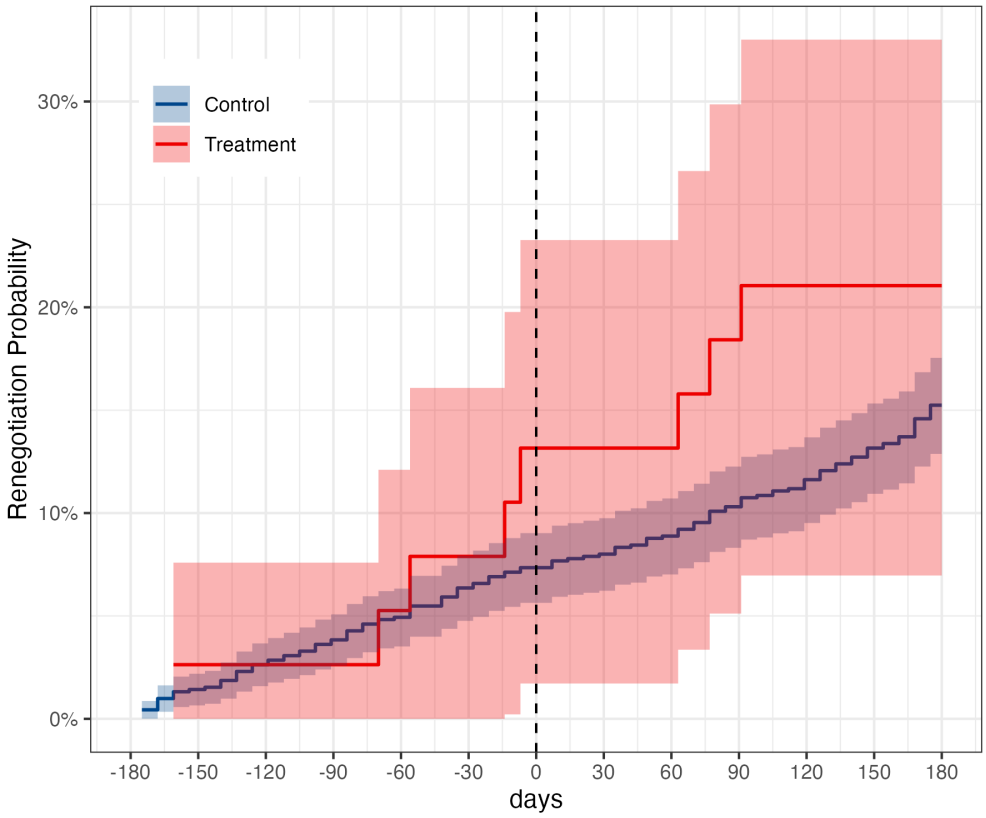


Figure D2: Renegotiation Likelihood: Placebo Test

We construct a hypothetical LSTA 100 index prior to the actual introduction of the LSTA 100 index. The figure plots the Kaplan-Meier cumulative hazard functions for having a renegotiation within the ± 180 days window of the placebo index inclusion. The treatment group (red line) includes loans added to our hypothetical LSTA 100 index during our simulated weekly rebalance. The control group (blue line) includes the ten loans just below the hypothetical index inclusion threshold and that would have not been included or excluded within the test window (±8 weeks). The shaded area represents the 95% confidence interval.

