Bank Capital and the Growth of Private Credit

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Abstract

This paper examines whether regulatory arbitrage can explain the growth of private credit. We show that business development companies (BDCs) — closed-end funds that provide a significant share of nonbank loans to middle market firms — are very well capitalized according to bank capital frameworks. They have median risk-based capital ratios of about 36% and, under the Federal Reserve's stress testing framework, they have median excess capital in the severely adverse scenarios of about 26%. While there is little risk to solvency, during stress scenarios, BDCs may deleverage to remain in compliance with the SEC regulatory leverage limits and bank loan covenants. Our baseline estimates suggest that over eight quarters the median (25th percentile) BDC would reduce assets by 8% (20%) in addition to the reduction of the fair value of their assets. More conservative compliance policies lead to more rapid and more significant deleveraging: up to 10% by the second quarter of the stressed period. Finally, our evidence cuts against the view that private credit has grown because nonbank financial intermediaries have to hold less capital than banks. Instead, we argue that banks find lending to middle-market lenders more attractive than middle-market lending. This is, in part, because over-collateralized loans to BDCs and other nonbank financial intermediaries get relatively favorable capital treatment, enabling banks to exploit their low-cost funding. It is also attractive because the loans are relatively large and thus less costly to originate, underwrite, and service than a portfolio of middle-market loans.

Keywords: private credit, middle market lending, business development companies, bank capital requirements, stress tests

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1 Introduction

Since the Global Financial Crisis, there has been very significant growth in lending by nonbank financial intermediaries to the corporate sector. This sort of lending — often referred to as private credit — grew to $1.70 trillion in 2023 and is expected to exceed $2.75 trillion by 2028 (J.P. Morgan Asset Management, 2024).

While the rise of private credit is well documented and receives considerable attention from the business press and policymakers, the source of this growth is less well understood. In particular, there is still no consensus as to why this form of credit — much of which is used to fund private equity sponsored transactions — has grown so much outside the banking sector. One common explanation is that the growth of private credit was driven by the increase in bank capital requirements following the Global Financial Crisis (GFC). According to this narrative, banks would have to finance loans to middle market businesses with more capital than nonbanks, making this form of lending less attractive. Thus, lending activity flowed to less regulated nonbanks, or the so-called "shadow banking" sector, which was able to use more leverage to finance its lending activity.

In this paper, we present evidence that calls into question the relevance of this form of regulatory capital arbitrage for understanding the growth of private credit. The evidence comes from a detailed analysis of business development companies (BDCs), which are closed-end investment funds that typically make loans to middle market firms sponsored by private equity, a form of private credit referred to as direct lending. We focus on BDCs both because they are an important type of nonbank lender, with aggregate assets of approximately $310 billion across nearly 150 BDCs, and because they are required to provide a wealth of information on their portfolio investments and financing in quarterly filings with the Securities and Exchange Commission (SEC).

Analysis of these filings reveals that BDCs are extremely well capitalized according to capital requirement methodologies that would be applied to banks. In particular, if a BDC were a bank, the most basic type of bank capital requirement, which is based on the so-called standardized approach, suggests that BDCs have equity capital of about 36% of risk-weighted assets, well in excess of the capital levels observed at banks. Furthermore, BDCs have more capital than would be required of banks if we apply the Fed's bank stress test methodology to BDCs. Our estimates indicate that in the severely adverse scenario, BDCs suffer median credit losses of about 16.0% of assets, offset by median net revenue of 8.1%. Median estimated net losses are about 7.1% of assets. The median stressed capital ratio is 30.2% and just one BDC has a stressed capital ratio below 4.5%. Given their high initial capital ratios, the vast majority of BDCs far exceed stressed minimum capital ratios despite holding fairly risky portfolios, with all but four BDCs having stressed capital ratios in excess of 15%.

Our application of the bank capital frameworks — both the standardized approach and stress testing methodology — suggests that BDCs are unlikely to fail and thereby create systemic risk through failure. Our analysis also indicates that banks are very unlikely to incur losses given their

over-collateralization. This does not mean that there are no financial stability risks associated with BDCs and private credit more broadly. In particular, to stay in compliance with the leverage limits imposed by the Investment Company Act of 1940 and bank credit agreements, in a stress scenario BDCs may be forced to cut lending and use proceeds of debt repayments to pay down debt. Such reductions in lending could adversely affect their middle market borrowers and the broader economy.

To analyze the extent of such deleveraging, we simulate what BDCs would do to stay in compliance with the SEC regulatory leverage limits during the Fed's severely adverse stress scenario. Because the fair value of their assets declines in the stress scenario, BDC asset coverage ratios also decline towards the regulatory minimum of 150%. To avoid violating the minimum we assume that a portion of free cash flows to equity – essentially undistributed net income plus debt repayments by portfolio companies – is used to pay down BDC debt obligations rather than to make loans. We estimate that median BDC reduces lending by about 8% after 6 quarters of stress, with lending by one quarter of BDCs falling by almost 20%. A more conservative compliance policy could lead to more rapid and more significant reduction in lending. In one version, in which BDCs maintain an asset coverage ratio greater than 167%, lending falls by 10% after just two quarters of stress. These estimates depend critically on assumptions about how much credit spreads widen during the stress scenario. It is also possible that the minimum asset coverage ratio covenants in bank facilities could be more binding and result in more deleveraging. The welfare consequences of such deleveraging are unclear given that demand for loans from private-equity sponsored middle market borrowers may increase or decrease during the stress scenario.

Taken together, our findings suggest that the growth of private credit cannot be explained by a form of regulatory capital arbitrage in which lending activity moves to intermediaries with the least capital. If anything, BDCs hold capital significantly in excess of what would be required of banks. This is not to say, however, that bank regulatory capital requirements have no effect on whether banks want to engage in middle market lending. Indeed, we show that given bank capital regulations, observed credit spreads, and funding costs, it is arguably more profitable for banks to lend to BDCs than to engage in the sort of middle market lending done by BDCs. Because BDCs typically borrow from banks via wholly-owned, bankruptcy-remote special purpose vehicles that are over-collateralized, these loans qualify as securitizations for the purpose of capital regulation. Given typical loan terms, which involve significant over-collateralization, banks can use a 20% risk weight in their calculation of capital, as opposed to the 100% risk weight that would be required for the underlying collateral (i.e. middle market loans). While credit spreads on middle market loans averaged about 650 bps in recent periods, spreads on bank loans to BDCs averaged about 225 bps. However, a combination of factors tend to increase the ROE of a loan to a BDC relative to a loan to a middle market borrower. First, the lower risk weight on loans to BDCs means banks can use more leverage to fund BDC loans. Second, given the lower risk of loans to BDCs, expected losses are lower. Third, BDC loans are much larger than typical middle market loans. Given the fixed costs of originating, underwriting and servicing, the operating expense of a portfolio of loans

to BDC is likely to be considerably lower than that of a comparably-sized portfolio of BDC loans. For plausible parameters, the ROE of a BDC loan exceeds that of a middle market loan made by a bank.

The broader point of this analysis is that large banks with low funding costs are better off making relatively safe loans that require less capital than making riskier, high-cost loans that require a lot of capital. This is related to the point made by Diamond (2020), which presents a model of why it is optimal for banks – financial intermediaries that are uniquely positioned to issue safe money-like claims – to hold safe assets to back those claims. To the extent that banks hold risky assets, it limits their ability to issue safe money-like claims on which they earn a "money premium." One can apply this insight to argue that rather than holding risky middle market loans, banks are better off holding senior claims on those middle market loans in the form of over-collateralized credit facilities. Further, we speculate that because nonbanks are lightly regulated and supervised, the operating expenses associated with originating, underwriting, and servicing risky loans may be lower than they are for banks, making nonbanks more efficient originators and holders of riskier credit. These observations may also help explain the broader growth of nonbank financial intermediation, which has been facilitated by bank loans to nonbank financial intermediaries such as private credit funds, mortgage companies and fintech lenders. This point has been documented by Acharya, Cetorelli, and Tuckman (2024), who also study the financial stability implications of this shift. It also helps to explain the significant shift over the past 25 years in the asset holdings of banks away from risky loans towards relatively safe securities, as documented and examined by Hanson et al. (2024) and Buchak et al. (2024).

Our paper is related to a growing literature on private credit. Davydiuk, Marchuk, and Rosen (2024) present evidence that direct lending by BDCs substitutes for bank lending, partly in response to stricter bank regulation. Davydiuk, Marchuk, and Rosen (2023) argue that following an increase in the cost of raising external equity, BDCs reduced the riskiness of their loan portfolios. Haque, Mayer, and Stefanescu (2024) document the fact that banks provide credit lines to firms alongside direct term loans provided by private credit funds and BDCs. Jang (2024) shows that private credit funds behave like relationship lenders, even more so than banks. In a survey of private debt funds in the U.S. and Europe, Block et al. (2024) document the important role they play in providing debt financing for private equity transactions, particularly in the U.S. They also report survey evidence that private debt funds, including BDCs, use relatively little leverage, although these leverage measures are not risk-adjusted. None of these papers explore the role that banks play in providing financing to private credit funds. Furthermore, while these papers claim that an increase in bank capital requirements led to the growth of direct lending, they do not explain why this type of lending has migrated to intermediaries that we show are *better* capitalized than banks.

Our paper is organized as follows. The next section provides background on BDCs and describes the data used. Section 3 presents summary statistics on the BDCs in our sample, including information on the size of the sector, the composition of their portfolios, and their financing. Sec-

tion 4 applies the bank capital framework to BDCs, using both the standardized approach and the Federal Reserve's stress testing framework. Section 5 discusses the potential risks to financial stability posed by private credit funds and models deleveraging by BDCs under a severely adverse stress test scenario. Section 6 compares the ROE of lending to BDCs to the ROE of bank middle market lending by banks. Section 7 concludes.

2 BDC Background and Data

BDCs are actively managed closed-end investment funds registered as such under the Investment Company Act of 1940.[1] They are required to make at least 70% of their investments in private companies or public companies with equity values below $250 million. BDCs are treated as registered investment companies (RICs), which means they are pass-through entities for tax purposes. As such they are required to pay out 90% of income as dividends, which are taxed as ordinary income to shareholders. BDCs can be internally managed, meaning the firm directly employs a team responsible for managing the BDC's assets, or externally managed, in which a separate entity is tasked with providing investment advisory services. Most BDCs are externally managed. BDCs can also be organized as traded or non-traded entities, depending on whether their stock trades on an organized exchange. Whether traded or not, all BDCs are required to report their financial statements and schedules of investments in quarterly filings with the SEC.

Most BDCs describe themselves as "direct lenders" or "middle market lenders" in their regulatory filings, with many of the remaining entities operating as venture capital funds or real estate investment trusts (REITs). BDCs engaged in direct lending manage nearly all BDC assets as those that do not engage in direct lending are typically very small.

BDCs are limited in the amount of leverage they can employ. When incurring new debt or making dividend payments, BDCs must have at least a 200% asset coverage ratio, defined as the ratio of assets to equity where assets are calculated on a gair value basis. Since 2018, however, BDCs meeting certain conditions can choose to operate with an asset coverage ratio of 150%.

As of 2023Q4, there were 150 active BDCs operating in the United States, managing assets valued at more than $310 billion. While BDCs comprise less than a fifth of the burgeoning private credit industry, and remain small relative to banks, they have grown into particularly important providers of credit to middle market firms.[2]

[1] Cai and Haque (2024) provide an overview of private credit and BDCs.

[2] Middle market firms are loosely defined, but typically include businesses with annual revenues of between $10 million and $1 billion.

2.1 Financial Statements

An entity electing to be treated as a BDC is required to file form N-54A with the SEC. When an entity decides to stop being treated as a BDC, it files form N-54C. We use these filings to assemble the population of BDCs that were active over the 1996–2023 period. We add two early BDCs that were launched prior to the availability of the SEC's EDGAR system: Capital Southwest Corp (CIK 17313) and Equus Total Return Inc (CIK 878932). Because some BDCs file Form N-54A but never launch, we require BDCs to file at least one quarterly or annual report with the SEC after electing to be regulated as a BDC.

We gather financial data for traded and non-traded BDCs from CRSP/Compustat and S&P's SNL database, respectively. For non-traded BDCs whose financials are not available through SNL, we use the SEC API to extract and standardize financial information from 10-Q and 10-K filings.[3]

2.2 Portfolio Holdings

Our main dataset consists of BDCs with portfolio holdings data from S&P Leveraged Commentary and Data (LCD). LCD provides robust coverage of portfolio holdings for 85 BDCs — including all of the publicly traded BDCs and the largest non-traded BDCs — between 2013Q3 and 2023Q3.

For each asset holding, the LCD data includes issuer name, industry, fair value, amortized cost, principal or number of shares, and maturity date. It also provides information about a loan's terms, including whether it is fixed or variable rate, its spread over SOFR or LIBOR, and whether the loan includes additional features such as an interest floor.

