

# Banks as Stewards <sup>\*</sup>

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## Abstract

Banks may play a more active role in corporate finance than previously documented. Banks with industry expertise steward firms to undertake value-creating opportunities in transition technologies or expansion (new to the firm) sectors. Bank financing can unlock neglected opportunities, especially when banks have specialization, and firms neglect opportunities because of short-termist discount rates. We set up an empirical two-way fixed effect identification approach, building off the dynamic comparables strategy in the spirit of [Sun and Abraham \(2021\)](#) to test these predictions empirically in U.S. administrative loan data. We leverage detailed regulatory risk measures and granular loan-level industry attribution in supervisory data that covers over 70% commercial lending. We find that firms are more likely to undertake transition and expansion loans with specialized banks. Furthermore, we show empirically that the effect of stewardship is stronger for short-termist firms, consistent with the idea that such firms would otherwise neglect value-creating opportunities (Kodak moments). We show the results are robust to limiting the sample to firms with similar transition opportunities due to the passage of the Inflation Reduction Act, limiting concerns about dynamic confounders. Consistent with stewardship emerging a consequence of bank specialization (e.g. [Paravisini et al. \(2023\)](#), [Blickle et al. \(2024\)](#)), we document that banks offer lower interest rates for these projects. Active bank stewarding moves the literature beyond the classic view of banks as mere credit providers.

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# 1 Introduction

Economy-wide growth depends on, among other things, firms' ability to generate and undertake value-creating investment opportunities. What role might banks play in this process? One answer might be that banks have no role. The classic frictionless Modigliani-Miller benchmark suggests a limited scope for lenders other than mechanical providers of credit, since client firm investment is entirely driven by the fundamental characteristics of their investment opportunities. Even in the vast literature on banks' special role in screening, monitoring existing projects, and utilizing relationship information asymmetries, banks play little role in the firm decisions that lead to the generation and undertaking of new value-creating opportunities.<sup>1</sup>

Another answer, however, is that banks have a role as stewards, aiding firms in generating and undertaking value-creating projects. Three strands of literature head in this direction. First is the literature that studies banks as equity-holding insiders, affecting client firm decisions ([Berlin et al. \(1996\)](#); [Stiglitz \(1985\)](#), and [Winton \(2015\)](#)). Evidence in this line of research finds that firms with bank insiders have higher performance ([Gorton and Schmid \(2000\)](#)) and that banks act to gain board seats when client firms perform poorly ([Kaplan and Schoar \(2005\)](#)).<sup>2</sup> Yet, this active equity holder role for banks is only applicable and legal in specific contexts.

A second angle on banks as stewards might be found in the inference from the common banking work by [Giacomini et al. \(2024\)](#) and [Frattaroli and Herpfer \(2023\)](#). These papers find that firms who have a bank in common with their trade partners (or future partners) perform better in those trade relationships. The common banker literature suggests that banks bring an information channel as a benefit to client firms.

The third angle on banks as stewards comes from the bank specialization literature ([Blickle et al. \(2024\)](#), [Blickle et al. \(2025\)](#), [Paravisini et al. \(2023\)](#), and [Duquerroy et al. \(2022\)](#)). These papers find that banks exhibit industry and geography expertise (usually from path histories with clients a la [Lummer and McConnell \(1989\)](#)) that leads to both more favorable loan outcomes for banks and lower interest rates for clients.

Yet this literature does not thus far consider the more active role of banks in helping firm clients to generate and undertake value-creating investment opportunities. Herein is the contribution of our paper. We bring together the bank equity ownership and common banker literature ideas that banks have an active role to play in firm operations with a new channel. Banks develop expertise (specialization) not just in underwriting and monitoring existing firm projects, but also in impacting their clients' ability and willingness to generate and undertake new value-creating investment

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<sup>1</sup>See, for example, [Jaffee and Russell \(1976\)](#); [Stiglitz and Weiss \(1981\)](#); [Diamond \(1984\)](#); [Fama \(1985\)](#); [James \(1987\)](#); [Diamond \(1991\)](#); [Petersen and Rajan \(1994\)](#); [Puri et al. \(2017\)](#); and [Bharath et al. \(2009a\)](#).

<sup>2</sup>See the survey of this literature in [Drucker and Puri \(2007\)](#).

opportunities in the areas where banks have specialization. We call this bank stewardship.