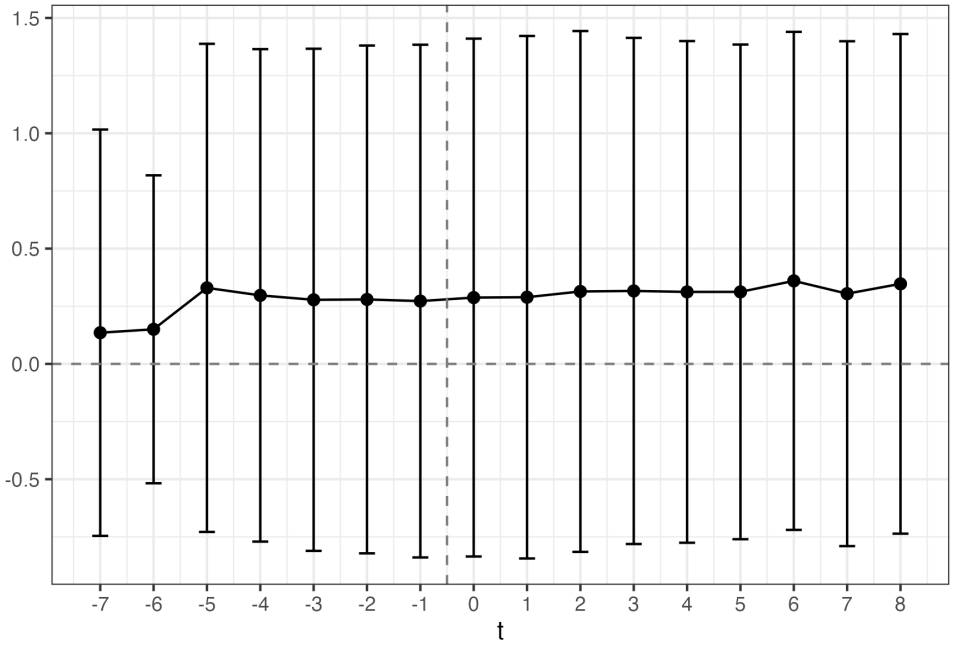


Figure D3: Interest Rate Reduction: Placebo Test

This figure plots the estimated effect of our hypothetical weekly index inclusion on the loan's interest rate. We then estimate the following regression models:

$$InterestRate_{i,t} = \sum_{s=-7}^{s=8} \beta_s Placebo\_Inclusion_i \times EventTime_s + \sum_{s=-7}^{s=8} EventTime_s + Controls_{i,t} + WeekFE + LoanFE + \epsilon_{i,t}$$

We construct a hypothetical LSTA 100 index prior to the actual introduction of the LSTA 100 index. $Placebo\_Inclusion_i = 1$ for loans added to our hypothetical index during a weekly rebalance, and zero otherwise. The control group includes ten loans just below the index inclusion threshold and that have not been included or excluded within the test window. $EventTime_s$ are time dummies relative to the inclusion week, where $s = 0$ is the inclusion week. Period $s = -8$ is omitted as the benchmark period. The figure plots β_s for s from -8 to $+8$. Control variables include loan size (*Size*), time-to-maturity (*Maturity*), the level of interest rate (*InterestRate*), secondary market price (*Price*), as well as past 90 day rolling returns (*Return*) and volatility (*Volatility*). Week and loan fixed effects are included. Standard errors are clustered at the week and loan levels. Error bars represent the 95% confidence interval.