We supplement portfolio holdings from LCD in a number of ways. First, because LCD does not include holdings of Blackstone Private Credit Fund (BCRED) – the largest BDC – until 2021Q4, we use the firm's 10-Q filings to extract portfolio holdings for the first three quarters of its existence.

Second, LCD reports portfolio holdings of some but not all joint ventures operated by the sample BDCs. These are joint ventures with other asset management companies and investors to originate loans. For example, in 2022, Blue Owl Credit Income Corp (Blue Owl) entered into an agreement with the State Teachers Retirement System of Ohio (STRS) to co-manage the Blue Owl Credit Income Senior Loan Fund LLC as a joint venture. Although Blue Owl and STRS have 87.5% and 12.5% economic ownership in the joint-venture, all investment decisions must be approved unanimously by an investment committee that has an equal number of representatives from Blue Owl and STRS. As a result Blue Owl is not deemed to be in control of the Blue Owl Credit Income Senior Loan Fund LLC and does not consolidate the JV in its financial statements. In its SEC filings, Blue Owl does include basic financials and schedule of investments of the JV. The example of the Blue Owl Credit Income Senior Loan Fund LLC is typical in that in most JVs,

[3] https://sec-api.io

the BDC owns more than half of the JV (the average share is 68.5%), but does not consolidate the JV because JV partners have an equal number of representatives on the investment committee with all investment decisions made unanimously. To improve the accuracy of the stress test exercise, which otherwise would have to treat JV stakes as any other equity position, we use SEC filings to extract the 2023Q2 portfolio holdings of the joint ventures not included in LCD.

We use instrument description along with issuer name and industry information to classify investments into the following asset classes: joint ventures (JVs), collateralized loan obligations (CLOs), equity (other than JVs and CLOs), 1st lien loans, 2nd lien loans, unitranche loans, senior secured loans, unsecured loans, other debt, and other.

The resulting dataset, excluding sub-BDCs, includes a panel of more than 430,000 holdings, with investments in nearly 13,000 different portfolio companies. The panel dataset provides information on the holdings of BDCs that collectively manage around 90% of total assets.

2.3 Financing

We gather instrument-level financing data from S&P Capital IQ, which is available for 120 different BDCs. This data allows us to assess how BDCs are funded on a more granular level. For each BDC-quarter pair, we have a description of the instrument and its amortized cost. For some of the BDCs for which S&P does not have information, we hand-collect data from quarterly SEC filings.

3 Summary Statistics on BDCs

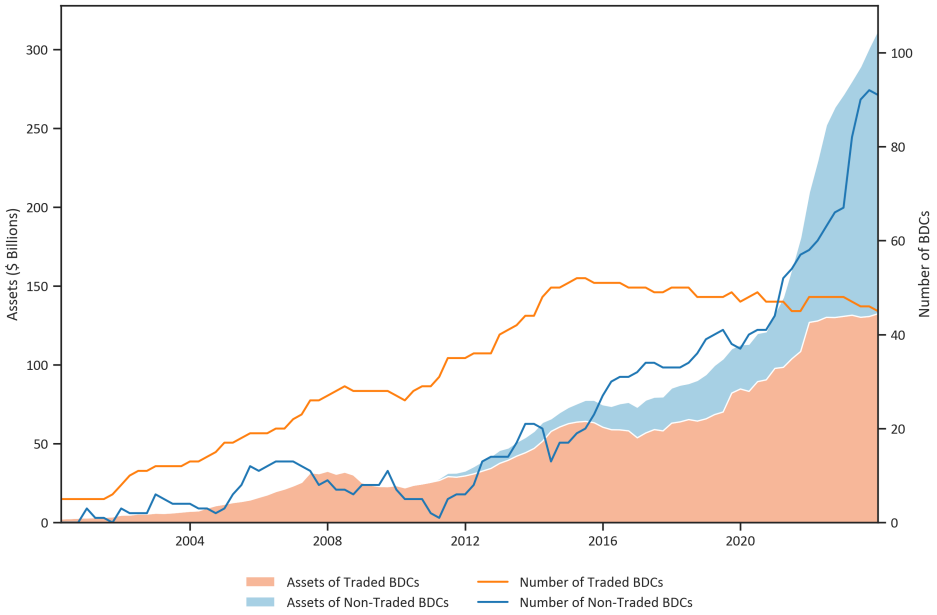
In this section, we provide summary statistics for the sample of BDCs in our study.

Figure 1 reports the number of active BDCs and the aggregate assets managed in each quarter during the 2000–2023 period. We separately report the number of traded and non-traded BDCs. The number of traded BDCs peaks at 52 in 2015 and remains fairly stable over the rest of the sample period. The number of non-traded BDCs fluctuates over time, reaching 37 by the end of 2019 and then climbing as high as 92 over the following four years. In 2023Q4, our sample comprises 45 traded BDCs and 91 non-traded BDCs, managing assets of $312 billion (Figure 1).[4]

[4] These estimates are in line with those put forward by the BDC Council, which represents and advocates for BDCs. It is also consistent with a number of related academic papers from an earlier period, including Davydiuk, Marchuk, and Rosen (2024).

Figure 1
Total Assets and Number of BDCs

This figure plots the number and total assets of of active BDCs from 2000Q1 to 2023Q4. Traded BDCs are defined as those whose stock trades on an exchange.



By plotting BDC size by quartile, we see that recent growth has been disproportionately driven by the largest BDCs, whose assets grew by a factor of four, on average, since the COVID-19 pandemic (Figure 2).

3.1 Portfolio Composition

We plot the asset composition of BDCs in Figure 3. BDCs generally hold no more than 5% of their assets in cash, with smaller BDCs generally holding somewhat more. The remainder is invested in debt and equity instruments. Debt instruments comprise around 80% of assets, while equity instruments make up the remaining 15%.

Some of the debt instruments held by BDCs are broadly syndicated loans (BSL). In Figure 4, we focus on debt holdings of BDCs that are not broadly syndicated loans. The share of debt instruments that are 1st lien loans has increased over time, rising from around 60% to 90% of all investments.

Figure 5 reports investment size by quartile. The median investment made by BDCs in 2023Q3 was around $10 million, while the top quartile loans were about $55 million.

Figure 6 plots the time series of the weighted average spread on BDC loans. The benchmark is generally LIBOR in the early years and SOFR more recently. The green line plots the average across all loans. Over the sample period, the spread declines from nearly 800 bps to around 650

Figure 2
BDC Assets by Quartile

This figure shows the average size of active BDCs, measured in terms of assets, between 2000Q1 and 2023Q4. A BDC is defined as active in all quarters between the filing of Form N-54A and Form N-54C. The sample of 5 largest BDCs is dynamic and, in 2023Q4, includes the Blackstone Private Credit Fund, Ares Capital Corp., Blue Owl Credit Income Corp., FS KKR Capital Corp., and Blue Owl Capital Corp.

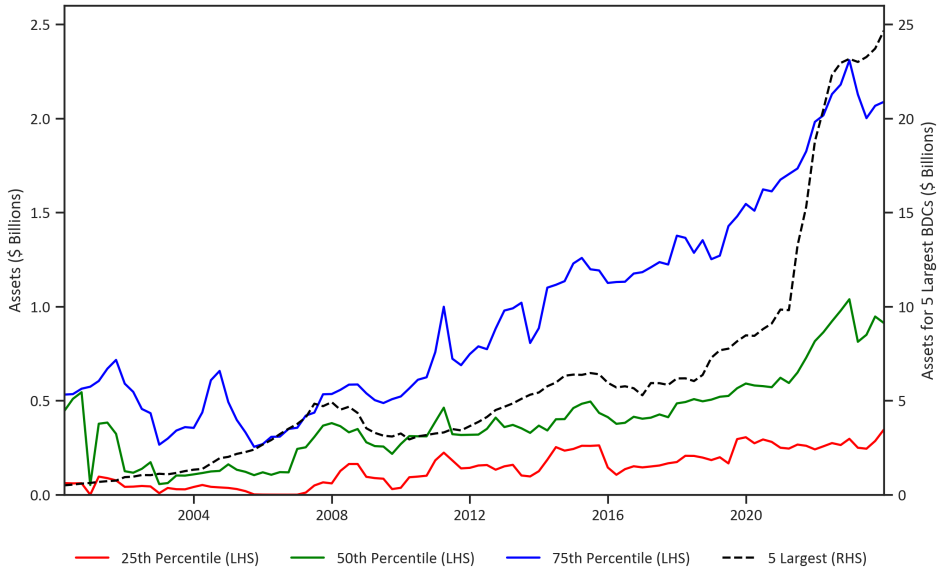


Figure 3
BDC Asset Composition

This figure shows the composition of BDC assets from 2013Q3 to 2023Q3. Assets are decomposed into cash, CLOs, equity in joint ventures (JVs), other equity, broadly syndicated loans (BSL), and all other loans.

(a) Value-weighted

(b) Equal-weighted

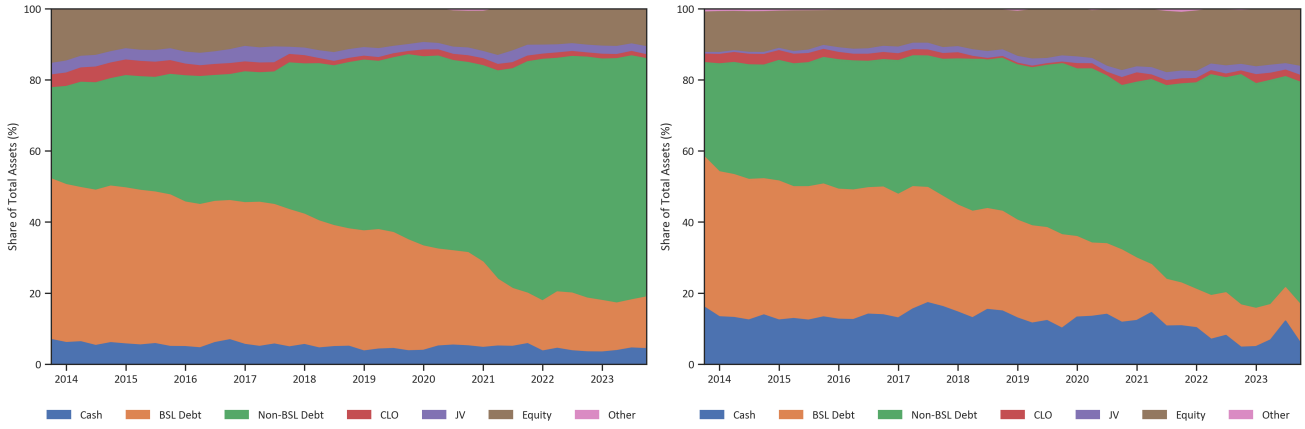


Figure 4
BDC Loan Portfolio Composition

This figure reports the composition of BDC loan portfolios from 2013Q3 to 2023Q3. Loans are decomposed into senior secured, 1st lien, 2nd lien, unsecured, unitranche, and other loans. We retain only debt investments not classified as broadly syndicated loans (BSLs).

