Bank Capital and the Growth of Private Credit*

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Abstract

We show that business development companies (BDCs), a significant source of private credit, are very well capitalized according to bank capital frameworks. These types of private credit funds have median risk-based capital ratios of about 36%, which is 26 percentage points more than the Federal Reserve's stress testing framework would require. Our evidence thus cuts against the view that private credit has grown because nonbank financial intermediaries have less capital than banks.

Instead, we argue that, for plausible parameters, banks find lending to private credit funds more attractive than direct middle-market lending. This is, in part, because over-collateralized loans to private credit funds get favorable capital treatment, enabling banks to exploit their low-cost funding.

We also present a model explaining banks' observed preference for making middle-market loans via affiliated private credit funds rather than on the bank's balance sheet. For plausible parameters, banks choose to forgo less expensive balance sheet funding to avoid the extra regulatory and supervisory costs of managing a risky loan portfolio on the bank's balance sheet.

Finally, we examine the financial stability risks of private credit. While there is little risk to the solvency of private credit funds, they may deleverage during periods of stress. Our baseline estimates suggest that over eight quarters, the median BDC would reduce outstanding loan balances by 9.5%, about half by selling assets and half by using free cash flows to pay down debt rather than to make new loans.

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

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1 Introduction

Since the Global Financial Crisis, lending by nonbank financial intermediaries to the corporate sector has grown substantially. This kind 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). Although 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 middle market private equity-sponsored transactions – has grown so much outside the banking sector. One common explanation is that the growth of private credit – and other forms of nonbank 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 ("middle market loans"), a form of private credit often referred to as direct lending.[1] We focus on BDCs both because they are an important type of nonbank lender, with aggregate assets of approximately $310 billion across nearly 150 entities, 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). However, our conclusions from examining BDC data very likely apply to other types of funds that hold private credit ("private credit funds") given their similar portfolio holdings and financing. Section 2 provides background on BDCs and describes our data sources. Section 3 presents summary statistics on the BDCs in our sample.

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 above the capital levels that are required and observed in 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 mean credit losses of about 16.6% of assets, offset by mean net revenue of 8.3%. Mean estimated net losses are about 8.3% of assets. The

[1] As a shorthand, we will refer to these loans as "middle market loans" although BDCs and private credit funds typically skew their lending to riskier middle market loans used to finance private equity buyouts and follow-on transactions by those firms.

average stressed capital ratio is 30.4%, 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%. By contrast, in the 2024 stress tests, the average bank had a stressed capital ratio of 9.9%, well below the average stressed minimums of BDCs (Board of Governors of the Federal Reserve System, 2024).

If private credit funds are much better capitalized than banks, why has direct lending grown so much in recent years? Why are banks, which generally have lower funding costs, not originating and holding middle-market loans on balance sheet? Why are they instead more prone to lend to middle-market lenders rather than make loans to middle-market firms? And to the extent that banking organizations originate middle-market loans, why are they doing so through the private credit funds, including BDCs, they establish and manage?

We offer a number of answers in Section 5. We start by showing that given bank capital regulations, observed credit spreads, and funding costs, it is arguably more profitable for banks to lend to private credit funds than to riskier middle market firms. Because banks typically lend to private credit funds 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 requirements, as opposed to the 100% risk weight that would be required for the underlying collateral (i.e., commercial and industrial loans). While credit spreads on middle market loans averaged about 600 bps in recent periods, spreads on bank loans to BDCs averaged about 230 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. One factor is that the lower risk weight on loans to private credit funds means banks can use more leverage to fund BDC loans. Another factor is that given the lower risk of loans to private credit funds, expected losses are lower than they are for middle market loans. Finally, BDC loans are considerably larger than typical middle market loans. Given the fixed costs of originating, underwriting and servicing loans, the operating expense of a portfolio of loans to private credit funds is likely to be considerably lower than that of a comparably-sized portfolio of middle market loans. For plausible parameters, the ROE of a loan to a private credit fund well 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.

These observations may also help explain the broader growth of nonbank financial intermediation, which has been facilitated by bank loans to nonbank financial intermediaries ("NBFIs") 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).

We also present a simple model to explain why it can make sense for banks to engage in middle market sponsored lending through private credit funds rather than on balance sheet. In the model, banks compare the value of balance sheet lending to the value of fee income from the management of a private credit fund. We assume that asset managers can charge fees that extract all the alpha from private credit – as suggested theoretically by Berk and Green (2004) and documented for private credit funds in a recent paper by Erel, Flanagan, and Weisbach (2024). The benefit of lending on balance sheet is that banks have lower funding costs than private credit funds. However, balance sheet lending is relatively tax-disadvantaged because only the portion of bank lending funded by debt can be shielded from taxes, while fee income from asset management can effectively shield all of the lending amount from taxes. Moreover, we assume that banks have larger operating expenses than private credit funds because it is more costly to originate, underwrite and service a loan portfolio under the regulatory and supervisory oversight of multiple bank regulators.

We examine whether the tax and operating expense disadvantages of balance sheet lending are plausibly large enough relative to their funding cost advantage to explain why balance sheet lending to middle market borrowers is less profitable than asset management of a private credit fund. For relatively low or modest funding cost disadvantage of 50–100 bps, the operating expense advantage of private credit funds has to be between about 8 and 48 bps of the loan portfolio to make private credit more profitable. Given estimated operating expenses of private credit of about 138 basis points, this differential cost seems plausible. However, if private credit funds have a 175 bps funding disadvantage, their operating expense advantage would need to be at least 108 bps, meaning that bank operating expenses would have to be at least 78% higher than they are for private credit funds. If this differential is implausibly high, there would have to be other advantages of direct lending. One possibility is that there is an additional "shadow cost" of holding risky middle market loans on a bank's balance sheet due to interagency supervisory leveraged loan guidance around the management of such loans (Chernenko, Erel, and Prilmeier, 2022). Thus, while the model assumes that there is no difference between the loan portfolios that banks and private credit funds can hold, in practice this guidance may have discouraged banks from holding valuable loans that private credit funds hold. Another possibility is that our model understates the fees that private credit funds are able to charge if investors overestimate pre-fee alpha, particularly in recent years when there has been such significant growth in private credit. A combination of lower operating

expenses, leveraged loan guidance, and excessive fees could then explain private credit even if banks have a very significant funding cost advantage.

Following this analysis, we turn our attention in Section 6 to the potential financial stability implications of private credit. Our application of the bank capital frameworks – both the standardized approach and stress testing methodology – suggests that BDCs, and private credit funds more generally, 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, sell assets, 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%.[2] 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. Furthermore, if they would otherwise fall below the regulatory minimum, BDCs would sell portfolio assets in order to maintain their asset coverage ratio at or above the minimum. We estimate that the median BDC reduces lending by almost 10% after 8 quarters of stress, with lending of one quarter of BDCs falling by almost 15%. About half of aggregate deleveraging is due to asset sales, while the other half is due to using free cash flow for debt repayment instead of reinvestment.[3] 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 165%[4], lending falls by about 10% after just two quarters of stress. These estimates depend critically on assumptions about how much credit spreads widen during the stress scenario. 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.

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

[2] The Investment Company Act of 1940 requires BDCs to maintain at least 200% asset coverage ratio. The Small Business Credit Availability Act of 2018 allowed BDCs to elect to have a lower minimum of 150%. Since the vast majority of BDCs have elected to be subject to the 150% minimum, for simplicity, we refer to the minimum as being 150% even though some BDCs are still subject to the 200% minimum.

[3] We assume that because of slow moving capital, other funds that purchase the fire-sold assets reduce their own lending.

[4] 210% for BDCs still subject to 200% regulatory minimum.

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 compared to banks, 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.

2 BDC Background and Data

BDCs are actively managed closed-end investment funds registered as such under the Investment Company Act of 1940.[5] They are required to make at least 70% of their investments in US-based 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 managed externally. 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 fair 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

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

credit industry, and remain small relative to banks, they have grown into particularly important providers of credit to middle market firms.[6]

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.[7] 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.[8]

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 initially include holdings of Blackstone Private Credit Fund (BCRED), the largest BDC, 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, respectively, all investment decisions must be

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

[7] We separately add two 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).

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

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, 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, covers 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

In this section, we provide summary statistics for the sample of BDCs in our study. To begin, 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 declines slowly 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).

Figure 1
Total Assets and Number of BDCs
This figure plots the number and total assets of active BDCs from 2000Q1 to 2023Q4.

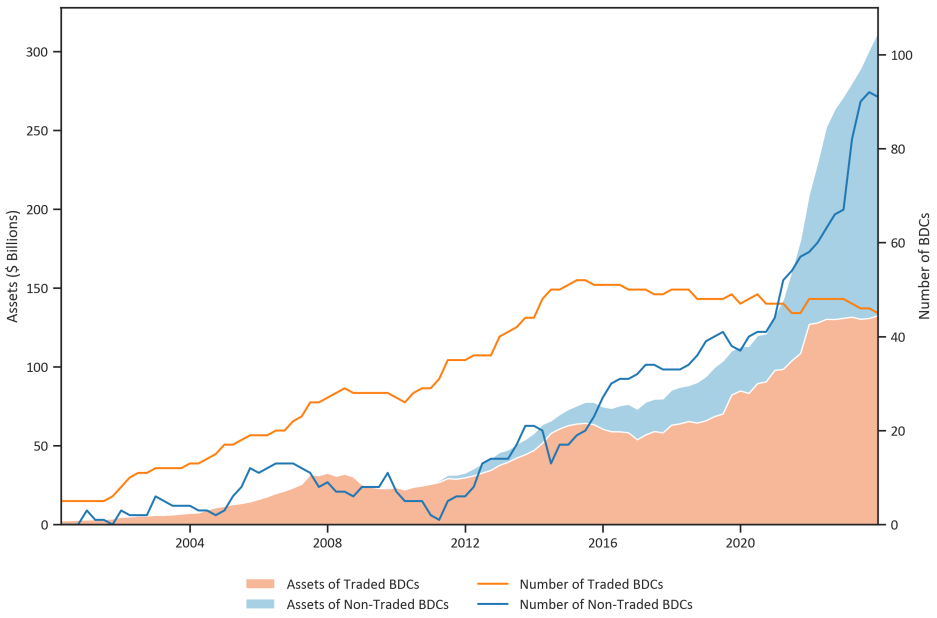


Table 1 reports summary statistics, as of 2023Q2, for the sample of 60 BDCs meeting the following criteria: at least $100 million in assets; data available on portfolio holdings; the share of loans relative to total assets of at least 50%. The median (mean) BDC has $2.1 ($4.1) billion in assets. The largest BDC, Blackstone Private Credit Fund, has assets of $51.6 billion.