E Exclusion

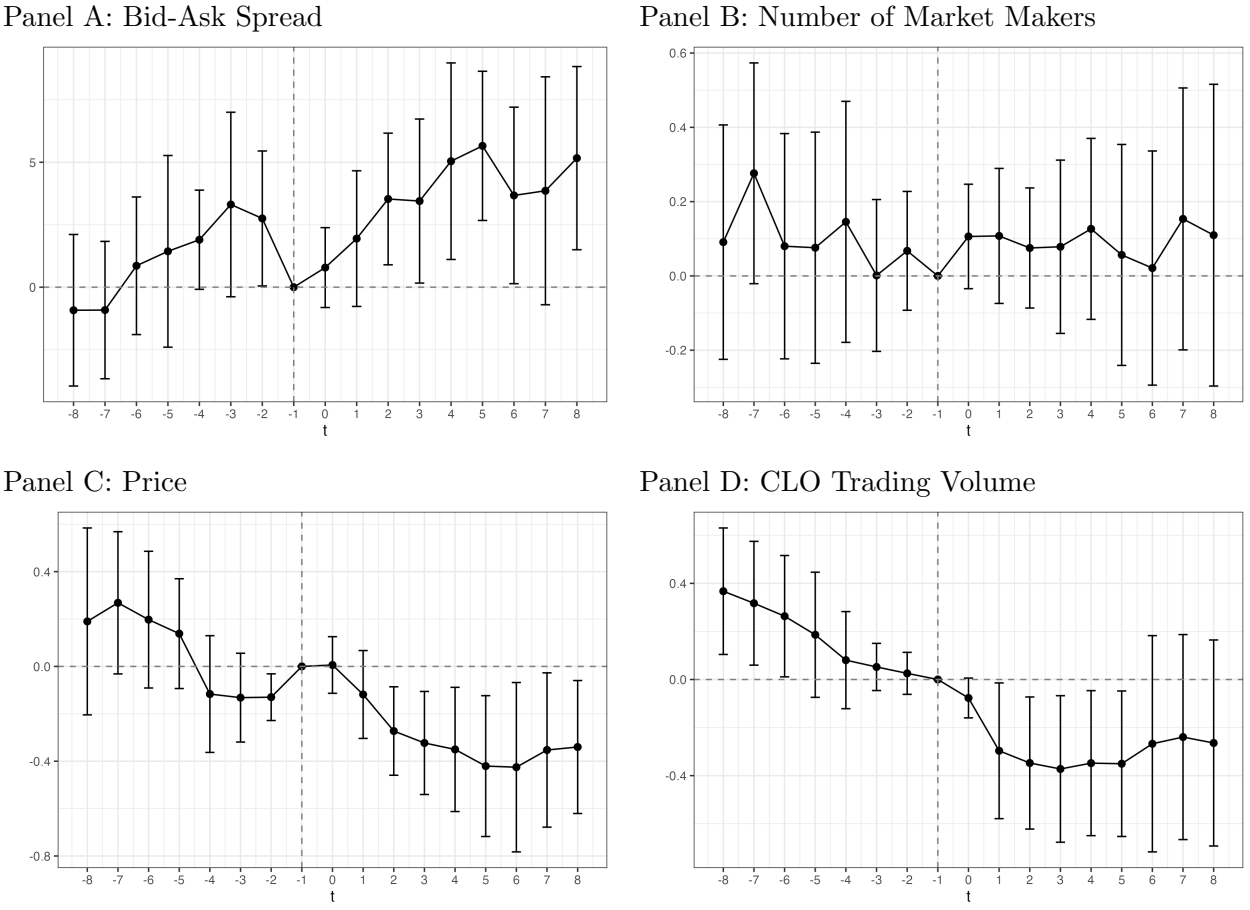


Figure E1: Implications of Index Exclusion on Secondary Market Activities

This figure plots the effect of LSTA 100 semi-annual index exclusion on loan trading attributes. We estimate the following regression model:

$$LoanTradingAttribute_{i,t} = \sum_{s=-8, s\neq -1}^{s=8} \beta_s Exclusion_i \times EventTime_s + \sum_{s=-8, s\neq -1}^{s=8} EventTime_s + Controls_{i,t} + WeekFE + LoanFE + \epsilon_{i,t}$$

Panels A through D show the effect of semi-annual index exclusion on Bid-Ask spread, number of market makers, price, and CLO trading volume relative to one week before the index exclusion. $Exclusion_i = 1$ for loans excluded from the LSTA 100 during a semi-annual rebalance and zero otherwise. The control group includes ten loans just below the index inclusion threshold and that have not been included or excluded within the ± 8 weeks window of the semi-annual rebalance. $EventTime_s$ are time dummies relative to the exclusion week, where $t = 0$ is the exclusion week. Period $t = -1$ (i.e., one period prior to exclusion) is omitted as the benchmark. We plot β_s for s from $t - 8$ to $t + 8$. We include week and loan fixed effects and control for 90 days of rolling price volatility ($Volatility$). Standard errors are clustered at the week and loan levels. Error bars represent the 95% confidence interval.

Table E1: The Effect of Index Exclusion on Loan Trading Attributes

This table reports the results of the analyses of LSTA 100 index exclusion from loan trading attributes. We estimate the following model:

$$LoanTradingAttribute_{i,t} = \beta Exclusion_i \times Post_t + Post_t + Controls_{i,t} + LoanFE + WeekFE + \epsilon_{i,t}$$

$Exclusion_i = 1$ if the loan is excluded to the LSTA 100 index during a semi-annual rebalance, and zero otherwise. $Post_t$ equals to one after the semi-annual index rebalance. Columns (1) and (2) report results for the bid-ask spread ($BidAsk$), columns (3) and (4) report results for the number of market markers ($N\_MarketMaker$), columns (5) and (6) report results for the secondary market price ($Price$), columns (7) and (8) report results for CLO trading volume (CLO_Volume). The control group includes ten loans just below the index inclusion threshold and that have not been included or excluded within the test window of ± 8 weeks of the index exclusion. We control for 90 days rolling price volatility ($Volatility$). All specifications include week and loan fixed effects. Standard errors clustered at the week and loan levels are presented in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10%, respectively.

	$BidAsk$		$N\_MarketMaker$		$Price$		CLO_Volume	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$Exclusion \times Post$	3.544***	3.013**	−0.015	−0.002	−0.472**	−0.373**	−0.443**	−0.447**
	(1.132)	(1.092)	(0.093)	(0.091)	(0.186)	(0.164)	(0.158)	(0.160)
$Post$	−3.763	−3.377	0.031	0.022	0.345	0.272	0.063	0.065
	(2.282)	(1.976)	(0.086)	(0.080)	(0.241)	(0.219)	(0.123)	(0.124)
$Volatility$		0.049		−0.001**		−0.009***		0.0003
		(0.030)		(0.0005)		(0.003)		(0.0004)
Week FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Loan FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	6,256	6,256	6,256	6,256	6,256	6,256	6,256	6,256
Adjusted R^2	0.826	0.831	0.815	0.816	0.962	0.966	0.296	0.296