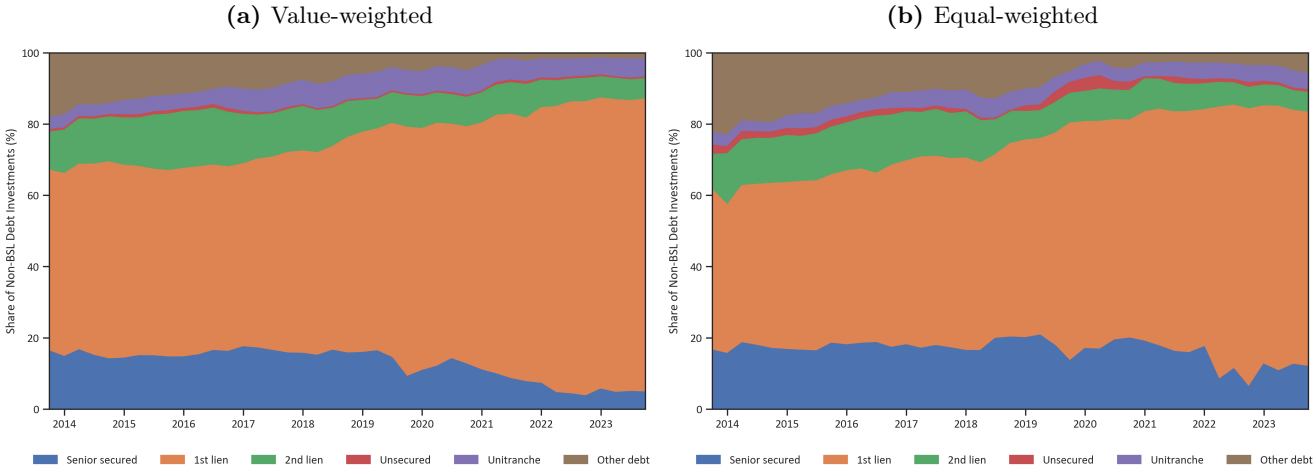
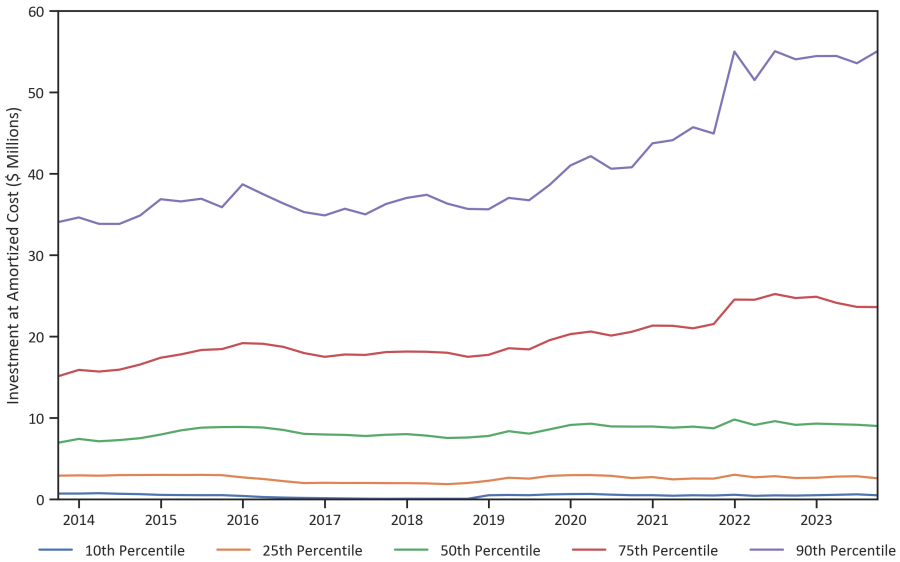


Figure 5
BDC Investment Size

This figure shows the 10th, 25th, 50th, 75th, and 90th percentile of investment size, measured at amortized cost, between 2013Q3 and 2023Q3. Investments include all debt and equity investments in the same portfolio company.



bps. Part of this decline is due to the decline in the portfolio share of second-lien loans, documented in Figure 4. However, the blue and orange lines in Figure 6 show that spreads on both first- and second-lien loans have declined over the sample period. This decline in spreads may be the result of increased competition among BDCs or decline in cyclicality of investments.

Figure 6
BDC Loan Spread

This figure reports the weighted average spread on all floating-rate loans, 1st lien loans, and 2nd lien loans from 2013Q3 to 2023Q3. The spread includes both cash and PIK components.

Figure 7 suggests that BDCs mostly lend to firms in industries such as High Tech, Business Services, and Healthcare & Pharmaceuticals. As of 2023Q3, these industries respectively attracted 25%, 17%, and 15% of all BDC loans, by value.

To examine the cyclical sensitivity of BDC portfolios, in Figure 8, we plot the time series of the distribution of portfolio-level industry default beta. An industry's default beta is calculated as the slope from a regression of the annual industry default rate as reported by Moody's on the average default rate across all industries. For each BDC-date observation we calculate the value-weighted average of industry default beta across all loans in the BDC's portfolio. Industry default beta is the slope from the annual regression of industry default rate on the average default rate across all industries. Annual default rates over 1970–2023 for 35 industries are from Moody's Annual Default Study. Internet Appendix Table IA1 reports industry default beta, the average annual default rate, and the standard deviation of the annual default rate for each industry. Industries with the lowest default beta are Insurance (0.00), Utilities: Electric (0.06), Utilities: Oil & Gas (0.08), and Utilities: Water (0.12). Industries with the largest default beta are Media: Advertising, Printing & Publishing (2.88), Hotel, Gaming, & Leisure (2.43), and Media: Broadcasting & Subscription (2.08).[5] Because industry default beta is assumed to be constant, changes over time in the distribution of portfolio-level betas are due to changes in portfolio shares of different industries and changes in the sample of BDCs.

[5] Industry default beta has 0.85 correlation with the time-series average of the annual default rate for the industry. We find similar results if we use the average default rate instead of default beta.

Figure 7
BDC Investments by Industry

This figure reports the share of aggregate BDC investments by industry, as of 2023Q3. We use a large language model (LLM) to map almost five thousand raw industry descriptions in the holdings data into 35 Moody's industries. Equal-weighted shares refer to the simple average of portfolio shares across BDCs.

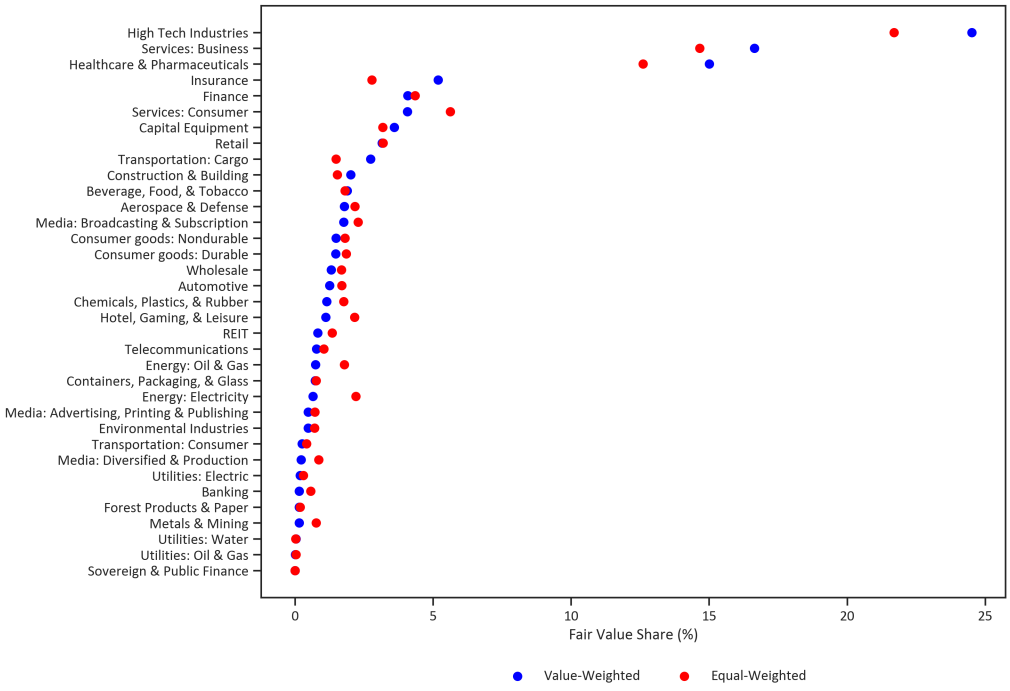


Figure 8
Portfolio-Level Industry Default Beta

For each BDC-date observation we calculate the value-weighted average of industry default beta across all loans in the BDC's portfolio. Industry default beta is the slope from the annual regression of industry default rate on the average default rate across all industries. Annual default rates over 1970–2023 for 35 industries are from Moody's Annual Default Study. The sample consists of BDCs with at least $100 million in assets and loan portfolio share of at least 50%.

The median portfolio-level industry default beta declines from a bit less than one during the first few years of the sample period to about 0.85 at the end. This suggests that BDCs have been shifting their portfolios to less cyclical industries. We also see an increase in the dispersion of industry default betas across BDCs. The interquartile range increases from around 0.15 to around 0.25.

3.2 Financing

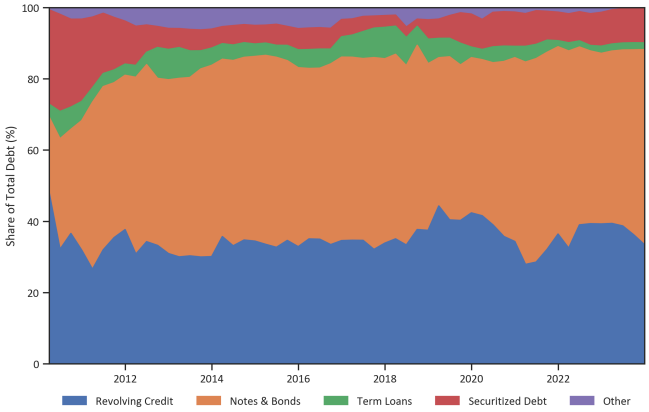
In Figure 9, we decompose BDC financing into revolving credit, unsecured notes and bonds, term loans, securitized debt, and other debt. Notes and bonds include SBA debentures, which are a particularly prominent source of financing for BDCs that lend to small firms.

BDCs depend primarily on revolving credit, extended predominantly by large banks, and corporate debt. Together, these sources of financing comprise around 85% of total BDC debt financing in 2023Q4. The remaining 15% includes securitized debt, term loans, and other debt.

Figure 9
BDC Debt by Instrument Type

This figure plots the share of aggregate BDC debt by instrument type from 2010Q1 to 2023Q4. Debt is decomposed into revolving credit, notes and bonds, term loans, securitized debt, and other. Notes and bonds are expressed net of securitized debt. Other aggregates commercial paper, leases, trust preferred securities, and other borrowings. It also includes total debt not elsewhere classified.

(a) Value-weighted



(b) Equal-weighted

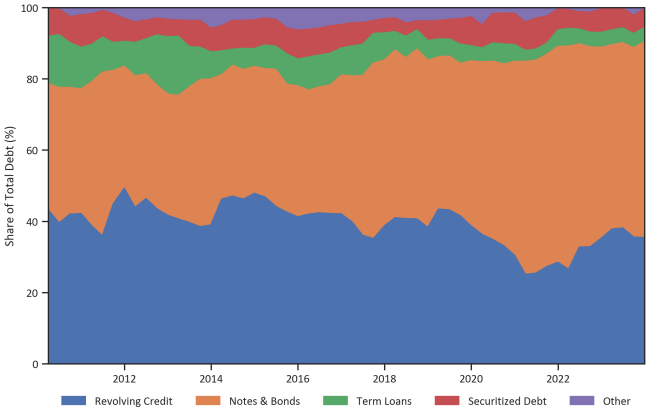
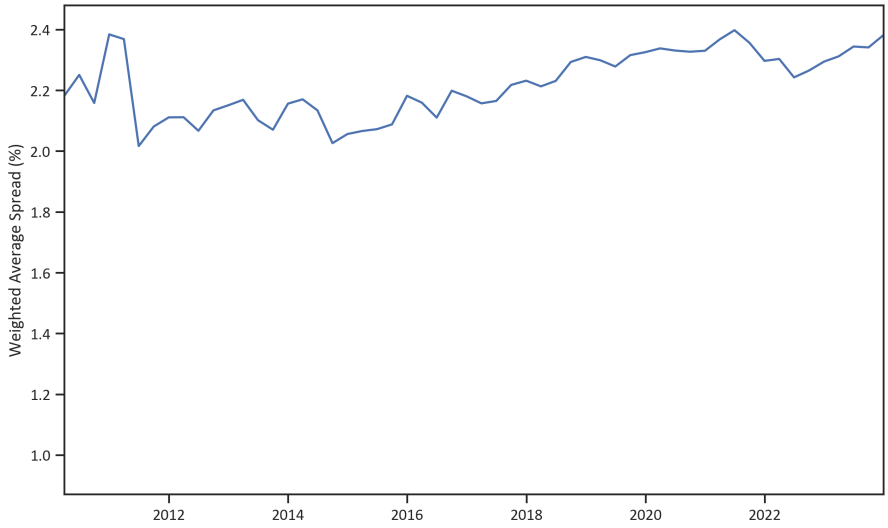


Figure 10 plots the time series of the weighted average spread paid by BDCs on their credit facilities.[6] As with loans, the financing spread is typically expressed over LIBOR earlier in the sample, and over SOFR in recent years. The spread on credit facilities trends up from around 200 bps in the earlier years to 230 bps in 2024.

[6] A limitation of the Capital IQ capital structure details data that we use to construct Figure 10 is that sometimes the reported values of maturity and interest rate are the most recent header values instead of the historical ones.

Figure 10
BDC Financing Spread
This figure reports the weighted average spread on all revolving credit used by BDCs from 2010Q1 to 2023Q4.



4 Application of Bank Capital Framework to BDCs

A commonly proposed explanation for the growth in nonbank middle market lending is that banks are subject to strict capital requirements and that the increase in capital requirements after the GFC shifted more middle market lending to the nonbank sector. This explanation is hard to square with the fact that BDCs operate with significantly more equity capital than banks do — generally a 1-1 debt-to-equity ratio. By all accounts, private credit funds also operate with similar leverage to BDCs. Such simple comparisons may be misleading, however, because they do not account for the riskiness of BDC assets, which, as shown in Figure 3, include equity in portfolio companies, joint ventures, and CLOs. To make a true apples-to-apples comparison between BDCs and banks, this section applies bank capital requirements and stress tests to BDCs.