BDCs invest premodinantly in loans. The median (mean) share of loans is 84% (82%). Most of the rest is equity in portfolio firms. CLO equity and equity in JVs are on average 1% and 2% of assets. Cash buffers are small at 2–3% of assets.

The next set of variables reports the characteristics of portfolio loans. The unit of observation for these variables is a BDC-loan. The median loan is a bit less than $5 million.[9] The median loan has a spread of 600 basis points. The interquartile range is 550–700 basis points. Finally, we report the distribution of the default beta. 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. [10] Consistent with BDCs

[9] Because asset managers can allocate a single loan across multiple funds under management, the typical loan to a middle-market firm is much larger.

[10] 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). 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 the default beta.

Table 1
Summary Statistics

This table reports summary statistics for the sample of 60 BDCs with at least $100 million in assets, data on portfolio holdings, and with the share of loans relative to total assets of at least 50%. Data are as of 2023Q2. Bank debt refers to drawn lines of credit. Financing spread is the weighted average spread on each BDC's lines of credit. For loan characteristics — loan size, loan spread, and default beta — the unit of observation is BDC-loan. 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.

				Percentile			
	Mean	SD	Min	25th	50th	75th	Max
Total assets	4,080	7,463	217	942	2,138	3,316	51,615
Asset shares							
Loans	0.82	0.11	0.58	0.76	0.84	0.91	0.96
Equity	0.09	0.08	0.00	0.04	0.07	0.12	0.29
CLO equity	0.01	0.05	0.00	0.00	0.00	0.00	0.30
JVs	0.02	0.05	0.00	0.00	0.00	0.00	0.22
Cash	0.03	0.04	0.00	0.02	0.02	0.04	0.25
Loan characteristics							
Loan size ($ mil)	15.91	45.58	0.00	1.15	4.78	14.80	1345.80
Loan spread (bps)	648.57	227.56	0.00	550.00	600.00	700.00	4135.00
Default beta	0.86	0.17	0.60	0.74	0.83	0.97	1.49
Debt/Assets	0.50	0.09	0.20	0.46	0.52	0.55	0.69
Debt shares							
Bank debt	0.40	0.21	0.00	0.29	0.41	0.57	0.70
Unsecured bonds	0.46	0.23	0.00	0.32	0.44	0.58	1.00
Securitized debt	0.07	0.15	0.00	0.00	0.00	0.00	0.67
Other debt	0.07	0.16	-0.05	-0.01	-0.00	0.01	0.51
Financing spread (bps)	238.66	51.54	175.00	200.00	230.00	267.06	425.00

and private credit funds targeting less cyclical industries, the median (mean) default beta is 0.65 (0.83)

Most BDCs have a debt-to-assets ratio of around 50%. The interquartile range is 46–55%. The minimum in our sample is 20%, while the maximum is 69%.[11] For the average BDC, 40% of its debt obligations are drawn bank lines of credit and 46% are unsecured notes. The rest are mostly secured bonds, including CLOs and SBA debentures. Finally, Table 1 reports the financing spread on bank lines of credit. The median spread is 230 basis points.

[11] Because the SEC has granted exemptive relief to allow BDCs to exclude SBA debentures from the definition of senior securities, the asset coverage ratio for this BDC was 155.7%.

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 — generally a 1-1 debt-to-equity ratio. By all accounts, private credit funds operate with similar leverage to BDCs Block et al. (2024).[12] Such simple comparisons may be misleading, however, because they do not account for the riskiness of BDC assets, which, as shown in Table 1, 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 the 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.[13]

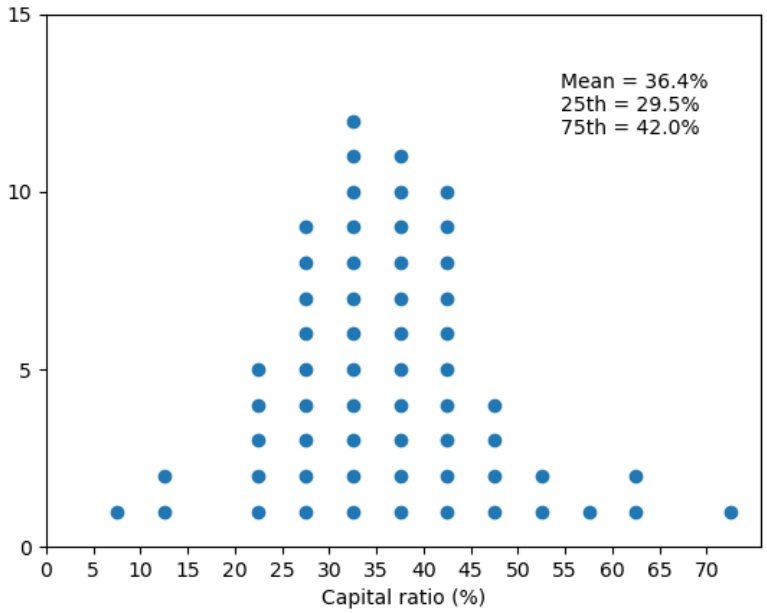
Figure 2 reports the distribution of the risk-weighted capital ratios for the BDCs in our sample. The sample consists of BDCs with at least $100 million in assets and loan portfolio share of at least 50%. We sort BDCs into 5-percentage-points-wide bins and use dots to represent the number

[12] The exception is European private credit funds which tend to be unlevered.

[13] In Section 5 we estimate the expected loss on loans to middle-market firms at around 1.6%.

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 ratio of 13.1%.

Figure 2
Risk-Weighted Capital Ratios
This figure plots the distribution of the risk-weighted capital ratios for sample BDCs as of 2023Q2.



4.2 BDC Capital Based on Stress Tests

The calculation of risk-weighted capital ratios in Figure 2 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 help determine the capital requirements of the large banks that are subject to these stress tests.

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.[14] In particular, we follow the Fed's approach in assuming that

[14] https://www.federalreserve.gov/publications/files/2023-june-supervisory-stress-test-methodology.

SOFR drops to 0.25% while 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 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. 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.[15]

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%. Absent a reliable classification of CLOs held by sample BDCs, 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.[16] We first use the same approach as above to estimate losses on each JV's loan portfolio. We

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

[16] LCD includes holdings data for some but not all of the JVs. We supplement LCD data with 2023Q2 holdings data

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.[17] The average loss rate on investments in JVs is 34%.[18]

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.[19]

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 each BDC's 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.[20]

To estimate noninterest income, we collect data on the 2023Q2 dividend income, fee income,

extracted from the 10-Q/K filings.

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

[18] 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 JV debt-to-assets ratio of about 60%.

[19] 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.

[20] 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.

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.

Noninterest 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 3 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 13.0–19.3%. 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 2.5% to 22.5%. The interquartile range is 6.5–9.9%. 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 for this BDC.

Subfigure (c) reports the distribution of the net loss rate, the difference between portfolio losses and PPNR, scaled by total assets. The median net loss is around 7.2%. The interquartile range of net losses is 4.2–10.6%.

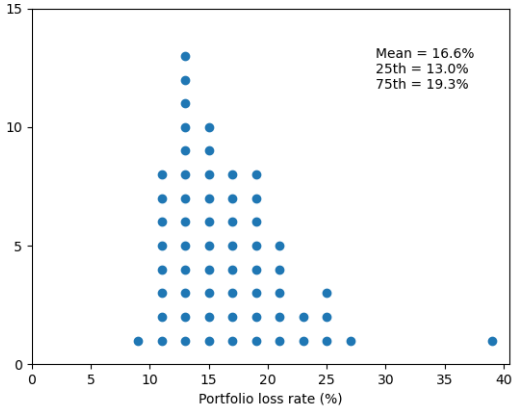
Finally, subfigure (d) of Figure 3 reports the distribution of the stressed capital ratio. In this subfigure, BDCs are sorted into bins that are 5 percentage points wide; the x-axis plots the mid point of each bin. Stressed capital ratios vary from 3.0% to 62.0%. The interquartile range is 19.7–40.8%. 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 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

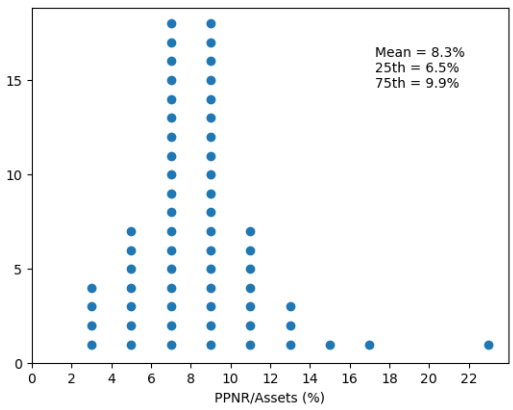
Figure 3
Stress Test

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.

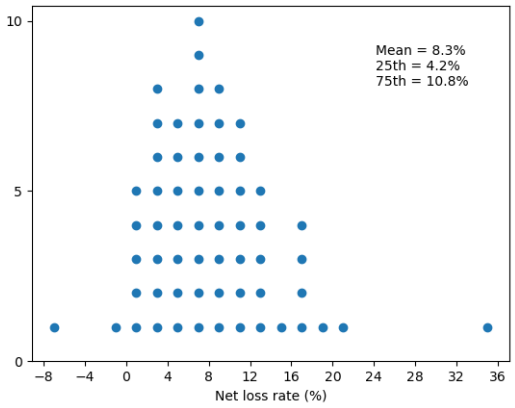
(a) Portfolio loss rate



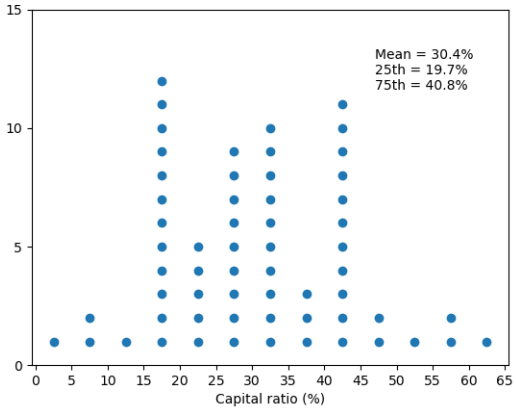
(b) PPNR/Assets



(c) Net loss rate



(d) Stressed capital ratio



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 Middle-Market Lending vs. Lending to Private Credit Funds vs. Managing the Assets of Private Credit Funds

This section starts with the observation that banks generally do not originate, underwrite and hold on their balance sheets loans used to finance buyouts of middle market firms – the bread and butter of the private credit market.[21] Banks do, however, participate in this market in two important ways. First, they lend to private credit funds, including both BDCs and those structured as limited partnerships or LLCs. In our data, about half of the debt obligations of BDCs is in the form of credit lines provided by banks.[22] Second, to the extent that banks are involved in originating and underwriting middle market buyout loans, they do so through their asset management arms as sponsors of private credit funds. For example, Goldman Sachs and Morgan Stanley sponsor and manage the assets of BDCs and numerous other types of private credit funds through their asset management divisions. JP Morgan also sponsors and manages private credit funds. Citigroup and Wells Fargo have recently announced partnerships with asset management firms (Apollo and Centerbridge, respectively) to make middle market loans through private credit funds.