To give some examples, consider the Applied Research division of JPMorgan Chase. Honing in on its research in quantum computing for in-house use and client growth advisory roles, JPMorgan states: "JPMorganChase is one of the first financial institutions worldwide to invest in quantum computing and to build an internal team of scientists to work on new quantum algorithms and applications."<sup>3</sup> Likewise, according to U.S. regional bank FifthThird about the technology, media, and telecommunications (TMT) sector: "In a sector with unlimited growth potential that's tempered with significant and evolving risk, your financial solutions team needs an eye on the horizon and feet on the ground. That's what we provide our more than 200 TMT clients: Deep industry knowledge. Decades of combined experience. Actionable insights."<sup>4</sup> U.K. bank Standard Chartered advocates its stewardship both in sectors such as: "Our global expertise enables us to support agri-traders, soft commodity and supply chain providers with the knowledge to navigate the complexities of global trade flows and support our clients' green business ambitions,"<sup>5</sup> and in geographies such as: "Having been on the ground in [emerging frontier markets across Asia, Africa and the Middle East ] for decades, we can guide you through the local nuances. But beyond this, we can be your local advocate. By working with governments, regulators and clearing systems, we pioneer new opportunities for you."<sup>6</sup>

On the client side, bank stewardship depends on firms' having a need. A long-standing corporate finance literature concludes that firms may pass-up profitable investment opportunities. A starting point might be that firms forego opportunities because of credit constraints (Fazzari et al. (1988); Kaplan and Zingales (1997)), but since banks can overcome credit constraints without stewardship, we look to other motivations. In particular, banks may have a stewardship incentive to foster investment because of other hindrances to firms' taking investment opportunities including short-termism (Amihud and Lev (1981); Narayanan (1985); Stein (1989); Bolton et al. (2006); Graham et al. (2005); Kumar and Purnanandam (2023)) and agency challenges such as empire entrenchment, enjoying the quiet life, and career concerns (Holmstrom and Costa (1986); Shleifer and Vishny (1989); Hirshleifer and Thakor (1992); Stein (2003); Bertrand and Mullainathan (2003)).

We begin with a model that envelopes bank stewardship into a firm's yes-or-no investment decision for a transition expansion opportunity. The firm faces a valuation tradeoff of using earnings for immediate dividends or for higher future growth from investing in a transition opportunity. The model is intentionally simple: we do not embed uncertainty or asymmetric information. The

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<sup>3</sup>We accessed the webpage <https://www.jpmorganchase.com/about/technology/research/applied-research> on October 18, 2025.

<sup>4</sup><https://www.53.com/content/fifth-third/en/commercial-banking/industries/TMT-solutions.html>, referenced October 19, 2025.

<sup>5</sup><https://www.sc.com/en/corporate-investment-banking/industries/>, accessed October 20, 2025

<sup>6</sup><https://www.sc.com/en/corporate-investment-banking/financial-markets/>, accessed October 20, 2025.

tradeoff calculation is a function of industry-determined (exogenous) growth opportunity and capital intensity, as well as a firm-specific discount rate. Following the recent advances in the literature (Gormsen and Huber (2024); Lenzu et al. (2025)), we focus on the discount rate, and its importance acting as a hurdle rate or cost of capital. In this setup, high discount rates may induce firms to neglect investment opportunities.

We then show that bank financing unlocks neglected opportunities for some firms with valuable expansions hindered by high discount rates. By securing bank finance, firms can pay out all of current earnings as dividends, thus appeasing short-termist pressures, while financing the transition investment, the optimal long-term strategy. This seemingly straightforward punchline has not, to our knowledge, been emphasized in the literature. A bank’s capacity to offer a transition loan is a function of expected loan performance, which is increasing in specialization and stewardship. Thus, a bank’s specialization and stewardship capacity increases its role to unlock neglected investment for firms.

Our model delivers testable predictions. In our model, those not investing are a mixture of those without transition opportunities and those with neglected opportunities. Thus, we focus on predictions applicable in the dataset of originated loans. Our dependent variables are whether a loan is a loan in a transition 6-digit NAIC sector, whether a loan is an expansion for a firm into a new (for that firm) transition sector, and the interest rate. The first prediction is that transition and expansion loans will be more likely to be extended by banks with a specialization. The expansion loan test will capture the actions of stewardship from specialized banks. Second, the more that a firm suffers from short-termist pressures, the more valuable is bank specialization to unlock neglected opportunities. The final prediction concerns the mechanism: Transition loans and expansion loan from banks with higher specialization/ stewardship capability will have a lower interest rate. This third prediction elucidates the interest rate mechanism. Because the interest rate is a result from bank stewarding action, we view the interest rate mechanism as indicative to pricing and bank effort to unlock expansion, thereby increasing their lending book.