4.1 BDC Capital Based on the Standardized Approach

We start by calculating the risk-weighted assets and capital ratios for all direct lending BDCs in our data as of 2023Q2. Following Basel III, we apply the following risk weights to portfolio securities:

- 100% weight on loans to portfolio companies.
- 400% weight on equity position other than holdings of CLOs, but including equity in joint ventures.
- 1,250% weight on holdings of CLO equity.

- 50% conversion factor for commitments to lend, including both revolving credit and delayed draw loans.

We apply these risk weights to each position's amortized cost.

In calculating the risk-based capital ratios, we make two adjustments to net assets to reflect differences in accounting between banks and BDCs. First, we subtract the difference between the fair value and amortized cost of portfolio securities. This accounts for the fact that BDCs report net assets at fair value while banks use historical cost accounting for most of their assets. Second, we create an allowance for credit losses, which we conservatively estimate as 2% of the amortized cost of portfolio loans.[7]

Figure 11 reports the distribution of the risk-weighted capital ratios for 60 direct lending BDCs with both portfolio holdings and debt structure data. The sample consists of BDCs with at least $100 million in assets and loan portfolio share of at least 50%. We sort BDCs into 5-percentage-points-wide bins and use dots to represent the number of BDCs in each bin, plotted at its midpoint. The median BDC has a capital ratio of 36%. The interquartile range is 30–42%. There are a few outliers. The three BDCs with capital ratios around 10% — OFS Capital Corp, Prospect Capital Corp, and Oxford Square Capital Corp — have large holdings of CLOs, which attract a 1,250% risk weight. BDCs in the right tail are non-traded BDCs with low leverage ratios. Thus, BDCs capital ratios significantly exceed those of large banks that could engage in middle market lending. In 2023Q2, banks with assets greater than $100 billion had a median common equity tier 1 risk-weighted capital ratios of 13.1%.

4.2 BDC Capital Based on Stress Tests

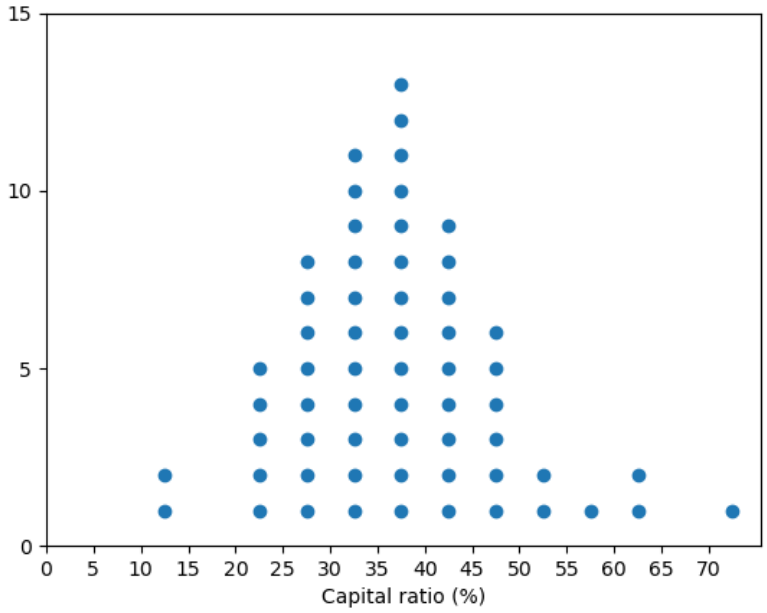
The calculation of risk-weighted capital ratios in Figure 11 suggests that BDCs have much more capital than would be required of banks investing in a similar portfolio of assets. However, it is possible that BDCs would perform poorly under the Federal Reserve's stress tests, which can be thought of as a complementary approach to determining bank capital requirements. Given the risk in BDC assets and the lack of diversification across loan types, the stress tests may determine the binding capital requirement. (Greenwood et al., 2017).

To evaluate this possibility, we conduct a stress test of BDC performance in a severely adverse scenario. Our stress test is meant to mirror the stress tests conducted by bank regulators. We use the parameters from the 2023 severely adverse scenario as outlined in the Federal Reserve's *2023 Stress Test Methodology* document. In particular, we follow the Fed's approach in assuming that SOFR drops to 0.25% while the stock prices fall by 45%. The main difference relative to the bank stress tests is that given data limitations we do not model the dynamics of credit losses over

[7] In Section 6 we estimate the expected loss on loans to middle market firms at around 1.6%.

Figure 11
Risk-Weighted Capital Ratios

This figure plots the distribution of the risk-weighted capital ratios for 61 as of 2023Q2. The sample consists of BDCs with at least $100 million in assets and loan portfolio share of at least 50%.



time, but instead simply focus on losses over a two-year period, the horizon of the severely adverse scenario.

The stress test consists of two main pieces: portfolio losses and pre-provision net revenue. We discuss these in turn.

4.2.1 Portfolio Losses

We separately estimate losses on holdings of i) portfolio loans, ii) CLOs, iii) equity in joint ventures, and iv) other equity securities.

Our starting point for estimating losses on portfolio loans is the estimated losses on commercial and industrial (C&I) loans in the 2023 bank stress test. To account for the fact that BDC loans may be riskier than the average C&I loan held on bank balance sheets, we use the 75th percentile loss rates on secured loans, namely 15.3%. This forms our estimate of the baseline loss rate on first lien loans. The assumed loss rate on unsecured loans is 19.7%. Bank stress test results do not separately report losses on second-lien loans, which are rare in bank portfolios. As an estimate of the losses on second-lien loans, we take the average between the assumed loss rates on first lien and unsecured loans. Finally, we assume a 40% loss rate on loans that are non-accruing. This conservatively assumes that none revert to accruing status and all default with a recovery rate of

60%.

To account for differences across BDCs in their exposure to more versus less cyclical industries, we use portfolio-level industry default betas reported in Figure 8. As of 2023Q2, portfolio-level default beta varies from 0.59 to 1.49, with a mean of 0.86. We use this beta to scale the baseline estimates of the loss rates on performing loans.[8]

For holdings of CLOs we assume a loss rate of 41.75% based on the estimates in the Residual tranche risk analysis study conducted by Oliver Wyman. Oliver Wyman conducted an analysis of losses on the residual tranches of different types of asset-backed securities — middle market CLOs, broadly syndicated loan CLOs, prime auto loan ABS, subprime auto loan ABS, and private student loan ABS — under an adverse scenario calibrated to the 95th percentile of Value at Risk. The estimated losses on the residual tranches of broadly syndicated loan CLOs and middle market CLOs of 43.5% and 26%. We take a value-weighted average, with BSL CLOs accounting for about 90% of the market.

To estimate losses on investments in joint ventures, we look through to the holdings of each JV.[9] We first use the same approach as above to estimate losses on each JV's loan portfolio. We then use data on the JV shares and capital structure to calculate the loss on BDC's investment in a JV. For a few JVs for which we do not have portfolio holdings data, we use the average loss rate across all JVs with holdings data.[10] The average loss rate on investments in JVs is 34%.[11]

The loss rates on warrants and on all other equity investments are assumed to be 100% and 45%, respectively. We assume that warrants expire worthless, while other equities experience the same 45% drop as the overall stock market under the 2023 severely adverse scenario.[12]

[8] The loss rate on non-accrual loans is not adjusted for industry default beta.

[9] LCD includes holdings data for some but not all of the JVs. We supplement LCD data with 2023Q2 holdings data extracted from the 10-Q/K filings.

[10] BDCs may not include in their SEC filings portfolio holdings data for JVs that account for a small share of BDC's assets.

[11] JVs hold similar loan portfolios to their parent BDCs. Adjusting for industry default beta, JVs suffer about 13.6% loss on their portfolios. This translates into about 34% loss on equity given average debt-to-assets ratio of about 60%.

[12] We tried estimating the implied beta of equities held by BDCs. We did this by first unlevering the observed equity betas of publicly-traded BDCs and then running a regression of the unlevered beta on the portfolio shares of different instruments. The coefficient on the equity share should capture the average beta of the equity instruments held by the BDCs. The estimated equity beta is around 0.8. This is low considering that portfolio firms have above average leverage. On the other hand, BDCs do tend to target less cyclical firms. Given the limitations of this analysis and to be conservative, we assume beta of one.

4.2.2 Pre-Provision Net Revenue

Pre-provision net revenue (PPNR) is defined as net interest income plus noninterest income minus noninterest expense.

To estimate interest income, we use the reported spreads on portfolio loans along with a 0.25% benchmark SOFR rate. Whenever it is reported in the LCD holdings data, we account for the floors on the base and/or overall rates. For fixed-rate debt instruments, we use the stated interest rate.

To estimate interest expense we use data on the BDC debt structure. For most BDCs in the sample, we are able to get the list of debt instruments along with their characteristics from Capital IQ. Although most of the time, Capital IQ reports the interest rate on fixed-rate debt and the formula for variable-rate debt, in some cases, the formula field simply says "Benchmark." In such cases, we check the 10-Q/K filings for the spread information. For 19 BDCs without debt structure information in Capital IQ, we extract this information from the 10-Q/K filing that corresponds to 2023Q2. We also collect information on the unused facility fees. Finally, we account for the effects of interest rate swaps outstanding as of 2023Q2.[13]

To estimate noninterest income, we collect data on the 2023Q2 dividend income, fee income, and other income. We assume that fee and other income stay at their 2023Q2 values. Dividend income is assumed to drop by half of the drop in the value of equities, i.e., 27.5%. This assumption is meant to reflect the stickiness of dividends and the increase in dividend yields during periods of market stress.

Non-interest expense under the stress scenario is assumed to stay at its 2023Q2 value except that the incentive fee expense is assumed to drop to zero.

4.2.3 Results

Figure 12 reports the results of the stress tests. Subfigure (a) shows the distribution of portfolio losses. Loss rates vary from 9.7% to 39.1%, but the interquartile range is much narrower at 13.1–18.7%. The median loss rate is 16.0%. Outlier BDCs with large loss rates are those with significant holdings of CLOs, equities, or joint ventures.

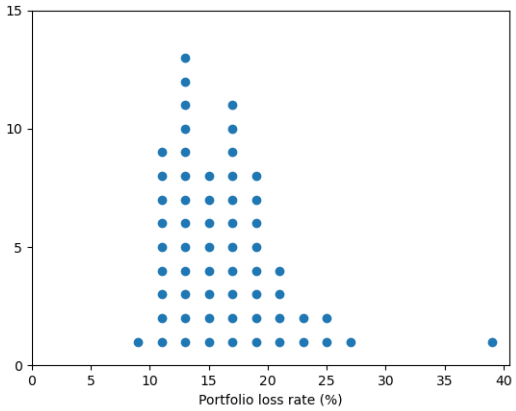
Subfigure (b) reports the distribution of pre-provision net revenue (PPNR) over the two-year stressed period relative to assets. PPNR varies from 2.4% to 22.5%. The interquartile range is 6.6–9.9%. The median PPNR is 8.1%. The outlier with 22.5% PPNR is Venture Lending & Leasing IX Inc. This BDC extends fixed-rate loans, but has floating-rate liabilities under a line of credit. As a result, large declines in interest rates under the severely adverse scenario result in high PPNR

[13] Interest rate swaps data are extracted from the 10-Q filings. As of 2023Q2, ten BDCs in the stress test sample had interest rate swaps. All of these were fixed-to-floating swaps meant to match the interest rate exposure of the BDC's fixed-rate notes with its floating-rate portfolio loans.

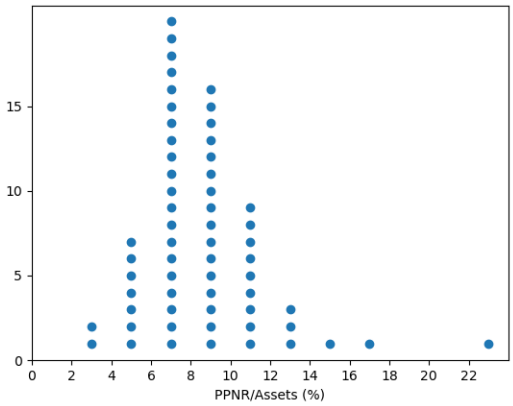
Figure 12
Stress Test

Subfigure (a) reports the distribution of the estimated portfolio loss rates. Subfigure (b) reports the distribution of the pre-provision net revenue (PPNR). Subfigure (c) reports the distribution of the net loss rate — the difference between PPNR and portfolio losses. Portfolio losses, PPRN, and net losses are scaled by total assets. Subfigure (d) reports the distribution of the stressed capital ratio. The numerator is calculated as initial net assets minus portfolio losses plus pre-provision net revenue. The denominator is risk-weighted assets, which following the bank stress test methodology are assumed to stay constant. In subfigures (a)–(c), BDCs are sorted into bins that are 2 percentage points wide; x-axis plots the mid point of each bin. In subfigure (d), BDCs are sorted into bins that are 5 percentage points wide; x-axis plots the mid point of each bin. The sample consists of BDCs with at least $100 million in assets and loan portfolio share of at least 50%.