We try to explain this pattern by addressing two questions: (1) Is it more profitable for a bank to use its own balance sheet to lend to private credit funds than to lend directly to middle market firms? (2) Is it more profitable for a bank to originate, underwrite and manage the assets of a private credit fund than it is to make loans to middle market firms on the bank's own balance sheet? We now consider these questions in turn.

5.1 Middle Market Lending vs. Lending to Private Credit Funds

To compare middle market lending with lending to private credit funds (both BDCs and limited partnerships or LLCs), 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 lending to private credit funds with "plain vanilla" middle market lending, by which we mean investing in first-lien middle market loans, not the equity of portfolio companies or CLO equity. ROE_i of a loan to borrower type i, where i could be a middle market loan (MM) or a loan to a private credit fund (PCF), is as follows:

$$ROE^i = \frac{1-\tau}{E^i}\Big(R_L^i - Losses^i - OpEx^i - (1-E^i)R_D\Big). \tag{1}$$

E^i stands for the equity to be invested as a share of the loans made, which will be determined

[21] Haque, Mayer, and Stefanescu (2024) present evidence that banks continue to lend, primarily through lines of credit, to firms that borrow from private credit funds. However, according to numerous industry participants, banks generally do not originate term loans to fund buyouts of middle market firms.

[22] This does not account for the undrawn portion of the credit facilities from banks.

by the regulatory capital treatment of MM and PCF loans as well as the bank's target capital ratio. Banks earn interest income on their loans to borrower type i, R_L^i, that is a spread over SOFR, $SOFR + Spread_L^i$. Against this interest income they subtract their expected losses, $Losses^i$, operating expenses, $OpEx^i$, and debt funding costs, $(1-E^i)R_D = (1-E^i)(SOFR+Spread_D)$. To get ROE^i, we just multiply this quantity by one minus the tax rate, τ, and divide by the equity, E^i.

Table 2 provides illustrative ROE calculations. We use the value of SOFR as of mid 2023 of 5.30%. The spread on middle market loans ($Spread_L^{MM}$) is assumed to be 6.00%, the median loan spread in Table 1, while the spread on PCF loans ($Spread_L^{PC}$) is assumed to be 2.30%, the median financing spread in Table 1.

To calculate the expected losses on MM loans, we start by assuming a default rate of 4% to reflect the typical 1-year default rate on B- and CCC-rated loans.[23] Since most BDCs with bond ratings (those holding the bulk of BDC assets) have a BBB issuer rating, the default rate on PCF loans of 0.25% is set to approximate the typical 1-year default rate on BBB-rated securities.[24] This is likely to be an upper bound on the default rate of loans to private credit funds, as they are structured as securitizations and are senior to any bonds.

We assume a 60% recovery rate on defaulted MM loans and a 95% recovery rate on defaulted PCF loans. The assumed recovery rate for MM loans is based on the average recovery rate for first-lien loans. For PCF loans, we assume a 95% recovery rate to reflect the fact that these credit facilities are over-collateralized with typical advance rates of not more than 75% for first-lien performing loans.

These assumptions generate expected losses of 1.60% and 0.0125% on MM and PCF loans, respectively. 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 their SEC filings, Cliffwater tracks the performance of direct lending and constructs the Cliffwater Direct Lending Index (CDLI).[25] 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 the average

[23] 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%.

[24] 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%.

[25] 2023 Q3 Report on U.S. Direct Lending

Table 2
Bank Lending to Middle-Market Firms vs Private Credit Funds

This table provides illustrative calculations of the economics of bank lending to middle-market firms (MM loans) versus lending to private credit funds (PCF loans) for different values of the target capital ratio. 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 PCF 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 PCF 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 the expenses of Ares Management Corporation and Blue Owl Capital Inc — two large publicly-traded asset managers specializing in private credit. Details of the estimation of operating expenses are provided in the Internet Appendix. Operating expenses for PCF loans are assumed to be significantly lower to reflect the much larger size of the loans and lower screening and monitoring costs.

	MM loans	PCF loans		
	20% of RWA	20% of RWA	12% of RWA	5% of assets
SOFR	5.30%	5.30%	5.30%	5.30%
Spread	6.00%	2.30%	2.30%	2.30%
Default rate	4.00%	0.25%	0.25%	0.25%
Recovery rate	60%	95%	95%	95%
Expected loss	1.60%	0.0125%	0.0125%	0.0125%
Spread on debt funding	0.55%	0.55%	0.55%	0.55%
Tax rate	25%	25%	25%	25%
Operating expenses	1.38%	0.20%	0.20%	0.20%
Risk weight	100%	20%	20%	20%
Capital (% of assets)	20.0%	4.0%	2.4%	5.0%
ROE	13.65%	33.22%	52.43%	27.45%

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 four largest banks: Bank of America, Citigroup, JPMorgan Chase, and Wells Fargo. The assumed tax rate is 25%.

We assume that MM lending comes with operating expenses of about 1.38% of assets. This estimate is based on the reported expenses of two publicly-traded asset managers that specialize in private credit: Ares Management Corporation and Blue Owl Capital. We estimate their operating expenses as GAAP expenses plus depreciation and amortization, which mainly reflects amortization of intangible assets due to acquisitions. GAAP expenses include equity and performance-based compensation, i.e. allocation of carried interest. Asset managers' expenses do not include various professional fees and other administrative expenses incurred by their funds. We estimate these separately using data on the BDCs managed by Ares and Blue Owl. The Internet Appendix provides more details on the estimation of the operating expense ratio.

Given the regulatory compliance costs and other costs of supervision, the operating expenses of middle market lending for banks could well be greater than the 1.38% estimate that uses data on private credit managers. We will return to this issue in the next subsection when we compare the value to a bank of middle market lending on its balance sheet to the value of middle market

lending conducted as an asset manager of a private credit fund.

Given that loans to private credit funds are much larger and require much less screening and monitoring, we assume operating expenses of about 20 basis points.[26] For a $500 million credit facility, this would imply $1 million in annual operating expenses.

Finally, for E^i, we use a 100% risk weight for MM loans and 20% risk weight for loans to private credit funds. The right weight for PCF loans is typically only 20% because most loans are extended to wholly owned special purpose subsidiaries of PC. These loans are structured and overcollateralized, so they qualify to be treated as "securitization exposures" under bank capital requirements. The risk weight for securitization exposures is determined by the Simplified Supervisory Formula Approach (SSFA), which in turn depends on (i) the extent of overcollateralization of the loan to the special purpose subsidiary, (ii) the capital requirement applicable to the underlying pool of MM loans (8%, in the case of MM loans that are not defaulted, and 12% in the case of MM loans that are defaulted), and (iii) the portion of the MM loan pool that is defaulted or seriously delinquent. The SSFA specifies a minimum risk weight of 20% for any given securitization exposure. Based on our conversations with industry professionals, most loans to special purpose subsidiaries of PC have a 20% risk weight under SSFA due to the overcollateralization of such loans. Our own calculations using the SSFA worksheet published by the FDIC [27] show that the 20% risk weight floor under SSFA applies to a portfolio of middle market loans with no defaults as long as the overcollateralization percentage is at least 12.19%.[28]

Column 1 reports the ROE of lending to middle-market firms (loans to MM). We assume that when lending to middle-market firms, banks operate with a target CET1 ratio of 20%.[29] The ROE

[26] Since asset managers allocate originated loans to multiple funds under management, a bank lending to different funds managed by the same adviser mostly needs to evaluate the adviser's loan origination platform and workout capabilities. Once this evaluation has been performed, the incremental costs of screening and monitoring a new fund are likely to be low.

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

[28] Where the overcollateralization is only 12.19%, the risk weight under SSFA will begin to increase rapidly as underlying MM loans begin to default or become seriously delinquent. However, if the amount of overcollateralization is greater than 12.19% (which we understand is typically the case), the SSFA risk weight can remain at 20% even as the underlying pool begins to deteriorate. For example, if the overcollateralization is 30%, then the SSFA risk weight will remain at 20% until approximately 17% of the underlying loan pool defaults or becomes seriously delinquent, at which point the SSFA risk weight will begin to climb rapidly as additional MM loans default or become seriously delinquent.

[29] In the Fed's 2023 stress tests the projected minimum for the CET1 ratio for domestic banks that engage in C&I lending is 8.78%. We interpret this to say that banks try to maintain at least 8.78% CET1 ratio under stress. Using calculations similar to the BDC stress tests in Section 4.2, we estimate net losses on bank lending to middle-market firms of 10.82%, resulting in 19.60% target CET1 ratio during normal times. We round this up to 20%. Our estimates of portfolio losses and PPNR for banks differ from Section 4.2 in three respects. First, we assume that bank's portfolio consists entirely of first-lien senior secured loans, which earn 600 bps spread relative to SOFR and experience 15.3% loss rate under stress. Second, to be conservative in our estimation of the minimum capital ratio, we calculate the difference between total losses incurred over two years and PPNR earned over one year. Effectively, this assumes that portfolio losses are front-loaded during the first year. Third, to calculate the interest expense component of PPNR, we assume that banks finance their lending to middle-market firms with floating-rate debt that accounts for 80% of their total funding.

of middle-market lending is 13.65%. On its own, this looks attractive, but as the next three columns show, the ROE of lending to private credit funds is significantly higher.