We corroborate the predictions from our model empirically, using Federal Reserve loan-level data collected as part of supervisory stress-testing efforts. The Y-14-Q schedule H data contains information about a loan’s riskiness – as measured using supervisory procedures that are standardized across banks –, the exact 6-digit industry of a loan, and a number of other important loan characteristics including purpose, duration, rate paid, collateral pledged, syndication status, etc. Overall, the data covers more than 70% of U.S. C&I lending. We measure bank specialization as the lagged proportion of the banks’ lending book directed towards loans associated with “transition” projects, defined in loan-level NAIC codes. Expansion loans are loans in transition sectors that the firm has not previously had operations.

We find that transition loans and expansion transition loans are much more likely to be orig-

inated by banks specialized in transition lending. A one standard deviation change in bank specialization explains around a third of the unconditional probability that a firm may take a transition loan. Our model is an extended two-way fixed effects (TWFE) specification, with bank, firm, sector, and time fixed effects as well controls. Identification in such a setting relies on considerations of dynamic confounders. We discuss our identification strategy in terms of isolating dynamic comparables akin to the role of the control specification advancements in the TWFE literature (([Athey and Imbens \(2022\)](#)); [Imai and Kim \(2021\)](#)); [Callaway and Sant’Anna \(2021\)](#)); [Sun and Abraham \(2021\)](#)); [Goin and Riddell \(2023\)](#)). Following in the spirit of [Sun and Abraham \(2021\)](#), we need to ensure that each observation (firm-bank pair at a point in time) has an appropriate and dynamic comparables group. Thus, because the nature of our dependent variable differs from the credit supply shock comparisons in [Khwaja and Mian \(2008\)](#) or the across geography comparisons in [Paravisini et al. \(2023\)](#), our appropriate dynamic comparison group of bank-firm pairs is within detailed industry-quarter/year fixed effects. Within these comparables time-sector buckets, we further level on relationship borrowing. Finally, using the advantage of the Fed Y14 data, we also level firms on risk profiles for firms at a point in time, used in stress testing and thus common across banks. Our results are robust to implementing specifications with these more stringent model determinants.

Additional robustness is found in our honing in on a borrower’s past exposure to specialized lenders along with the passage of the Inflation Reduction Act (IRA) – which marked an exogenous shock to the availability of transition investment opportunities for firms in some industries. The IRA sample counter concerns regarding the endogenous selection of specialized banks by borrowers with transition projects in need of financing. Assuming that the IRA exogenously created transition opportunities for a range of firms in particular sectors, we consider which firms ended up initiating new transition projects. Again, we show that firms taking up transition projects are more likely to borrow from specialized banks and firms taking up transition expansion projects do so with banks with a capacity to steward. Another way to think about this test is that limiting to firms that all benefit from Inflation Reduction Act helps to compare firms that are similar in terms of their access to transition opportunities, helping to address concerns about other dynamic confounders by limiting to a more comparable set of firms. Even in this sub-sample, we find similar effects of specialization on both transition and expansion loans, showing that our results are unlikely to be driven by unobserved dynamic confounders.

Our second finding shows that this lender specialization and stewardship helps firms overcome short-termism to undertake neglected projects. This is a counterintuitive result, consistent with the model, that a bank’s stewardship may be most important for those firms with constraints, which may otherwise forego investing in transition projects. We argue that these results shed light on the question of whether banks approach firms or firms approach banks; because our results

imply that short-termist firms are, all else equal less likely to undertake transition investments on their own, these results help support a view that lenders play a particularly important role in unlocking and initiating transition investments. Our results are consistent with evidence from other large industrial transitions: it may be the case that firms which choose to not undertake transition (i.e. the Kodaks when the economy transitioned to digital cameras) put themselves at greater risk from remaining solely in the stationary economy.

Finally, we delve into the interest rate mechanism. We show that the price of transition and transition expansion loans is lower if the loan is originated by a bank with more prior specialization in transition lending. Given the high degree of detail in supervisory data, which includes both a internal bank and regulators' confidential risk assessments of borrowers, we can make loans by differently specialized banks as comparable as possible in terms of their default risk. We find strong evidence that specialized lenders offer lower interest rates, even conditioning on default risk proxies, consistent with the literature on specialization (Paravisini et al. (2023), Blickle et al. (2024)).