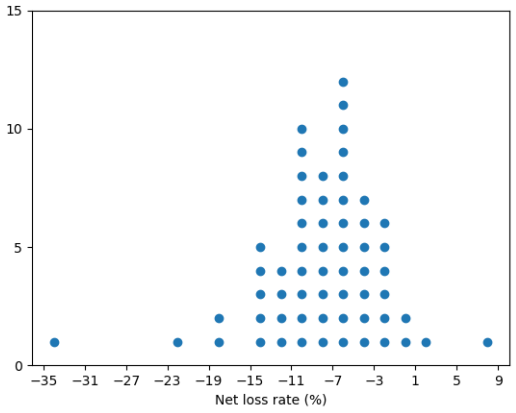
(a) Portfolio loss rate



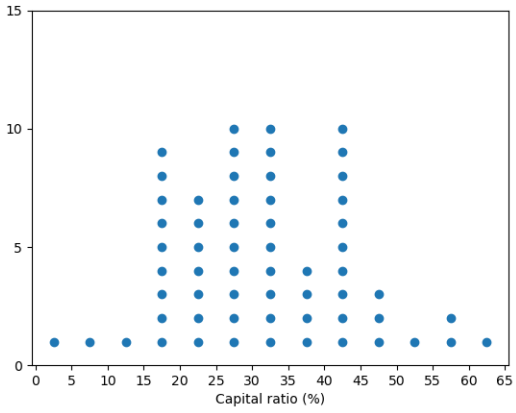
(b) PPNR/Assets



(c) Net loss rate



(d) Stressed capital ratio



for this BDC.

Subfigure (c) reports the distribution of the difference between PPNR and portfolio losses, scaled by total assets. The median net loss is around 7.1%. The interquartile range of net losses is 4.2–10.6%.

Finally, subfigure (d) of Figure 12 reports the distribution of the stressed capital ratio. In this subfigure, BDCs are sorted into bins that are 5 percentage points wide; the x-axis plots the mid point of each bin. Stressed capital ratios vary from 3.0% to 62.0%. The interquartile range is 20.0–40.8%. Only one BDC has a stressed capital ratio below 4.5%. Another three BDCs have stressed capital ratios of around 10%. All of these outlier BDCs have significant holdings of the residual tranches of CLOs, which attract 1,250% risk weight.

This analysis has implications for the amount of a capital a BDC would have to hold if it were regulated as a large bank subject to the stress tests. The required common equity tier 1 ratio (CET1 ratio) is given by the minimum CET1 ratio of 4.5% plus the stress capital buffer plus a G-SIB surcharge, applicable to the eight G-SIBs in the U.S. The stress capital buffer (SCB) is the greater of (i) 2.5% and (ii) the change in the CET1 ratio from its initial level to the minimum CET1 ratio over the stress period plus an adjustment for dividends paid for a portion of the stress period. We cannot calculate the exact SCB because we calculate the change in the CET1 ratio at the beginning and end of the period. The median decline in the CET1 ratio is 5.5%, with an interquartile range of 2.8%–7.9% Ignoring dividends and a G-SIB surchange, this implies a median CET1 requirement of 10%, with an interquartile range of 7.3% - 12.4%. Every BDC except one has a capital ratio in excess of the required amount; the median excess is 25.7 percentage points. Thus, on both the standardized approach and the stress test approach, BDCS are much better capitalized than banks would likely be if they were making the sorts of loans BDCs make.

5 Financial Stability Risks

Although we have established that BDCs are well-capitalized according to standard bank capital frameworks, it is still worth considering the potential risks to financial stability. There are at least three potential risks. First, it is possible that the entities that provide capital to BDCs could be adversely affected in a stress scenario. However, the risk to banks seem remote given that their loans are highly over-collateralized. Bondholders are in a more junior position relative to banks, but the risks they face seem on par with those of other BBB or BBB- bondholders. While they would likely get downgraded and their spreads would rise, our estimates also suggest that it is very unlikely that BDCs would default on these bonds. The shareholders of BDCs bear risks similar to average holder of equity given that BDC equity betas are about one. Of course, it is possible that the holders of the bonds and equity are leveraged financial intermediaries. Marked-to-market Losses on these investments could exacerbate other difficulties they would experience during highly stressed scenarios.

A second possible financial stability risk stems from heightened default risk of portfolio companies. This is a more general concern with leveraged lending and is not unique to BDCs or private credit funds.

Third, there is a risk of deleveraging as BDCs incur losses in the their portfolios in a stress

scenario. As noted above, BDCs have to remain in compliance with a minimum asset coverage ratio of 150% as required by Investment Company Act of 1940. They also have covenants in their bank credit facilities that specify similar minimum asset coverage ratios. Violating the regulatory minimum limits the ability of the BDC to pay dividends and take on new debt, while violating bank covenants could lead the bank to call theirloans. BDCs may thus use proceeds of debt repayments to pay down their debt obligations to remain in compliance with asset coverage ratios rather than lend to other firms, thus reducing new credit formation. In the extreme, they may be forced to sell loans in their portfolios, potentially at fire sale prices, using the proceeds to pay down debt.

To evaluate the extent of deleveraging that could occur in the severely adverse stress scenario, we conduct a dynamic simulation of BDC lending and debt management subject to compliance with asset coverage ratio minimums specified in the Investment Company Act of 1940 and in the credit agreements with banks that lend to BDCs.

Every quarter in the simulation, there are two main shocks to a BDC's portfolio value. The first shock is to portfolio company defaults, which are assumed to spike under the severely adverse scenario. Each performing company at the start of a quarter defaults during the quarter at a rate that is the product of the industry default beta and the average default rate specified by the macroeconomic scenario.[14] Once a company defaults, the value of all of its equity securities is wiped out. Its debt securities stop accruing interest and are assumed to recover 60% of their par value at default.[15] Our benchmark simulation assumes that it takes six quarters for default to be resolved and for BDCs to realize the recovery value. Because multiple BDCs may hold loans and equity securities of a given company, default shocks introduce cross-sectional correlation in changes in portfolio values.

The second main shock to BDC portfolio values stems from the widening of yield spreads and the decline in the stock market, both of which affect the fair market value of portfolio assets. At each point in time, we value loans by forecasting their remaining promised payments and discounting them at the prevailing yield. We estimate the remaining promised payments using the current value of the benchmark rate, which in the 2023 severely adverse scenario quickly falls to 0.25%, and the cash and PIK spreads on the loan. In estimating the remaining payments we assume that the benchmark rate will remain constant.

The discount rate used to value loan payments is the sum of three components: i) the benchmark

[14] The Fed's stress test scenarios do not specify default rates. We model default rates using the combination of annual default rates from Moody's and quarterly bankruptcy filings (https://www.uscourts.gov/statistics-reports/analysis-reports/bankruptcy-filings-statistics). We first calculate the peak default rate as a simple average of the 2009 default rates for B (6.80%) and Caa–C (26.39%) credit ratings. To model quarterly time series of default rates, we use the number of Chapter 11 bankruptcy filings around the GFC. Starting in 2008Q1, we calculate the ratio of the number of bankruptcy filings during the quarter relative to the 2009Q2 peak of 3,965 filings. We then multiply this ratio by the peak default rate of 16.60% to calculate the quarterly default rate.

[15] The par value at default can be different from the par value at the beginning of the simulation due to PIK interest. This is one way in which the simulation captures the greater riskiness of PIK debt.

rate, ii) the initial yield-to-maturity, and iii) the aggregate shock to yield spreads. We calculate the initial yield-to-maturity using our forecasts of the remaining cash flows as of 2023Q2 and the reported loan prices. The third component is the product of the loan's industry default beta and the average increase in yield spreads specified by the macroeconomic scenario. The Fed's severely adverse scenario assumes that the yield spread on BBB-rated corporate bonds increases by 3.6 percentage points from 2.2% to 5.8%. The scenario, however, does not specify yields on lower rated bonds or loans. To model the change in yield spreads on BDC portfolio loans, we use the GFC as our benchmark. Over the course of 2008, the increase in the option-adjusted yield spread on B-rated corporate bonds was 2.4 times the increase in the option-adjusted yield spread on BBB-rated corporate bonds. The increase in the yield spread on CCC and lower rated bonds was 3.9 times the increase in the spread on BBB-rated bonds. Taking a simple average between the two, the average yield spread on B, CCC and lower rated bonds increased by about 3.15 times the increase in the yield spread on BBB-rated bonds. Given that the severely adverse scenario assumes about 3.6 percentage points increase in the yield spread on BBB-rated bonds, the average increase in the yield spread on B, CCC, and lower rated bonds is likely to be on the order of 11.3 percentage points. However, because loans have higher recovery values than bonds, we assume a slightly smaller peak increase in yield spreads of 10 percentage points. Thus, the yield spread shock in our stress test exercise is the BBB yield spread assumed in the Fed's severely adverse scenario scaled up by 2.78 times.

To value equity securities other than equity in JVs, we calculate their returns by multiplying the return on the Dow Jones index specified by the Fed's severely adverse scenario by the industry default beta. Given that equity in CLOs is estimated to suffer similar losses over the course of the stress test exercise, we assume that the timing of the returns on CLO equity matches the timing of the returns on the other equity securities.

To value investments in JVs, we first value JV portfolio holdings. Because we have limited data on the debt structure of JVs, we assume that they borrow through lines of credit that pay interest at SOFR plus 250 basis points. The interest rate on JV credit facilities tends to be a bit higher than the interest rate on BDCs' own credit facilities because JVs tend to have smaller and less diversified portfolios. We assume that JVs maintain a constant debt amount and distribute their free cash flows to the JV partners according to their economic stakes. Thus, JVs do not reinvest in their portfolios.

We next calculate each BDC's income and cash flow. Income is the sum of interest income, including PIK, dividend income, and other income such as various fees charged to portfolio companies. We model dividend and other income in each quarter as a fixed percentage of the fair value of BDC assets in the quarter. This percentage is assumed to be equal to the percentage in 2023Q2 at the start of the stress scenario. In practice, these income sources are relatively small fraction of BDC income, and thus have little impact on the simulation results.[16]

[16] The mean shares of dividend income and of fee and other income in total investment income are 4.6% and 1.5%.

Total expenses are the sum of interest expense, base management and incentive fees, and other expenses. We use information on the debt structure of BDCs and on their interest rate swaps to calculate interest expense. For tractability, we assume that BDCs maintain their debt composition across bank loans and bonds throughout the simulation. Thus, when BDCs adjust their total borrowing, they do so proportionally. This assumption of fixed debt composition should have little impact on the simulation results.[17] Base management fees and other expenses are assumed to be a constant percentage of assets. We assume that because of weak performance during the severely adverse scenario, BDCs will not incur any incentive management fees.

To maintain their pass-through status as Registered Investment Companies (RICs), BDCs are required to distribute at least 90% of the net income. We therefore calculate free cash flow as

$$FCF = Net\ income - 0.9 \times Net\ income - PIK\ interest + Principal\ payments \tag{1}$$

Equation 1 subtracts PIK income because it is included in the calculation of net income but does not generate any cash flow.

Finally, we specify BDC behavior as a function of the asset coverage ratio, the ratio of total assets to debt. When the asset coverage ratio is greater than 200%, BDCs reinvest positive free cash flow pro-rata into their existing portfolio positions. Although in reality BDCs would reinvest into new loans, assuming reinvestment into the existing portfolio positions is a simple way to maintain the correlation structure in portfolio holdings across BDCs. The two main weaknesses of this approach to modeling reinvestment are that it results in the weighted average maturity declining over time and that it may underestimate future income and free cash flow as new loans are likely to be originated at higher spreads.

As the asset coverage ratio declines from 200% to 150%, we assume that BDCs direct an increasing share of their free cash flow to paying off debt such that by the time the asset coverage ratio drops to 150%, BDCs are using all of their free cash flow to reduce their debt. For example, when the asset coverage ratio is 170%, BDCs use 60% of their free cash flow to pay off debt and reinvest the other 40%. This assumption is a simple way to capture the fact that paying off debt has a larger effect on the asset coverage ratio than reinvesting in portfolio assets, but that, absent constraints, investment advisers would prefer to reinvest and maintain larger assets under management.