We calculate the ROE of PCF loans under three alternative scenarios. The first scenario uses the same 20% CET1 ratio as the MM loans. Given the 20% risk weight of PCF loans, however, the ratio of capital to assets is 4.0%. The ROE of PCF loans is 33.22%. Given that PCF loans have significantly smaller losses, the second scenario assumes that when lending to private credit funds, banks target a plausible 12% CET1 ratio. The ROE of PCF loans in this case is 52.43%. Under the first two scenarios, the ratio of capital to gross assets is less than the 5% Supplemental Leverage Ratio (SLR). If the SLR constraint binds, as it may be for banks with large trading operations and securities portfolios, the ROE could be calculated based on 5% equity capital. The last column of Table 2 reports the ROE of PCF loans when banks are subject to the 5% leverage ratio. The estimated ROE is 27.45%.

The estimated differences in ROE on MM loans and PCF loans do not account for potential differences in their required rates of return. Although lending to private credit funds is less risky than lending to middle market firms, the required rate of return on equity may be higher for PCF loansbecause 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 sensitive to specific assumptions about the unlevered asset beta of the loans and the risk borne by the bank's debtholders. However, under a broad range of reasonable assumptions, the ROE of lending to private credit funds exceeds a bank's required rate of return.

If it is indeed the case that banks earn excess returns by lending to private credit funds, one has to ask how this can persist in equilibrium. One possibility is that there is imperfect competition in the supply of credit to private credit funds — and nonbank financial intermediaries more broadly — such that banks charge oligopolistic rates on these loans. Schwert (2018) presents evidence that banks earn excess returns on leveraged loans, which he suggests could be related to market power. Jiang (2023) estimates a loan pricing model and finds evidence of market power in the pricing of bank credit lines to nonbank mortgage originators.

It is also possible that banks are not earning excess returns because contractual spreads do not reflect the true risks and costs of lending to private credit funds. 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.[30]

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

5.2 Middle Market Lending vs. Management of Private Credit Funds

As noted above, a number of the very largest banks are involved in private credit not just through lending to private credit funds, but as sponsors of private credit funds. In these roles, they establish the entities that originate and fund middle market loans. They charge fees for managing the fund, typically in the form of a management fee (a percentage of assets under management) and a performance fee. Realized fees average about 3.1% of assets under management for publicly-traded BDCs and 1.7% for non-traded BDCs.

Why do banks engage in private credit as asset managers rather than as balance sheet lenders? To address this question, we compare the value of balance sheet lending with the value of asset management. First, consider balance sheet lending, where we normalize the size of the loan portfolio to one. Assuming no growth in assets, the value of the middle-market lending business is:

$$-E_b + (1-\tau)PV\Big[R_L - (1-E_b)R_{Db} - Losses - OpEx_b\Big], \tag{2}$$

where $PV[\cdot]$ is the present value operator. E_b is the equity investment of the bank in the middle market loan portfolio. R_L is the interest income on middle market loans. R_{Db} is the debt funding cost of the bank. $OpEx_b$ is the operating expenses of balance sheet lending by the bank. We assume that interest income, R_L, and expected losses are the same regardless of whether the portfolio is held on balance sheet or in a private credit fund. Importantly, however, we allow operating expenses to be different at banks and private credit funds, along with differences in debt funding costs.

A key feature of banking is that banks can raise funding at rates below comparable-risk firms and nonbank financial intermediaries. Thus, we write $R_{Db} = R_c - \Delta$, where R_c is the competitive market cost of debt for nonbanks and Δ is the premium or subsidy that banks benefit from when they issue debt.

With this decomposition, we can write (2) as:

$$-E_b + (1-\tau)\Big(PV[Loans] - (1-E_b)\big(PV[R_c] - PV[\Delta]\big) - PV[OpEx_b]\Big), \tag{3}$$

where $PV[Loans]$ is the present value of loan income less expected losses.

Given that R_c is the competitive market rate, the present value of this component of debt funding is simply 1. Thus, we can write (3) as:

$$-1 + \tau(1-E_b) + (1-\tau)\Big(PV[Loans] + (1-E_b)PV[\Delta] - PV[OpEx_b]\Big) \tag{4}$$

The value of the middle-market lending business to the bank is just the pre-financing NPV of the business $-1 + (1-\tau)(PV[Loans] - PV[OpEx_b])$ plus two financing benefits: the tax shield from debt financing $\tau(1-E_b)$ and the below market-rate financing, $(1-\tau)(1-E_b)PV[\Delta]$.

As an alternative to funding on their balance sheet, banks could set up a separate private credit fund to hold and finance middle market loans and receive asset management fees for managing the fund. The private credit fund is financed with equity E_p and debt $(1 - E_p)$. The pre-fee value of the private credit fund is:

$$-E_p + PV\Big[R_L - (1 - E_p)R_c - Losses\Big]. \tag{5}$$

Note that we are assuming the loans and expected credit losses are the same in the private credit fund and the bank. However, there are four differences between asset management and balance sheet lending. First, the fund has to borrow at the market rate, R_c, not at the lower rate $R_c - \Delta$. Second, the fund will typically have more equity, $E_p > E_b$. Third, $OpEx_p$, which is borne by the bank as asset manager, could be less than $OpEx_b$. Finally, the fund pays no taxes as it is a flow-through entity. We also assume that equity investors in the fund are tax exempt, as most investors in private credit are pension funds, endowments, and other tax-exempt institutions.

The asset manager of the private credit fund is assumed to be able to charge a fee equal to the pre-fee value created by the fund. This is the Berk and Green (2004) assumption that managers that can create excess returns are the scarce resource, and thus competition for managers drives fees up to eliminate after-fee excess returns (alpha). This is a reasonable assumption in light of the fact that Erel, Flanagan, and Weisbach (2024) find that alpha in private credit after fees is approximately zero. In untabulated results, we also document that alpha in BDC returns is close to zero, although the estimate is noisy.

Under the assumption of zero alpha, the annual fee, f, per unit of assets under management is just the NPV of the loan portfolio:

$$PV[f] = -1 + PV[Loans] \tag{6}$$

Given there are no taxes at the fund level and all financing is at market rates, the Modigliani-Miller theorem applies and capital structure does not affect value and thus fees.

While we are assuming that the fund and their investors are tax exempt, the bank pays taxes on its fee income less operating expenses. Thus, the present value of managing the assets of the private credit fund is

$$(1 - \tau)\Big(PV[Loans] - 1 - OpEx_p\Big). \tag{7}$$

We compare the value to the bank of balance sheet lending vs. asset management by comparing (4) and (7). The bank will prefer managing private credit funds to balance sheet lending provided:

$$\tau E_b + (1 - \tau)\Big(PV[OpEx_b] - PV[OpEx_p]\Big) > (1 - \tau)(1 - E_b)PV[\Delta] \tag{8}$$

The benefit of balance sheet lending is that the bank gets cheaper after-tax debt financing of $(1-\tau)(1-E_b)PV[\Delta]$. The cost is that banks likely have higher operating expenses due to regulatory and supervisory oversight. There is also a tax cost relative to asset management. For bank lending, only the debt component of financing is tax deductible, whereas in the case of asset management, the entire investment is effectively deductible because fees are reduced by the initial investment in the loan portfolio.

Absent any funding advantage and operating cost differential, banks would avoid balance sheet lending because of the tax advantage of a private credit fund. Given average bank tax rates of 25% and assumed capital ratios for middle-market lending of 20%, this amounts to a private credit tax advantage of 5% of the loan portfolio.

The exact size of the funding advantage for banks, Δ, is difficult to estimate. As noted in the previous subsection, the relevant funding cost is their marginal wholesale funding cost, which is approximately SOFR + 55 bps. This might understate the marginal cost of funding middle market loans given that these loans are riskier than the average assets held by a bank and their cash flow and values are imperfectly correlated with the cash flows and value of middle market loans. The other assets of the bank, including loans, securities, and fee streams, help explain why banks can borrow in wholesale markets at SOFR + 55 bps. However, in theory, an increase in middle-market borrowing could lead to an increase in funding costs such that the marginal cost of funding the loans could be greater than SOFR + 55 bps.

For now, we consider a range of possibilities for Δ from 50 bps to 175 bps. The high end of this range is just the difference between the spread on BDC credit facilities of 230 bps and the spread on bank wholesale funding, 55 bps. The bank's funding advantage could come from implicit guarantees because banks are too big to fail or because banks are positioned to issue money-like instruments for which they are paid a premium.[31] For illustrative purposes, we discount Δ at the bank's long-term funding cost, which is approximately 100 bps above the 10-year Treasury yield of 3.81% at the end of 2023Q2. With a tax rate of 25% and leverage of 80%, the present value of the after-tax funding advantage (the right hand side of (8)) is 6.2% on the low end ($\Delta = 50$ bps), 21.8% on the high end ($\Delta = 175$ bps), and 12.5% for an intermediate level bank funding advantage ($\Delta = 100$ bps).

If the tax benefit from the private credit structure (τE_b) is 5%, we can calculate the threshold operating expense advantage of private credit above which private credit would be more favorable to the bank than balance sheet lending. Thus, based on inequality (8) and discounting operating expenses at 4.81%, we see that at $\Delta = 50$ bps, the threshold operating expense advantage of private credit is 8 bps, meaning that as long as the operating expenses of private credit are 8 bps lower

[31] Note that the funding advantage is not the difference between money market rates and deposit rates. Large banks like JPMorgan and Bank of America have low deposit rates approaching zero but they pay large amounts to attract depositors who are willing to accept low rates on their deposits through an extensive branch network, advertising and ancillary services.

than bank operating expense, it is more favorable to engage in middle market lending through private credit funds rather than on bank balance sheets. At $\Delta = 100$ bps the threshold is 48 bps, and at $\Delta = 175$ bps the cutoff is 108 bps. If, as we suggested above, the operating expenses of private credit funds and BDCs are about 138 bps, then bank operating expenses would need to be between 6% and 78% greater to make it worthwhile for banks to forgo their funding cost advantage to operate through a private credit fund or BDC.

While we cannot observe the operating expenses that a bank would incur on middle market loans if they were originated, underwritten, serviced, and funded on the bank's balance sheet, it is reasonable to think that they are indeed higher than they would be if the bank operated the middle market lending business through a private credit fund. Those extra costs relate to an extra degree of care that must be taken when the loan portfolio — and bank operations more generally — is subject to regulatory and supervisory oversight. In June 2024, there were 347 supervisory findings outstanding ("Matters Requiring Attention" and "Matters Requiring Immediate Attention") at the 26 U.S.-headquartered banks with over $100 billion of assets. About two-thirds of the supervisory findings were related to governance and controls. Only one third of these banks had satisfactory ratings across all three ratings categories (capital planning and positions, liquidity risk management and positions, governance and controls).[32]

One form of supervision that may be particularly relevant here is the interagency guidance on leveraged lending, originally issued in 2001 and revised in 2013.[33] 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 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.[34] Indeed, when BDCs report statistics on the debt-to-EBITDA ratio of their portfolio companies, the average tends to be above six – a cutoff commonly used by supervisors to identify risky leveraged loans. Furthermore, a significant share of BDC portfolios consists of annualized recurring revenue (ARR) loans. ARR loans are not underwritten based on cash flow measures like EBITDA but rather based on subscription-based revenues, which are often thought to be highly sticky. Often, the borrowers have negative or low EBITDA; in the latter case, this results in very high debt-to-EBITDA ratios. Lenders make these loans based on forecasts

[32] See the Federal Reserve's *Supervision and Regulation Report* of May 2024: https://www.federalreserve.gov/publications/files/202405-supervision-and-regulation-report.pdf

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

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

that with further growth and the support of their private equity sponsors, the firms will eventually generate enough EBITDA to cover loan payments. Goldman Sachs BDC, for example, reports that as of December 31, 2024, about 20% of its portfolio involved investments "where EBITDA may not be the appropriate measure of credit risk." As a result, Goldman Sachs BDC excludes these investments from the reported weighted average net debt-to-EBITDA ratio of 6.2x.

A combination of leveraged loan guidance and other forms of supervision may therefore lead banks not to make the sort of middle market loans that private credit funds would find optimal to make. In our model, this would result in a lower net present value of the loan portfolio held on a bank's balance sheet relative to the loan portfolio of a private credit fund. Thus, there could be further costs that banks would incur if they ran their middle market lending business on the bank's balance sheet.[35] Regardless of whether we can document the magnitude of the cost differential, our simple model helps us infer what that cost differential must be given other parameters of the model and observed behavior. This model thus suggests that what may help to explain the growth of private credit is not regulatory capital arbitrage, but rather "supervisory arbitrage."

Finally, we note that our findings and our model suggest that banks do not necessarily have an advantage in loan origination, underwriting, and servicing of the sort envisioned by Diamond (1984), at least in the context of middle-market lending. This is a market in which a strong community presence made possible by an extensive branch network is less important than relationships with middle-market private equity sponsors, which asset management firms have been well-positioned to cultivate. Instead, the advantage that banks have is in funding, as modeled by Diamond (2020). This leads them to focus most of their activity on making relatively safe loans to middle market lenders rather than making risky loans to middle market firms. In fact, it may be their institutional disadvantage in lending that leads banks to operate their middle market lending business off their balance sheet and in private credit funds and BDCs.

[35] It is also possible that asset managers can charge higher fees than our model assumes if investors overestimate the expected risk-adjusted returns from private credit. Although it is difficult to rule out this alternative explanation, existing evidence on the returns of private credit funds does not provide much support. Using a cash-flow based methodology that builds on Gupta and Van Nieuwerburgh (2021) and Flanagan (2024), Erel, Flanagan, and Weisbach (2024) estimate insignificant alphas for a sample of private credit funds launched between 1992 and 2015. These results do not rule out the possibility that funds launched during the more recent period, which experienced very rapid growth in private credit, have negative risk-adjusted returns. Suhonen (2024) looks at the stock returns of publicly traded BDCs, analyzing data through June 2022. His estimates of alpha are small and imprecisely estimated. In untabulated results, we conduct a similar exercise while extending the sample period through December 2024 and controlling for the portfolio shares allocated to direct lending, Broadly Syndicated Loans (BSLs), and equity. Like Erel, Flanagan, and Weisbach (2024) and Suhonen (2024), we find our estimates are small and imprecisely estimated. Thus, we cannot rule out the possibility that investors overpay for private credit funds, but there is also no compelling evidence that they do.

6 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 their portfolios in a stress scenario and as the value of their portfolios declines. As noted above, the Investment Company Act of 1940 requires BDCs to maintain a minimum asset coverage ratio of total assets to debt. Although most BDCs have elected to be subject to a lower 150% asset coverage ratio allowed by the Small Business Credit Availability Act (SBCAA) of 2018, almost a fifth of the BDCs in our stress test sample are still subject to the 200% asset coverage ratio. BDCs 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 banks to call their loans. 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 extreme cases, 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 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.[36] 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.[37] 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 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 rate, ii) the initial spread-to-maturity, and iii) the aggregate shock to yield spreads. We calculate the initial spread-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

[36] 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.

[37] 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.

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.[38]

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.[39] 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

$$FCF = Net\ income - 0.9 \times Net\ income - PIK\ interest + Principal\ payments \tag{9}$$

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

[39] 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 about 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.

Equation 9 subtracts PIK income because it is included in the calculation of net income but does not generate any cash flow.

We specify BDC behavior as a function of the asset coverage ratio (ACR), the ratio of total assets to debt.[40] When the pro-forma ACR is more than 50 percentage points above its minimum, which for most BDCs is 150%, 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 ACR declines, we assume that BDCs direct an increasing share of their free cash flow to paying off debt so that by the time the ACR drops to 1.1 times its minimum (165% for BDCs with 150% minimum and 220% for BDCs with 200% minimum), BDCs are using all of their free cash flow to reduce their debt. 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 ACR drops below the regulatory minimum, BDCs are assumed to liquidate portfolio holdings to bring the ACR back to the regulatory minimum.[41] We think of the yield spreads assumed by the scenario as effectively capturing any fire sale discounts and thus assume that portfolio holdings are sold at their fair market value.

Figure 4 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 4 plots the 25th, 50th, and 75th percentiles of the distribution of the asset coverage ratio as well as the aggregate asset coverage ratio. The median BDC starts with an asset coverage ratio of 206%, reaches a minimum of 166% during quarter 3, stays low for a couple more quarters, then starts to recover, and eventually exceeds 200%.

Panel (c) of Figure 4 shows sizable declines in gross assets. For the median BDC, gross assets

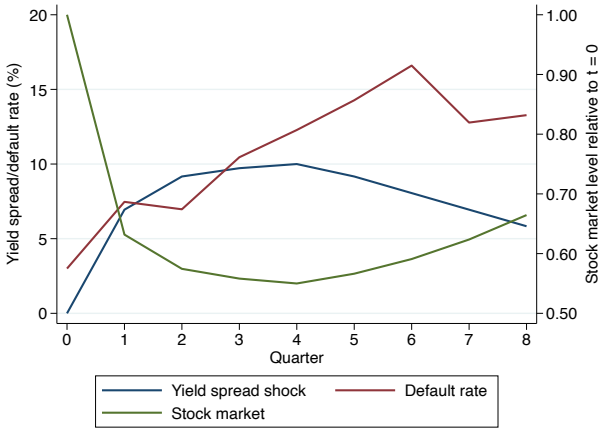
[40] To deal with the circularity between the asset coverage ratio and BDC's actions, we specify BDC behavior as a function of the pro-forma ACR that is calculated assuming that all cash flow is used to repay debt.

[41] Because SBA-guaranteed debentures are excluded from the calculation of the asset coverage ratio, we exclude from the simulation a few BDCs with SBA-guaranteed debentures.

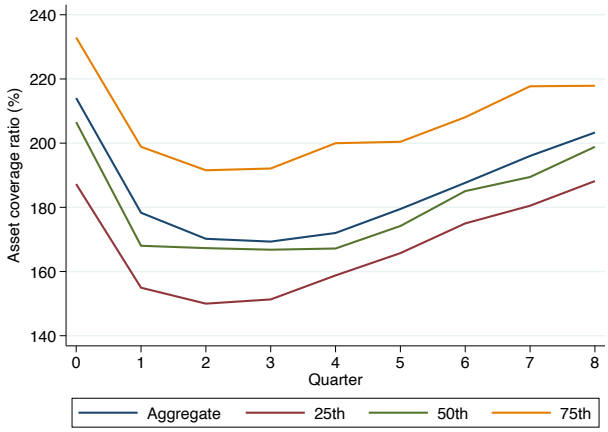
Figure 4
Deleveraging under a Severely Adverse Scenario

This figure reports the results of the stress test exercise modeling the ability of BDCs to comply with the regulatory asset coverage ratios (ACR). Details of the exercise are described in Section 6. Panel (a) plots the time series of the 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 ACR. Panel (c) plots the distribution of 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 asset sales and FCF used to repay debt. Panel (e) plots aggregate asset sales and FCF used to repay debt, scaled by the initial aggregate assets.