Finally, when the asset coverage drops below 150%, BDCs are assumed to liquidate portfolio holdings to bring the asset coverage ratio back to 150%.[18] We think of the yield spreads assumed by

[17] This assumption matters only if there are large changes in debt and large within-BDC variation in the cost of different debt instruments. In our baseline model, one year into the simulation, the median BDC reduces its assets by less than 5%. Given that BDCs start with debt-to-equity ratio of about 100%, this corresponds to about 10% decline in total debt. If for a given BDC, the difference between the cheapest source of debt and the weighted average is 200 basis points, then over the course of the second year of the simulation, interest expense relative to the initial total assets will be about 10 basis points lower.

[18] Because SBA-guaranteed debentures are excluded from the calculation of the asset coverage ratio, we exclude from

the scenario as effectively capturing any fire sale discounts and thus assume that portfolio holdings are sold at their fair market value.

Figure 13 reports the results of this simulation. We first report in panel (a) the evolution of the key scenario variables: default rate, increase in yield spreads, and the level of the stock market index relative to $t = 0$. In the 2023 severely adverse scenario, the stock market experiences a large drop in the first quarter, while yield spreads spike. The stock market continues to decline while yield spreads continue to increase over the following three quarters. After four quarters, the stock market starts to recover and yield spreads start to decline. The default rate increases more gradually and peaks in the sixth quarter.

Panel (b) of Figure 13 plots the mean, median, 25th, and 75th percentiles of the distribution of the asset coverage ratio. The median BDC starts with an asset coverage ratio of 207%, reaches a minimum of 162% during quarter 2, stays low for a couple more quarters, then starts to recover, and eventually exceeds 200%.

Panel (c) of Figure 13 shows sizable declines in gross assets. For the median BDC, gross assets decline by 28% of their initial value. Most of this decline, however, is due to higher yield spreads depressing the valuation of portfolio loans. Panel (d) of Figure 13 tracks active deleveraging: cumulative value of the free cash flow used to repay debt instead of reinvesting in the portfolio. Almost all of the deleveraging is achieved by using maturities of portfolio loans to repay BDC's debt. Relatively little is due to sales of portfolio loans, which in the simulation happen only when BDC would otherwise fall below the 150% asset coverage ratio. For the median BDC active deleveraging amounts to 4.0% by the fourth quarter and 7.6% by the eighth quarter. Some BDCs however experience much larger deleveraging. The 25th percentile reaches 13.7% by the fourth quarter and 19.9% by the eighth quarter.

Our baseline model does not account for the potential drawdowns by portfolio companies on the lines of credit extended by BDCs. The potential drawdowns could be quite large during a stress scenario as evidenced during the GFC and COVID pandemic (Ivashina and Scharfstein, 2010; Chodorow-Reich et al., 2022; Greenwald, Krainer, and Paul, forthcoming). Such drawdowns could limit the capacity of BDCs to extend credit to other firms while remaining in compliance with asset coverage requirements.[19] The baseline model also does not account for the possibility that financial covenants in bank credit facilities may specify higher asset coverage ratios than the 150% ratio required by the Investment Company Act of 1940, or that BDCs may follow more conservative asset coverage policies.

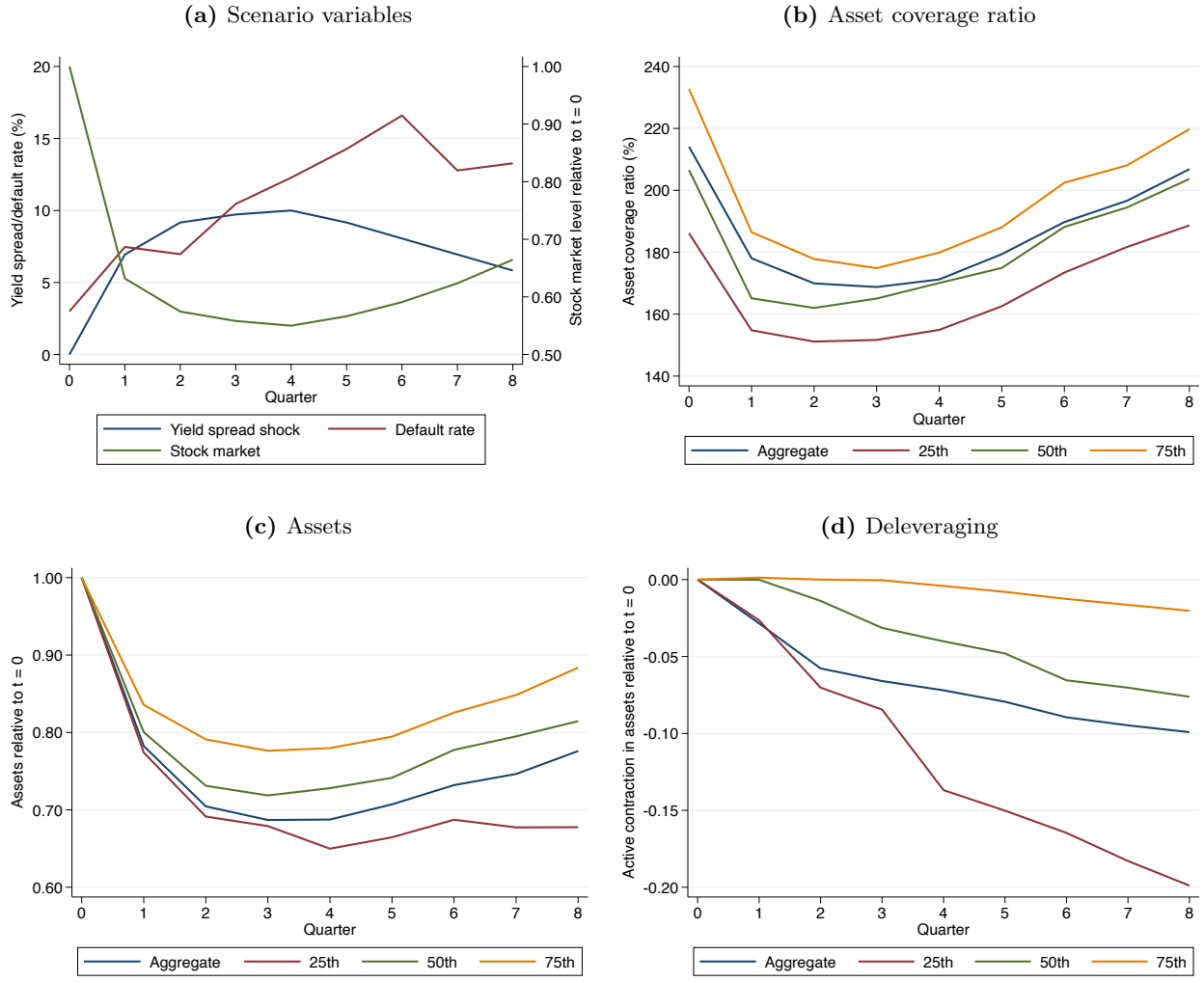
Figure 14 examines the dynamics of deleveraging under alternative models that account for

the simulation a few BDCs with SBA-guaranteed debentures.

[19] Such drawdowns are also a drain on the liquidity of banks that provide the credit lines, which could limit their ability to lend to other borrowers, as shown in Greenwald, Krainer, and Paul (forthcoming). Moreover, drawdowns by nonbank financial intermediaries during periods of stress appear to be larger than drawdowns by nonfinancial firms (Acharya et al., 2024).

Figure 13
Deleveraging under a Severely Adverse Scenario

This figure reports the results of the stress test exercise modeling the ability of BDCs to comply with the 150% asset coverage ratio required by the Investment Company Act of 1940. Details of the stress test exercise are described in Section 5. Panel (a) plots the time series of key scenario variables: the shock to yield spreads, default rate, and the stock market index relative to time 0. Panel (b) plots the distribution of the asset coverage ratio. Panel (c) plots the distribution of BDC assets indexed to their initial value. Panel (d) plots the distribution of the active change in BDC assets relative to their initial assets, specifically the cumulative value of the free cash flow used to reduce debt.

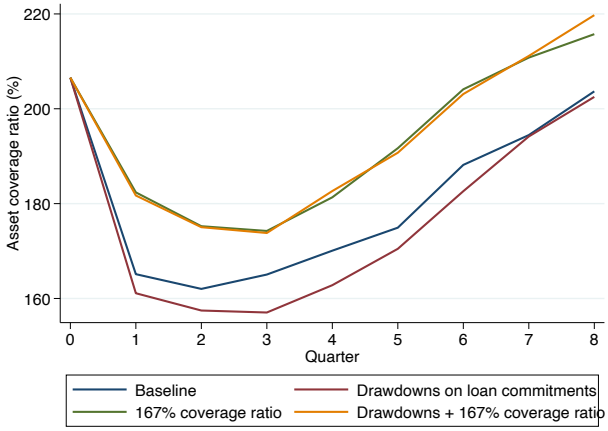


the commitments to lend and/or assume that BDCs maintain higher asset coverage ratios. The first model assumes that at $t = 1$, portfolio companies draw down half of the lines of credit and delayed draw term loans extended to them by the BDCs. Because we know only the aggregate value of undrawn commitments and not the value of commitments to each portfolio company, we allocate drawdowns pro-rata across all portfolio companies using the fair value of outstanding loans

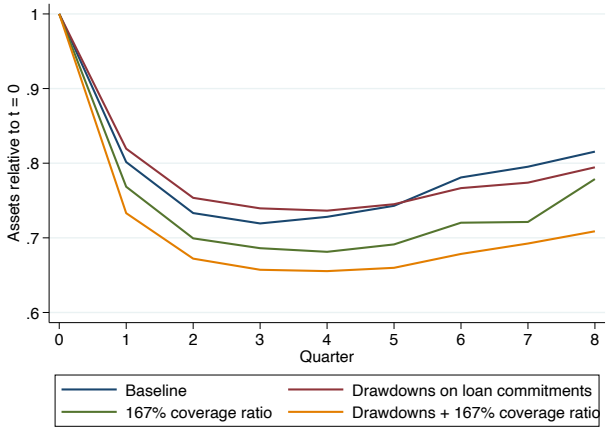
Figure 14
Deleveraging under a Severely Adverse Scenario: Alternative Assumptions

This figure reports the results of the stress test exercise described in Section 5 under alternative assumptions. The first alternative model assumes that half of each BDC's commitment to lend to its portfolio companies is drawn down at $t = 1$. The second alternative model assumes that BDCs maintain at least 167% asset coverage ratio. The third alternative model combines the first two. Panel (a) plots the median asset coverage ratio under the baseline model and the three alternative models. Panel (b) plots the median value of assets indexed to their initial value. Panel (c) plots the median change in BDC assets (relative to their initial assets) that is due to either drawdowns on commitments to lend or active repayment of debt.

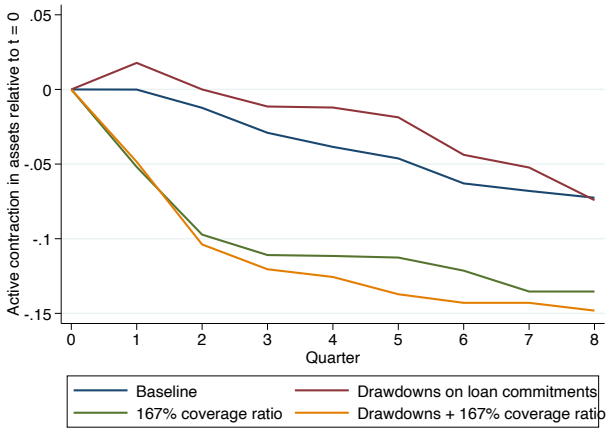
(a) Asset coverage ratio



(b) Assets



(c) Deleveraging



as weights.

The second model assumes that BDCs maintain an asset coverage ratio of at least 167% (which corresponds to 150% debt-to-equity ratio). This could be because the financial covenants in their credit agreements with banks specify stricter asset coverage ratios than the 150% ratio required by the Investment Company Act of 1940. Or it could be that BDCs themselves strive to maintain a

buffer relative to the 150% asset coverage ratio. Either way, as the asset coverage ratio declines from 200% to 167%, BDCs increase the share of their free cash flows that they use to repay debt. If the asset coverage ratio falls below 167%, BDCs liquidate some of their assets to maintain 167% asset coverage ratio.

The third model combines the first two, i.e., accounts for the drawdowns on loan commitments and assumes that BDCs maintain 167% coverage ratio.

The results in Figure 14 indicate that stricter asset coverage ratios have a much larger impact on deleveraging than do loan commitment drawdowns. In particular, under the third model, assets bottom out in quarter four at 65.5% of their initial value. Furthermore, BDCs delever by more and do so more quickly. By the second quarter, the median BDC delevers by 10.4%. This is net of the debt the BDCs take on at $t = 1$ in order to fund drawdowns on their commitments to portfolio companies. By comparison, under the baseline model, deleveraging is only 1.2% by $t = 2$.

The main limitation of the models in Figures 13 and 14 is that we have not yet modeled the ability of BDCs to roll over maturing debt. Furthermore, our modeling of drawdowns on commitments to portfolio companies is incomplete. Because we have only BDC-level commitments data, we allocate drawdowns pro-rata across all portfolio firms. However, distressed may be more likely than healthy firms to draw down on their facilities, and draw larger amounts when they do so. In that case, our results may underestimate the decline in BDC assets.[20] Finally, the results are contingent on the parameters of the severely adverse scenario. While we used mostly the same parameters as the Fed's 2023 severely adverse stress test scenario, we had to make our own assumptions about the increase in yield spreads and in default rates. Our peak default rate of 16.6% reflects the historical experience of B and lower rated issuers during the Global Financial Crisis. Similarly, our assumption about the increase in yield spreads combines information from the severely adverse scenario with the behavior of yield spreads during the GFC. Specifically, we use the ratio of the increases in the yield spreads on BBB versus B and lower rated bonds during the GFC to scale up changes in the yield spread on BBB-rated bonds assumed in the severely adverse scenario.

While these findings suggest that there would be a contraction in credit availability from BDCs during stress, the welfare effects of this contraction are ambiguous. On the one hand, demand for middle market loans may fall during the stress scenario as private equity firms are less interested in sponsoring buyouts. In this case, the contraction in supply would have little effect. On the other hand, existing portfolio companies may have greater demand for credit as they try to navigate a recession. In this case, the contraction in the supply of credit could have significant negative effects on the health of some middle market borrowers.

[20] On the other hand, our commitments data include both lines of credit and delayed draw terms loans. The latter may have stricter covenants and precedent conditions. Firms may therefore be restricted in their ability to draw down these commitments as a precaution.

A large literature, arguably beginning with Peek and Rosengren (2000) has shown that banks reduce loan supply in response to an adverse shock to capital. While the precise mechanism has not been studied, it is likely that banks seek to recapitalize by de-risking their balance sheets — using proceeds of loan repayments and other cash flows to invest in safe assets rather risky loans, which have higher risk weights. By contrast, in our simulations, we assume that BDCs recapitalize by paying down debt. Indeed, given that the SEC's regulation around asset coverage ratios do not risk-weight assets, investing in safer assets would do nothing to avoid violating the SEC's requirements.

6 Middle-Market Lending vs. Lending to Middle-Market Lenders

In this section, to try to understand why banks are not active middle market lenders, we compare the economics of lending to middle markets firms and lending to BDCs from the perspective of banks. Is it more profitable for a bank to be a middle market lender or to lend to middle market lenders? In making this comparison, we calculate the return on equity (ROE) of these two lending activities. We use ROE because it is the main measure banks use to evaluate lending opportunities. We compare BDC lending to "plain vanilla" middle market lending by which we mean investing in 1st lien middle market loans, not the equity of portfolio companies or CLO equity.

Table 1 provides illustrative ROE calculations. We use SOFR of 5.30%. The spread on middle market loans (MM loans) is assumed to be 6.25%, while the spread on loans to BDCs is assumed to be 2.00%.

The default rate on MM loans of 4% is set to capture the typical 1-year default rate on B and CCC rates loans.[21] Since most rated BDCs, which account for the bulk of BDC assets and bank lending to BDCs, have BBB issuer rating, the default rate on BDC loans of 0.25% is set to approximate the typical 1-year default rate on BBB-rated securities.[22] This is likely to be an upper bound on the default rate of BDC loans since they are structured as securitizations and are senior to any notes.

We assume 60% recovery rate on defaulted MM loans and 95% recovery rate on defaulted BDC loans. The assumed recovery rate for MM loans is based on the average recovery rate for 1st lien loans. For loans to BDCs we assume 95% recovery rate to reflect the fact that these credit facilities are overcollateralized with typical advance rates of around 75% for first lien performing loans.

[21] According to Moody's Annual Default Study, over 1983–2023, the 1-year default rate for B1, B2, B3, Caa1, Caa2, and Caa3 rated issuers were 1.76%, 2.74%, 4.23%, 3.78%, 6.49%, and 15.82%. While we do not observe the full distribution of credit ratings, with many borrowers being unrated, reports by Kroll Bond Rating Agency suggest that 11.6% of BDC portfolio firms received an assessment of b+ or higher, 19.5% are assessed b, 40.9% are assessed b-, and 28.0% are assessed ccc+ or lower. Using these weights and assuming that most of the firms with a score of ccc+ or lower have a ccc+ or ccc score results in a weighted average default rate of around 4%.

[22] According to Moody's Annual Default Study, 1-year default rates for Baa1, Baa2, and Baa3 ratings were 0.09%, 0.16%, and 0.26%.

Table 1
Bank Lending to Middle-Market Firms vs BDCs

This table provides illustrative calculations of the economics of bank lending to middle-market firms versus lenders to middle market firms (BDCs). The default rate on MM loans is meant to approximate the average 1-year default rates on B and CCC-rated loans. The default rate on BDC loans is meant to approximate the average 1-year default rate on BBB-rated loans. Recovery rate on MM loans approximates the average recovery rate on first-lien loans. Recovery rate on BDC loans is meant to reflect the high overcollateralization of these loans. Spread on debt funding reflects the typical rate on wholesale deposits. Operating expenses for MM loans are estimated using data on internally managed BDCs. Operating expenses for BDC loans are assumed to be significantly lower to reflect the much larger size of the loans and lower screening and monitoring costs.

	Target capital ratio			
	12% of RWA	12% of RWA	15% of RWA	5% of assets
	MM loan	BDC loan	MM loan	BDC loan
SOFR	5.30%	5.30%	5.30%	5.30%
Spread	6.25%	2.00%	6.25%	2.00%
Default rate	4.00%	0.25%	4.00%	0.25%
Recovery rate	60%	95%	60%	95%
Expected loss	1.60%	0.0125%	1.60%	0.0125%
Spread on debt funding	0.55%	0.55%	0.55%	0.55%
Tax rate	25%	25%	25%	25%
Operating expenses	2.00%	0.10%	2.00%	0.10%
Risk weight	100%	20%	100%	20%
Capital (% of assets)	12.0%	2.4%	15.0%	5.0%
ROE	17.51%	46.18%	14.89%	24.45%

Given the assumed default and recovery rates, we estimate expected losses on MM and BDC loans of 1.60% and 0.0125%. The estimated loss rate on MM loans is comparable to the historical loss rate on MM loans made by BDCs. Using BDC schedules of investment included in the SEC filings, Cliffwater tracks the performance of direct lending and constructs the Cliffwater Direct Lending Index (CDLI).[23] Since its inception in September 2004, the index has a net realized loss of 1.04% and net unrealized loss of 0.26% per year.

We assume, consistent with industry practice, that in assessing the funding costs of the loans they make, banks use their wholesale funding cost. This is the appropriate measure, not average deposit costs, because it is the marginal source of funds. Our estimate of the wholesale funding cost is a spread of 55 bps over SOFR. This estimate is based on the current CDS spreads on the senior debt of the top four banks by size: Bank of America, Citigroup, JPMorgan Chase, and Wells Fargo. The assumed tax rate is 25%.

We assume MM lending comes with operating expenses of about 2.00%. This estimate is based on the average operating expenses ratio of internally managed BDCs, which is less than the asset management fees typically changed by external asset managers.[24] Note that the given the regulatory

[23] 2023 Q3 Report on U.S. Direct Lending

[24] As of the end of 2023 there were six internally managed BDCs. We exclude two BDCs because they are very small (less than $300 million in assets) and thus have very high expense ratios of 4.54–4.59%, likely because of the fixed costs of making MM loans.

compliance costs and other costs of supervision, the operating expenses of middle market lending could well be higher for banks. Given that loans to BDCs are much larger and require much less screening and monitoring, we assume operating expenses of about 10 basis points. For a $500 million credit facility, this would imply $0.5 million in annual operating expenses.

Finally, we use a 100% risk weight for MM loans and 20% risk weight for BDC loans. The right weight for loans to BDCs is only 20% because most loans are extended to wholly-owned special purpose subsidiaries of BDCs. These loans are structured and overcollateralized, so they qualify to be treated as securitizations under bank capital requirements. The risk weight is determined by the Simple Supervisory Formula Approach, which in turn depends on the extent of over-collaterilzation, the capital requirement for the underlying pool of loans, and the deliquency rate in the loan pool. Based on our own calculations using the SSFA worksheet published by the FDIC,[25] and our conversations with industry practitioners, most loans set overcollateralization and other terms to result in a 20% risk weight.

Given all of these assumptions, we calculate the ROE_i of a loan to borrower type i, where i could be a middle market loan (MM) or a BDC loan (BDC):

$$\begin{aligned} ROE_i &= \frac{1-\tau}{E_i}\left(SOFR + Spread_i^{loans} - Losses_i - OpEx_i - (1-E_i)\times(SOFR + Spread^{funds})\right) \\ &= (1-\tau)(SOFR + Spread^{funds}) + \frac{1-\tau}{E_i}\left(Spread_i^{loans} - Spread^{funds} - Losses_i - OpEx_1\right) \end{aligned}$$

where E_i stands for the equity to be invested as a share of the loans made. E_i will be determined by the regulatory capital treatment of MM and BDC loans as well as the bank's target capital ratio.

Columns 1 and 2 assume that banks operate with a target 12% CET1 ratio. The ROE of lending to middle market firms is then 17.51% compared to 46.18% ROE of lending to BDCs. The risk weight of 100% on MM loans, means that equity invested in MM lending is 12%, while the risk weight of 20% on BDC loans means the equity invested for these loans is just 2.4%. The value of the risk weight on BDC loans that equalizes the ROE on MM and BDC loans is 56%. Given the assumption of a 20% risk-weight and a target CET1 ratio, banks only have to hold capital of 2.4% of assets on BDC loans. This is less than the 5% Supplemental Leverage Ratio. If this constraint binds for a banks, the ROE could be calculated based on 5% equity capital. The last column of Table 1 reports the ROE of lending to BDCs when they are subject to the 5% leverage ratio. The estimated ROE is 24.45%.

The estimated differences in ROE on MM and BDC loans do not account for potential differences in the required rates of return. While lending to BDCs is less risky than lending to middle market firms, the required rate of return on equity may be higher for BDC loans because they are more leveraged. While it would be useful to adjust for differences in risk, given the high debt-to-equity ratio, the calculation of the required rate of return is quite sensitive to specific assumptions about

[25] https://www.fdic.gov/resources/bankers/capital-markets/regulatory-capital/ssfa-job-aid.xls

the unlevered asset beta of the loans and the risk borne by the bank's debtholders. But under a broad range of reasonable assumptions, the ROE of lending to BDCs exceeds a bank's required rate of return.

If it is indeed the case that banks are earning excess returns by lending to BDCs, one has to ask how this can persist in equilibrium. One possibility is that there is imperfect competition in the supply of credit to BDCs — and nonbank financial intermediaries more broadly — such that banks charge oligopolistic rates on their loans to BDCs. Jiang (2023) presents evidence along these lines in the context of banks that fund nonbank mortgage originators. It is also possible that banks are not earning excess returns because the contractual spreads do not reflect the true risks and costs of lending to BDCs. In particular, while the risk of default on bank credit facilities might be negligible, as noted by Cooperman et al. (forthcoming), spreads may compensate for the costs of committing to provide liquidity during periods of stress — a time when bank capital and liquidity are at a premium. Because the base rate, SOFR, does not adjust as market risk increases and bank funding costs rise, banks need to incorporate these expected costs into the spreads on their credit facilities.[26]

Although we have argued that BDCs do not benefit from less onerous capital requirements, they may not be subject to other forms regulatory and supervisory oversight that bind on banks. One form of supervision that may be particularly relevant here is interagency guidance on leveraged lending, originally issues in 2001 and revised in 2013.[27] While this guidance does not prohibit leveraged lending, it "describes expectations for the sound risk management of leveraged lending activities." Complying with this guidance likely imposes costs on banks that are not borne by BDCs and private credit funds. More broadly, risky loans may garner particular attention from supervisors and increase the likelihood that banks will be judged as not complying with sound risk management practices. This is consistent with the finding of Chernenko, Erel, and Prilmeier (2022) that publicly-traded middle market firms with negative EBITDA are about 35 percentage points less likely to borrow from banks than nonbanks.[28]

Interestingly, to the extent that large banking entities engage in middle market lending, they typically do so through their asset management divisions rather than through their insured depository institutions. For example, Goldman Sachs recently announced a big commitment to private credit through GSAM, its asset management division. In fact, rather than making middle market loans with considerable leverage sourced at low cost, Goldman Sachs already makes middle market loans through its BDC, with relatively little, but expensive, debt financing. This is consistent with

[26] As Cooperman et al. (forthcoming) note, this contrasts with LIBOR, which adjusted with changes in bank funding costs. Thus, spreads on credit facilities have likely increased to reflect this change in the base rate.