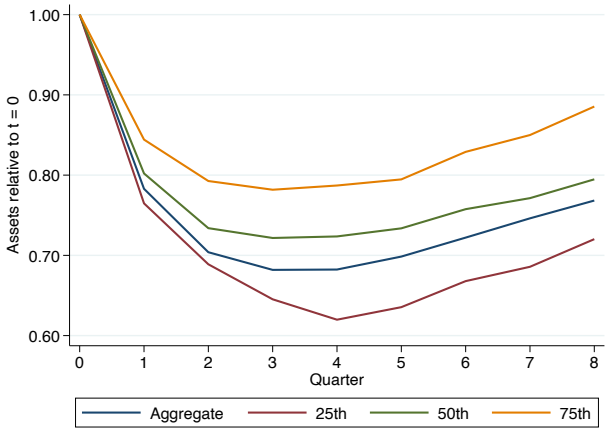
(a) Scenario variables



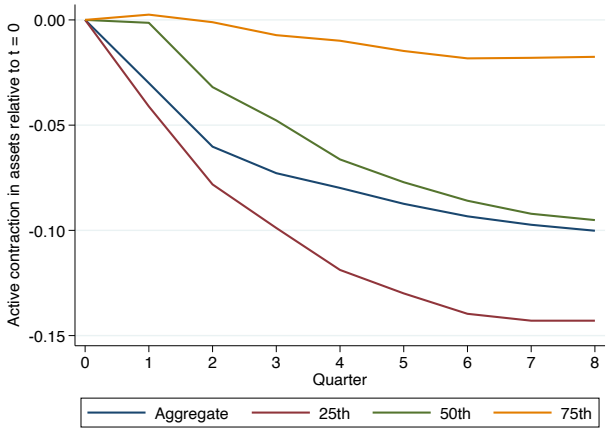
(b) Asset coverage ratio



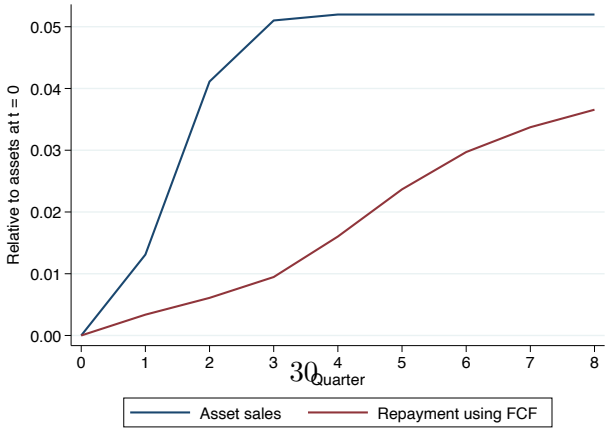
(c) Assets



(d) Deleveraging



(e) Asset sales versus FCF



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 4 tracks active deleveraging: cumulative value of asset sales and free cash flow used to repay debt instead of reinvesting in the portfolio. For the median BDC active deleveraging amounts to 6.6% by the fourth quarter and 9.5% by the eighth quarter. Some BDCs however experience much larger deleveraging. The 25th percentile reaches 11.9% by the fourth quarter and 14.3% by the eighth quarter.

Panel (e) of Figure 4 decomposes deleveraging into asset sales versus free cash flow used to repay debt. To avoid crowding the figure, we report only aggregate values rather than percentiles. By the third quarter of the simulation, aggregate asset sales reach about 5% of assets. After that, there are no more asset sales. BDCs, however, continue to use FCF to repay their debt. By the end of the simulation, FCF amounting to almost 4% of initial assets is used for debt repayment.

Our baseline model does not account for the potential drawdowns by portfolio companies on the lines of credit extended by BDCs. 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 the asset coverage requirements.[42] The baseline model also does not account for the possibility that financial covenants in bank credit facilities may specify higher ACR than the regulatory minimum, or that BDCs may follow more conservative asset coverage policies. On the other hand, dividend reinvestment plans that many BDCs have in place may allow BDCs to reduce the value of asset sales necessary to maintain their asset coverage ratios.

Figure 5 examines the dynamics of deleveraging under alternative models. Alternative models have sizable effects on aggregate asset sales (panel a) but muted effects on the value of FCF used for debt repayment (panel b). 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 as weights. Aggregate asset sales reach 8% of assets, or three percentage points more than under the baseline model.

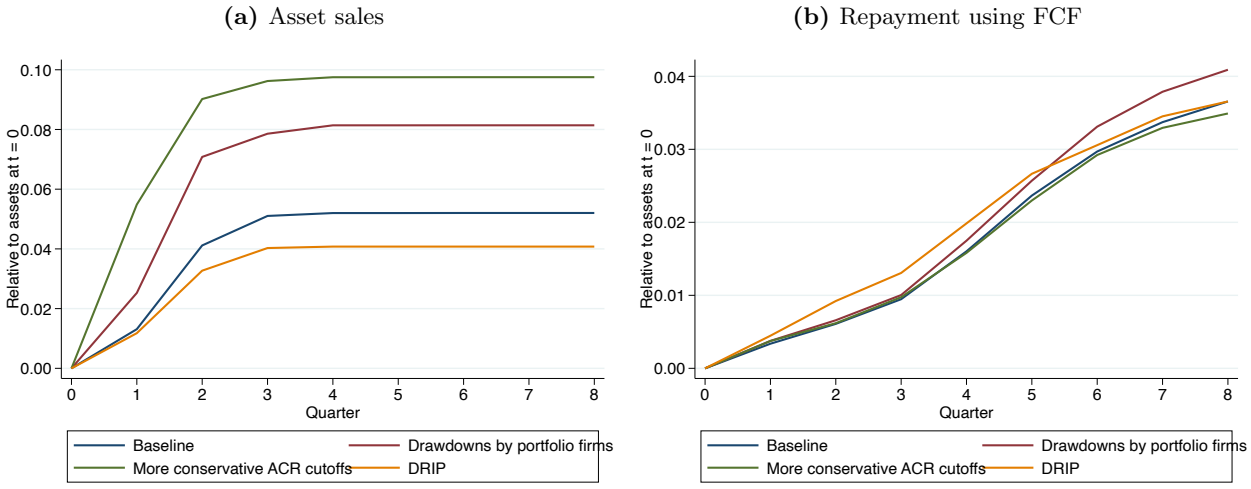
The second model assumes that to avoid violating the regulatory minimum ACR or the financial covenants in their bank credit facilities, BDCs maintain an ACR of at least 165%/210%. Under the assumption of more conservative policies, aggregate asset sales reach almost 10% of assets or double their value under the baseline model.

The third model tries to account for dividend reinvestment plans (DRIP) that many BDCs

[42] 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 5
Deleveraging under a Severely Adverse Scenario: Alternative Assumptions

This figure reports the results of the stress test exercise described in Section 6 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 165%/210% asset coverage ratio. The third alternative model accounts for dividend reinvestment plans by assuming that over the first four quarters of the simulation the share of dividends that is reinvested declines linearly from its 2023Q2 value to zero. Panel (a) plots aggregate asset sales median while panel (b) plots aggregate FCF used for debt repayment.



have in place. We use 10-Q/K filings for 2023Q2 to collect data on the share of dividends that was reinvested under each BDC's DRIP.[43] We assume that over the course of the first four quarters of the simulation, investors gradually opt out of DRIP. As a result, the share of dividends that is reinvested drops linearly from its 2023Q2 value to zero. DRIPs have a modest effect on deleveraging. They decrease aggregate asset sales by about one percentage point, but by increasing FCF, they also increase debt repayment through FCF.

The main limitations of the models in Figures 4 and 5 are that we have not yet modeled the ability of BDCs to roll over maturing debt or redemptions from perpetual non-traded BDCs. As their name suggests, perpetual BDCs have infinite duration and no plans to go public; they instead offer investors a periodic option to redeem their shares at NAV. Redemptions are usually quarterly and capped at 5% of outstanding shares. Perpetual BDCs have grown dramatically over time and as of the end of 2024 accounted for almost half of aggregate BDC assets. While their open-end nature makes perpetual BDCs more vulnerable to deleveraging, redemptions are at the discretion of the BDC's board of directors, and the board may amend or suspend redemptions at any time if it decides that doing so would be in the best interests of the shareholders.

Another limitation of the deleveraging exercise is our modeling of drawdowns on commitments to

[43] For most BDCs this calculation covers the first six months of 2023. For some BDCs, it covers a different horizon depending on the BDC's fiscal year.

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.[44] 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 in a stress scenario there would be a contraction in credit availability from BDCs and likely from other private credit funds, 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.

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 than 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.

7 Conclusion

We argue that the growth of private credit cannot be explained as an attempt to avoid onerous bank capital requirements. We show that BDCs — an important type of nonbank intermediary providing middle market loans — are far better capitalized than banks. However, despite their high levels of capital, leverage limits imposed by the SEC and by bank loan covenants could lead

[44] 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.

BDCs to 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. We outline plausible conditions under which it is more profitable to lend to BDCs and private credit funds than to lend directly to middle market firms. In part, this is because bank loans to BDCs and private credit funds (or, more precisely, SPVs established by them) are considered senior tranches of securitizations, allowing banks to use lower risk weights for these loans and thus relatively little capital. We also identify conditions under which banks would prefer to make middle market loans via affiliated BDCs or private credit funds rather on balance sheet. For plausible parameters, banks would be willing to forgo less expensive balance sheet funding to avoid the extra costs of managing a portfolio under the oversight of bank regulators and supervisors. We infer from the fact that banks are more likely to do their middle market lending through BDCs or private credit funds that such regulatory and supervisory costs are potentially substantial.

Our analysis 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 operating costs of compliance. We therefore conjecture that it is high capital requirements in combination with high supervision costs that make it more difficult for banks to meet their ROE targets and discourage bank lending. It may thus 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.

Finally, we note that our analysis helps to explain the growth in bank lending to NBFIs such as private credit funds, fintechs and hedge funds, a factdocumented by Acharya, Cetorelli, and Tuckman (2024). Favorable capital treatment of loans to NBFIs and more costly regulatory and supervisory oversight of banks, could be driving the shift of risky assets from banks to NBFIs.

References

Acharya, V. V., N. Cetorelli, and B. Tuckman. 2024. Where Do Banks End and NBFIs Begin? *Working paper* doi:10.2139/ssrn.4760963.

Acharya, V. V., M. Gopal, M. Jager, and S. Steffen. 2024. Shadow Always Touches the Feet: Implications of Bank Credit Lines to Non-Bank Financial Intermediaries. *Working paper* doi:10.2139/ssrn.4847858.

Berk, J. B., and R. C. Green. 2004. Mutual fund flows and performance in rational markets. *Journal of Political Economy* 112:1269–95. doi:10.1086/424739.

Block, J., Y. S. Jang, S. N. Kaplan, and A. Schulze. 2024. A survey of private debt funds. *The Review of Corporate Finance Studies* 13:335–83. doi:10.1093/rcfs/cfae001.

Board of Governors of the Federal Reserve System. 2024. 2024 Federal Reserve Stress Test Results. https://www.federalreserve.gov/publications/files/2024-dfast-results-20240626.pdf.

Buchak, r., G. Matvos, P. Tomasz, and A. Seru. 2024. The Secular Decline of Bank Balance Sheet Lending. *Working paper* doi:10.2139/ssrn.4738476.

Cai, F., and S. Haque. 2024. Private credit: Characteristics and risks. *FEDS Notes* doi:10.17016/2380-7172.3462.

Chernenko, S., I. Erel, and R. Prilmeier. 2022. Why do firms borrow directly from nonbanks? *Review of Financial Studies* 35:4902–47. doi:10.1093/rfs/hhac016.

Chodorow-Reich, G., O. Darmouni, S. Luck, and M. Plosser. 2022. Bank liquidity provision across the firm size distribution. *Journal of Financial Economics* 144:908–32. doi:10.1016/j.jfineco.2021.06.035.

Cooperman, H., J. D. Duffie, S. Luck, Z. Wang, and Y. D. Yang. forthcoming. Bank funding risk, reference rates, and credit supply. *Journal of Finance* doi:10.2139/ssrn.4303541.

Davydiuk, T., T. Marchuk, and S. Rosen. 2023. Market Discipline in the Direct Lending Space. *The Review of Financial Studies* doi:10.1093/rfs/hhad081.

———. 2024. Direct Lenders in the U.S. Middle Market. *Journal of Financial Economics* forthcoming. doi:10.2139/ssrn.3568718.

Diamond, D. W. 1984. Financial Intermediation and Delegated Monitoring. *The Review of Economic Studies* 51:393–414. ISSN 0034-6527. doi:10.2307/2297430.

Diamond, W. 2020. Safety transformation and the structure of the financial system. *Journal of Finance* 75:2973–3012. doi:https://doi.org/10.1111/jofi.12967.

Erel, I., T. Flanagan, and M. Weisbach. 2024. Risk-adjusting the returns to private debt funds. *Working paper* doi:10.2139/ssrn.4771873.

Flanagan, T. 2024. The value of bank lending. *Journal of Finance* forthcoming.

Greenwald, D., J. Krainer, and P. Paul. forthcoming. The credit line channel. *Journal of Finance* .

Gupta, A., and S. Van Nieuwerburgh. 2021. Valuing private equity investments strip by strip. *Journal of Finance* 76:3255–307. doi:https://doi.org/10.1111/jofi.13073.

Hanson, S., V. Ivashina, L. Nicolae, J. Stein, A. Sunderam, and D. Tarullo. 2024. The evolution of banking in the 21st century: Evidence and regulatory implications. *Brookings Papers on Economic Activity* .

Haque, S., S. Mayer, and I. Stefanescu. 2024. Private Debt versus Bank Debt in Corporate Borrowing. *Working paper* doi:10.2139/ssrn.4821158.

Ivashina, V., and D. S. Scharfstein. 2010. Bank lending during the financial crisis of 2008. *Journal of Financial Economics* 97:319 – 338. doi:10.1016/j.jfineco.2009.12.001.

Jang, Y. S. 2024. Are direct lenders more like banks or arm's-length investors? *Working paper* .

Jiang, E. X. 2023. Financing Competitors: Shadow Banks' Funding and Mortgage Market Competition. *The Review of Financial Studies* 36:3861–905. doi:10.1093/rfs/hhad031.

J.P. Morgan Asset Management. 2024. Private Credit Outlook. https://am.jpmorgan.com/content/dam/jpm-am-aem/global/en/institutional/investment-strategies-/alternatives/private-credit-outlook.pdf.

Peek, J., and E. S. Rosengren. 2000. Collateral damage: Effects of the japanese bank crisis on real activity in the united states. *American Economic Review* 90:30–45–. doi:10.1257/aer.90.1.30.

Schwert, M. 2018. Bank capital and lending relationships. *Journal of Finance* 73:787–830. doi:https://doi.org/10.1111/jofi.12604.

Suhonen, A. 2024. Direct lending returns. *Financial Analysts Journal* doi:10.1080/0015198x.2023.2254199.

Internet Appendix

for

Bank Capital and the Growth of Private Credit

This internet appendix reports

1. Additional details on the estimation of the operating expenses of lending to middle market firms.
2. Estimates of industry default beta in Table IA1.
3. Information on BDC Joint Ventures in Table IA2.
4. Summary of the deleveraging simulation assumptions in Table IA3.
5. Additional summary statistics in Figures IA1–IA9.

Operating Expenses of Middle Market Lending

We estimate the operating expenses of middle market market lending using the financial statements of two publicly-traded asset managers that specialize in private credit: Ares Management Corporation and Blue Owl Capital. Ares reports six segments: credit, real estate, private equity, secondaries, operations management group, and other. As of 2024Q3, credit, which itself consists largely of direct lending, accounted for 72% of aggregate AUM of $464 billion and 69% of total revenue. Blue Owl describes itself as operating three investment platforms — credit, real estate, and GP strategic capital, which provides capital to other private capital managers — but its financial statements have a single reportable segment. For consistency and simplicity we use firm-level expense data for both firms. We use GAAP expenses, which include equity and performance-based compensation of investment professionals, plus depreciation and amortization, which mainly reflects amortization of intangible assets due to acquisitions.

The denominator should be total assets: the sum of invested equity and drawn debt. Because neither Ares nor Blue Owl reports this measure directly, we have to estimate it from the other commonly reported metrics: AUM, Fee Paying AUM (FPAUM), and available capital. AUM is the sum of net asset value (NAV), drawn and undrawn debt, and uncalled equity capital. AUM therefore overestimates the value of the invested capital. What constitutes FPAUM varies across different investment vehicles, but generally for BDCs FPAUM is total assets while for the typical private investment fund, FPAUM is the net asset value of the drawn equity capital. Because

FPAUM does not always include drawn debt and because it does not include fee-exempt AUM such as own capital, FPAUM tends to underestimate the value of the invested debt and equity capital. We can estimate total assets for Ares as the difference between AUM and available capital or dry powder, which Ares reports separately in recent years. Blue Owl unfortunately does not break out the value of the available capital. For Blue Owl, we first calculate the difference between AUM and AUM that is not yet paying fees. We then assume that Blue Owl and Ares have the same relationship between total assets and the difference between AUM and AUM that is not yet paying fees. We therefore use the average ratio for Ares of 90% to scale down our estimate of Blue Owl's total assets.

Using the average of the beginning and end-of-year assets as the denominator, the average expense ratios for Ares and Blue Owl are 1.28% and 1.04%. We estimate each manager's expense ratio using as much data as possible to account for the potential time variation in expense ratios. We use 2016–2023 for Ares and 2022–2023 for Blue Owl, which went public in 2021. Finally, the average expense across the two asset managers is 1.16%.

Expense ratios of asset managers do not include various professional fees and other administrative expenses incurred by their funds. We estimate these separately using data on the BDCs managed by Ares and Blue Owl. The numerator is the BDC operating expenses other than i) management and incentive fees, ii) debt-related financing expenses, and iii) shareholder servicing fees and offering costs. The denominator is the average of the beginning and end-of-year assets. The average across the different funds is 0.22%.

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 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 6 in the paper.

Feature	Summary
Default	Performing firms default at the annual rate reported in panel (a) of Figure 4. 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 4) 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.

Additional Summary Statistics

Figure IA1
Distribution of BDC Size

This figure shows how the distribution of BDC size has evolved over 2000Q1–2023Q4. As of 2023Q4, the sample of 5 largest BDCs consists of Blackstone Private Credit Fund, Ares Capital Corp., Blue Owl Credit Income Corp., FS KKR Capital Corp., and Blue Owl Capital Corp.

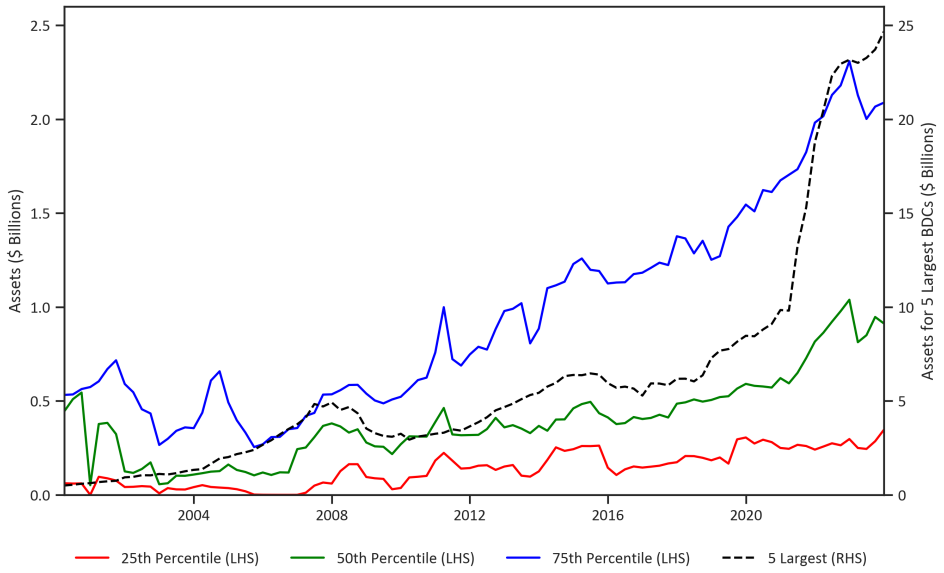


Figure IA2
BDC Loan Spread

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 IA3
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.

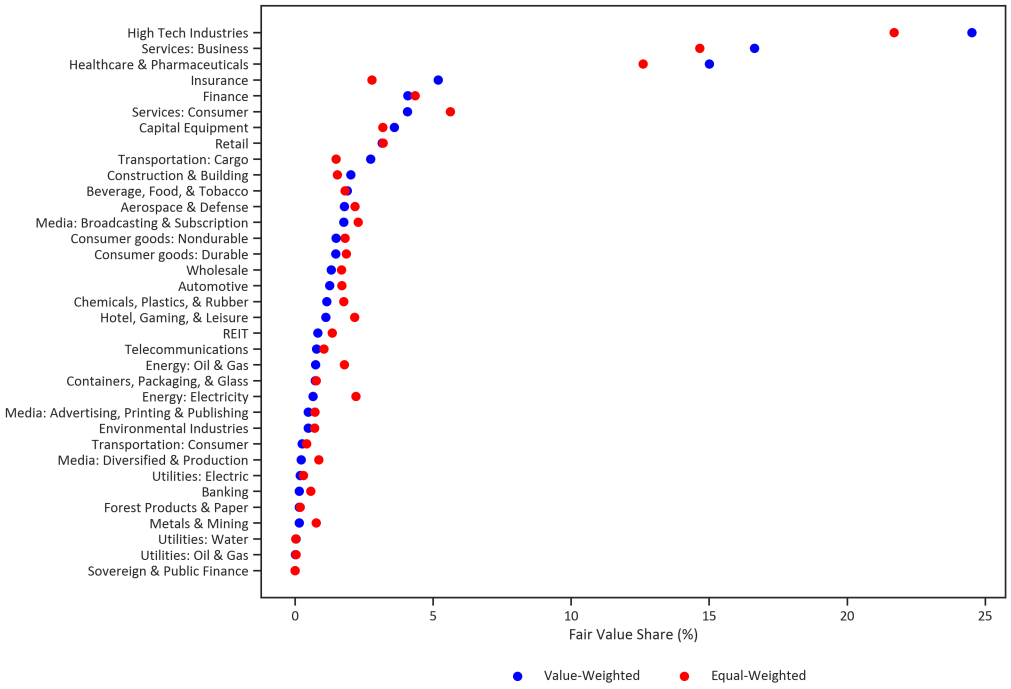


Figure IA4
Portfolio-Level Industry Default Beta

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%.