[27] The 2013 Interagency Guidance on Leveraged Lending can be accessed at: https://www.federalreserve.gov/supervisionreg/srletters/sr1303a1.pdf

[28] This may also help to explain why private credit funds appear to be more felxible in the way they renegotiate with borrowers who violate financial covenants, as shown by Jang (2024)

Goldman Sachs incurring significant supervisory costs were it to make risky middle market loans on its bank balance sheet, but avoiding those costs as the asset manager of its off-balance-sheet BDC. The difference between the financing costs of the Goldman Sachs BDC and the financing costs of the Goldman Sachs Bank provides some indication of how much extra regulatory and supervisory costs the bank would incur if it lent to risky middle market firms on its balance sheet.

7 Conclusion

We argue that the growth of private credit cannot be explained by the standard argument that lending activity flows to nonbank intermediaries (like BDCs) that are not subject to onerous bank capital requirements. We show that BDCs — an important type of nonbank intermediary providing middle market loans — are far better capitalized than banks are required to be. Despite their high levels of capital, leverage limits imposed by the SEC and bank loan covenants, could lead BDCs to significantly reduce lending during stress scenarios.

While the standard regulatory arbitrage story does not explain the growth of private credit, bank regulation and supervision likely play an important role. The fact that bank holding companies choose to conduct their middle market leveraged lending through BDCs and private credit funds suggest that they perceive greater regulatory and supervisory costs of lending through their depository institutions. It also suggests that bank capital requirements per se are not an impediment to lending given that bank holding companies *choose* to lend through entities that have much more capital than would be required of banks. Importantly, however, these entities have much lighter touch regulation and supervision and thus lower compliance costs. Thus, we conjecture that it is high capital requirements in *combination* with high compliance costs that prevents banks from meeting ROE targets and discourages bank lending. It may therefore be worth considering whether a policy of very high capital requirements combined with lighter touch regulation and supervision could meet financial stability and bank profitability objectives.

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Internet Appendix

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Bank Capital and the Growth of Private Credit

Table IA1
Industry Default Beta

This table reports industry default beta, average annual default rate, and the standard deviation of the annual default rate for each the 35 industries tracked by Moody's. Annual default rates over 1970–2023 are from Moody's Annual Default Study. Coverage for some industries does not start until after 1970. We report the number of annual observations for each industry in the N column. Industry default beta is the slope from the annual regression of industry default rate on the average default rate across all industries.

Industry	Beta	Mean	SD	N
Aerospace & Defense	0.58	0.8%	1.4%	54
Automotive	1.52	1.9%	3.2%	54
Banking	0.19	0.5%	0.8%	49
Beverage, Food, & Tobacco	0.59	1.0%	1.1%	54
Capital Equipment	0.93	1.4%	1.9%	54
Chemicals, Plastics, & Rubber	0.68	0.8%	1.5%	54
Construction & Building	1.85	2.6%	3.5%	54
Consumer goods: Durable	1.92	2.2%	3.9%	52
Consumer goods: Nondurable	1.76	3.2%	3.6%	54
Containers, Packaging, & Glass	1.08	2.5%	3.4%	37
Energy: Electricity	0.53	2.8%	3.4%	41
Energy: Oil & Gas	0.59	2.1%	3.1%	54
Environmental Industries	0.86	2.9%	4.4%	36
Finance	0.53	0.8%	1.3%	49
Forest Products & Paper	1.39	1.7%	2.9%	54
Healthcare & Pharmaceuticals	0.45	1.3%	1.6%	54
High Tech Industries	0.65	1.6%	1.6%	54
Hotel, Gaming, & Leisure	2.43	3.9%	4.8%	45
Insurance	0.00	0.3%	0.6%	44
Media: Advertising, Printing & Publishing	2.88	4.9%	7.2%	42
Media: Broadcasting & Subscription	2.08	3.1%	4.4%	41
Media: Diversified & Production	0.49	2.3%	3.8%	43
Metals & Mining	1.55	2.6%	3.8%	54
REIT	0.49	0.7%	1.7%	37
Retail	1.00	2.8%	2.7%	54
Services: Business	0.77	1.9%	2.2%	52
Services: Consumer	1.42	2.7%	3.5%	30
Sovereign & Public Finance	0.30	0.7%	2.0%	36
Telecommunications	1.17	1.5%	2.7%	54
Transportation: Cargo	0.68	2.2%	3.0%	54
Transportation: Consumer	1.50	3.0%	5.9%	54
Utilities: Electric	0.06	0.1%	0.3%	54
Utilities: Oil & Gas	0.08	0.2%	0.5%	54
Utilities: Water	0.12	0.2%	0.7%	35
Wholesale	1.39	2.7%	3.4%	45

Table IA2
BDC Joint Ventures

This table reports information on BDC joint ventures. For each JV, the table reports i) the name of the joint venture partner, ii) BDC's stake in the JV (*JV share*), iii) the value of BDC investment in the JV relative to BDC's total assets (*portfolio share*), iv) the value of JV assets (in millions), and v) JV's debt-to-assets ratio. JV information is as of 2023Q2. JV debt-to-assets ratio excludes subordinated debt provided by BDC or its JV partner. Some JVs do not report all relevant information.

				JV	Portfolio	JV	
CIK	**Name**	**JV**	**JV partner(s)**	**share**	**share**	**Assets**	**D/A**
1552198	WhiteHorse Finance Inc	WHF STRS Ohio Senior Loan Fund LLC	State Teachers Retirement System of Ohio	65.7%	10.6%	344	54%
1603480	TCW Direct Lending LLC	TCW Direct Lending Strategic Ventures LLC	Security Benefit Corp + Oak Hill Advisors LP	80.0%	7.1%	85	0%
1372807	Portman Ridge Finance Corp	Great Lakes Funding II LLC		12.5%	8.3%		
1372807	Portman Ridge Finance Corp	KCAP Freedom 3 LLC	Freedom 3 Opportunities LLC	62.8%	3.0%		
1383414	PennantPark Investment Corp	PennantPark Senior Loan Fund LLC	Pantheon Ventures (UK) LLP	60.5%	13.9%	839	64%
1504619	PennantPark Floating Rate Capital Ltd	PennantPark Senior Secured Loan Fund I LLC	Kemper Corp	87.5%	21.8%	848	62%
1414932	Oaktree Specialty Lending Corp	Senior Loan Fund JV I LLC	Trinity Universal Insurance Co	87.5%	4.2%	370	54%
1414932	Oaktree Specialty Lending Corp	OCSI Glick JV LLC	GF Equity Funding	87.5%	1.5%	127	52%
1496099	New Mountain Finance Corp	NMFC Senior Loan Program III LLC	SkyKnight Income II LLC	80.0%	4.2%	697	73%
1496099	New Mountain Finance Corp	NMFC Senior Loan Program IV LLC	SkyKnight Income Alpha LLC	78.6%	3.4%	501	71%
1512931	Monroe Capital Corp	MRCC Senior Loan Fund I LLC	Life Insurance Company of the Southwest	50.0%	6.3%	177	61%
1422183	FS KKR Capital Corp	Credit Opportunities Partners JV LLC	South Carolina Retirement Systems Group Trust	87.5%	8.9%	3,648	52%
1490927	Franklin BSP Lendig Corp	FBLC Senior Loan Fund LLC	Cliffwater Corporate Lending Fund	79.8%	10.1%	974	62%
1544206	Carlyle Secured Lending Inc	Middle Market Credit Fund II LLC	Cliffwater Corporate Lending Fund	84.1%	3.4%	248	63%
1544206	Carlyle Secured Lending Inc	Middle Market Credit Fund LLC	Credit Partners USA LLC	50.0%	9.5%	839	59%
17313	Capital Southwest Corp	I-45 SLF LLC	Main Street Capital Corp	80.0%	4.1%	153	56%
1812554	Blue Owl Credit Income Corp	Blue Owl Credit Income Senior Loan Fund LLC	State Teachers Retirement System of Ohio	87.5%	1.7%	809	62%
1655888	Blue Owl Capital Corp	Blue Owl Capital Corporation Senior Loan Fund LLC	The Regents of the University of California	50.0%	2.7%	1,158	61%
1859919	Barings Private Credit Corp	CPCF BPCC LLC	Cresset Partners Private Credit Fund LLC	9.1%	0.2%	115	58%
1379785	Barings BDC Inc	Sierra Senior Loan Strategy JV I LLC	MassMutual Ascend Life Insurance Company	89.0%	1.5%	107	72%
1655050	Bain Capital Specialty Finance Inc	Senior Loan Program LLC	Amberstone Co Ltd	50.0%	4.4%	874	60%
1655050	Bain Capital Specialty Finance Inc	International Senior Loan Program LLC	Pantheon	70.5%	9.4%	751	47%
1287750	Ares Capital Corp	Senior Direct Lending Program LLC	Varagon Capital Partners	87.5%	5.6%	5,128	73%

Table IA3
Summary of the Deleveraging Simulation Assumptions
This table summarizes the assumptions and features of the deleveraging simulation in Section 5 in the paper.

Feature	Summary
Default	Performing firms default at the annual rate reported in panel (a) of Figure 13. Once a firm defaults, its equity securities are wiped out. Loans stop accruing interest and recover 60% of the par value at default. Recovery is realized six quarters after default.
Portfolio valuation	
Loans	We use each loan's spread information along with the level of the benchmark rate (SOFR) specified by the macro scenario to forecast the remaining promised cash flows. Promised cash flows are then discounted at a rate that is the sum of three components: a) SOFR, b) loan's yield spread as of 2023Q2, and c) the aggregate shock to yield spreads (reported in panel (a) of Figure 13) scaled by the loan's industry default beta. Loan's yield spread as of 2023Q2 is the difference between the loan's IRR and SOFR as of 2023Q2. We do not model the term structure of the expected values of SOFR and of the yield spread shock. At each point in the simulation, we forecast and discount cash flows assuming that SOFR and the yield spread shock will remain at their current levels indefinitely. For loans with PIK option, borrowers are assumed to always max out the PIK component.
Equity in JVs	We calculate the value of equity in JVs and distributions from JVs from the bottom-up using information on JV portfolio holdings and total debt. JVs are assumed to borrow at 250 basis point over SOFR. JVs distribute their free cash flow pro-rata and do not reinvest.
Equity in CLOs	We use the quarterly stock market returns specified by the Fed's 2023 severely adverse scenario to track changes in CLO equity.
Other equity	We scale the quarterly stock market returns specified by the Fed's 2023 severely adverse scenario by the firm's industry default beta (reported in Table IA1).
Free Cash Flow	

(Continued)

Table IA3—*continued*

Feature	Summary
Interest income	Interest income is calculated using the benchmark rate (SOFR) and the stated spreads on portfolio loans. PIK income is included in total interest income but is subtracted from free cash flow.
Dividend income	Dividend income from JVs is calculated from the bottom-up. Dividend income from all other equity positions is calculated as a fixed percentage of the fair value of BDC assets. This percentage is assumed to be equal to the percentage in 2023Q2 at the start of the stress scenario. In calculating the ratio of dividend income to assets, we exclude dividend income from JVs, which is accounted for separately.
Other income	Other income, primarily fees charged to portfolio companies, is calculated as a fixed percentage of the fair value of BDC assets.
Interest expense	Interest expense on floating-rate debt is calculated using the benchmark rate (SOFR) and the stated spread as of 2023Q2. Interest expense on fixed-rate debt is calculated using the stated coupon rate. We account for the effects of interest rate swaps. Debt structure, the shares of different instruments, is held constant throughout the simulation. Total debt is scaled proportionally.
Management fees	Base management fees are calculated as a fixed percentage (2023Q2 value) of the fair value of BDC assets. Incentive fees are assumed to be zero during the stress scenario.
Other expense	Other expenses are calculated as a fixed percentage (2023Q2 value) of the fair value of BDC assets.
Free cash flow	FCF = Net income - 0.9 × Net income - PIK interest + Principal payments

(Continued)

Table IA3—*continued*

Feature	Summary
BDC behavior	BDCs distribute 90% of their net investment income. Positive free cash flow, which includes repayment of portfolio loans, is used to either reinvest in portfolio assets or repay debt. The split is determined based on the pro-forma asset coverage ratio, the ratio of total assets to debt, that assumes that FCF is fully reinvested. If the pro-forma asset coverage ratio is at least 200%, all FCF is reinvested pro-rata into portfolio loan at their fair values. If the pro-forma asset coverage ratio is between 150% and 200%, we linearly increase the share of FCF that is used to repay debt so that when the pro-forma asset coverage ratio is 150%, all FCF is used to repay debt. If the pro-forma asset coverage ratio is below 150%, BDC engages in pro-rata liquidation of portfolio securities at their fair values. Negative FCF is accommodated through increases in debt.