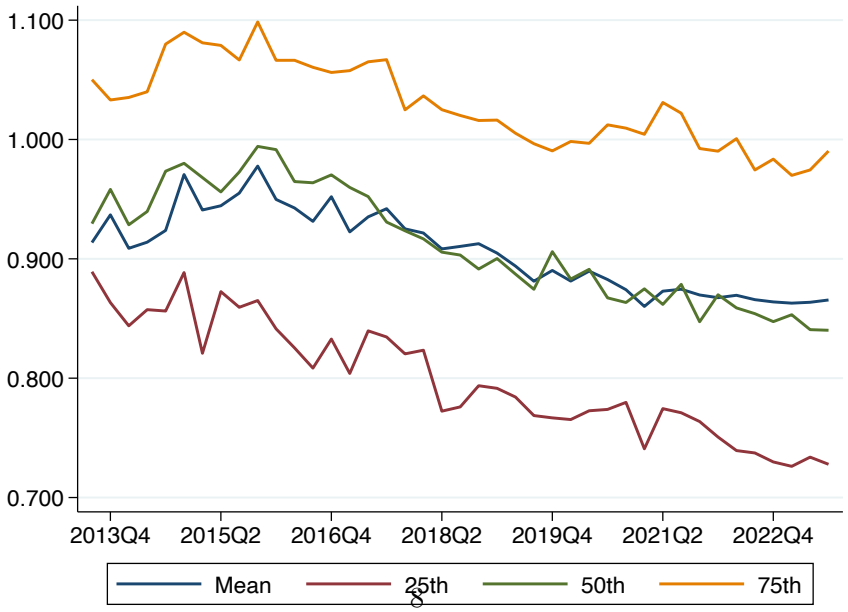
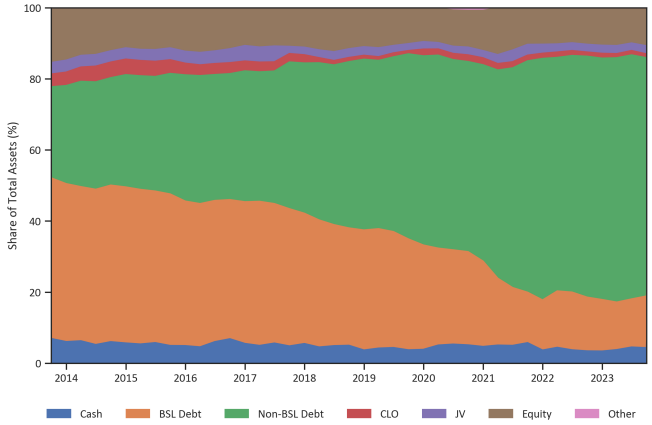


Figure IA5
BDC Asset Composition

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

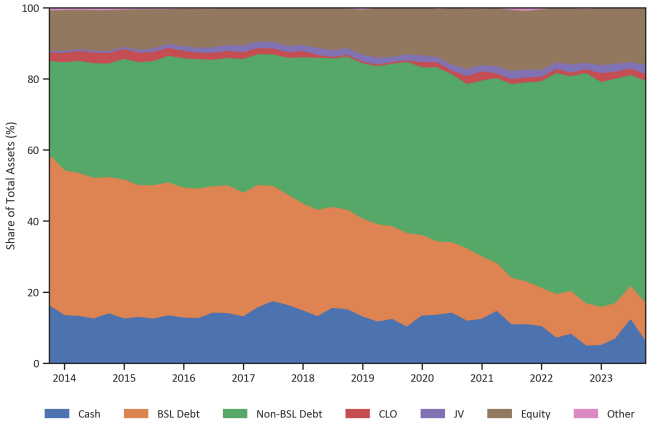
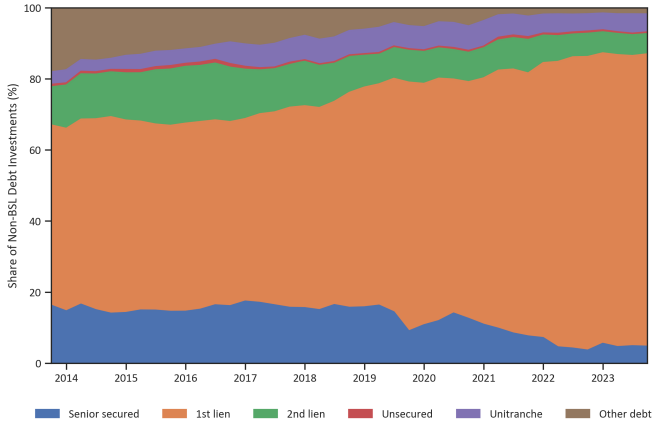


Figure IA6
BDC Loan Portfolio Composition

This figure reports the composition of BDC direct loan portfolios from 2013Q3 to 2023Q3. Holdings of broadly syndicated loans (BSLs) are excluded. Loans are decomposed into senior secured, 1st lien, 2nd lien, unsecured, unitranche, and other loans.

(a) Value-weighted



(b) Equal-weighted

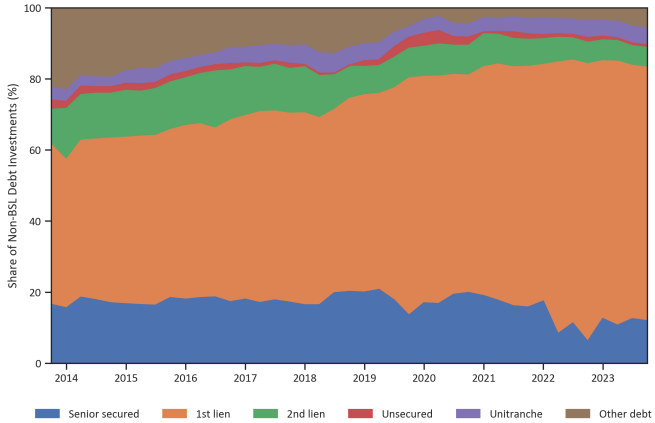


Figure IA7
BDC Investment Size

This figure shows percentiles of investment size, measured at amortized cost, between 2013Q3 and 2023Q3. We aggregate across all debt and equity investments in the same portfolio company.

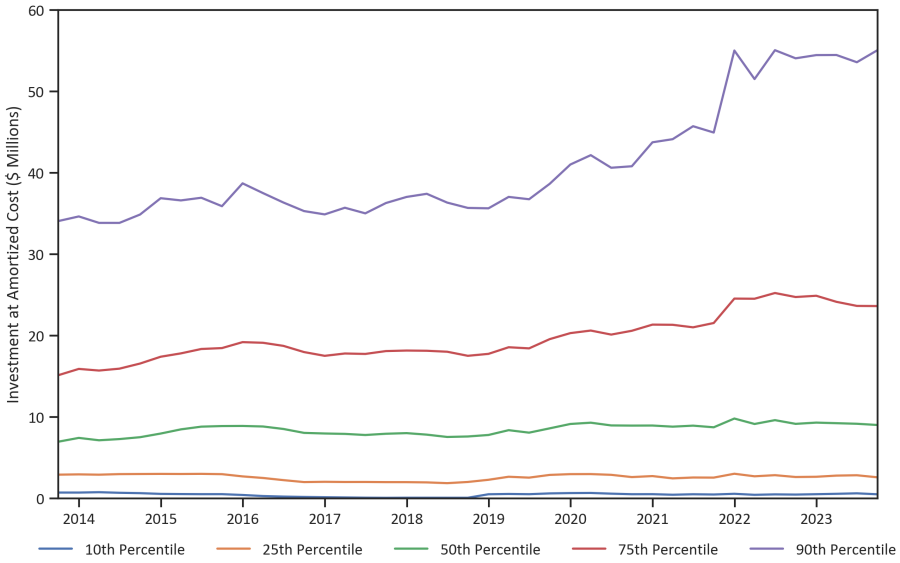


Figure IA8
BDC Debt by Instrument Type

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

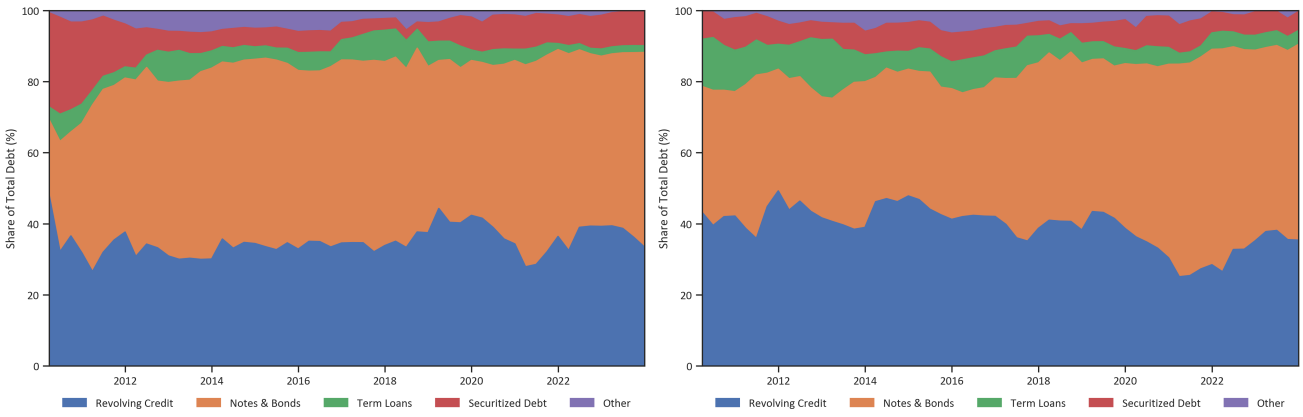


Figure IA9
BDC Financing Spread

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