## 2 Model

### 2.1 The Bank

We start with the bank and its incentive to make a loan. Bank  $b$  is willing to offer a loan to firm  $j$ , operating in industry sector  $s$ , if the following inequality holds:

$$-L + \frac{1}{(1+r)}L(1+i)\bar{\pi}_{j sb} \geq 0. \tag{1}$$

The bank provides principal value  $L$  today and gets back this principal, grown with interest  $(1+i)$ . This future cash flow is discounted at the long-run market discount rate  $r$ .<sup>7</sup>

The final term,  $\bar{\pi}_{j sb}$ , is the bank  $b$ -client  $j$  specific expected performance of the loan in industry sector  $s$ , where performance varies in expected default and the spawning of future lending business. Empirically, realizations of  $\pi_{j sb}$  are positive and likely to be close to one, but not constrained to be less than or greater than one. If a loan has high default risk because of the firm or sector, the expected performance will be less than one. On the other hand, if a loan is likely to spawn new lending or other financial services in the future, the expectation of  $\bar{\pi}_{j sb}$  could be greater than one.

To further understand the dimensions of  $\bar{\pi}_{j sb}$ , we write out its decomposed expectation as

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<sup>7</sup>The market discount rate is generally higher than the cost of capital for a bank, but we assume this rate also captures a Jorgensenian user cost of capital including the mean rate of lending provision costs.

follows:<sup>8</sup>

$$\begin{aligned}
\bar{\pi}_{j\,sb} = & \underbrace{\pi_{\dots}}_{\text{Overall Mean}} + \underbrace{\pi_{j\cdot\cdot}}_{\text{Firm Effect}} + \underbrace{\pi_{\cdot s\cdot}}_{\text{Sector Effect}} + \underbrace{\pi_{\cdot\cdot b}}_{\text{Bank Effect}} \\
& + \underbrace{\pi_{j\cdot b}}_{\text{Relationship Lending}} + \underbrace{\pi_{\cdot sb}}_{\text{Return to Specialization}} + \underbrace{\pi^{\text{stew}}}_{\text{Return to Stewardship}},
\end{aligned} \tag{2}$$

where, denoting prior time with superscript *prior* and all other firms except  $j$  as  $-j$ :

$$\pi^{\text{stew}} = \pi_{[-j]sb}^{\text{prior}} \times I_{js}^{\text{NoExperience}}.$$

If firm  $j$  has no experience in sector  $k$ ,  $\{I_{js}^{\text{NoExperience}} = 1\}$ , the bank has an expected return to harnessing its stewardship capacity to induce investment opportunities for firm  $j$  in line with the bank's lagged specialization in that sector. Note that we define the banks lagged specialization as sector expertise working with any of the  $[-j]$  firms except  $j$ .

In this formulation, the performance of a loan can be considered to result from banks, sector, and firm expected deviations from an overall mean performance,<sup>9</sup> as well as returns to relationship lending ( $\pi_{j\cdot b}$ ), industry specialization ( $\pi_{\cdot sb}$ ), and stewardship ( $\pi^{\text{stew}}$ ). Hereafter, we add superscripts *relat*, *spec*, and *stew*, to these respective parameters for clarity. Following the literature, we assume that expected loan performance is increasing in relationship, specialization, and stewardship:  $\frac{\partial \pi_{j\,sb}}{\partial \pi^m} > 0$  for  $m \in [\text{relat}, \text{spec}, \text{stew}]$ .<sup>10</sup>

A bank will lend as long as the interest rate is sufficiently high to satisfy the inequality of wanting to lend; i.e.:

$$\text{hurdle rate} : i \geq \frac{(1+r)}{\bar{\pi}_{j\,sb}} - 1. \tag{3}$$

<sup>8</sup>We use the ANOVA notation of a subscripted dot to denote a mean taken over the omitted subscript letter, such as  $\pi_{j\cdot b} = \frac{1}{K} \sum_{k=1, \dots, K} \pi_{j\,sb}$ .

<sup>9</sup>Firm and sector effects might reflect risk, and a bank shifter might reflect market power.

<sup>10</sup>Blickle, Parlato, and Saunders (2024); Blickle, He, Huang, and Parlato (2025) find that banks with specializations in industries are able to offer lower interest rates to clients while yet lending more profitably. Likewise, Paravisini, Rappaport, and Schnabl (2023) find that banks with specialty knowledge about geography within sectors of export expertise provide lower interest, more profitable loans. Duquerroy et al. (2022) find that banks have industry specialization that further determines the equilibrium amount of lending into the future, and Frattaroli and Herpfer (2023) find that bank interconnected firms find value-enhancements for both the firm and the bank. Finally, a longstanding literature documents the lending relationship implications for loan contracts as value enhancement for firms and banks. See, for example, Bharath et al. (2007), and Bharath et al. (2009b) and the survey Elyasiani and Goldberg (2004).

If we assume that banks operate in an quasi-competitive environment, where they price loans at the hurdle rate equality condition of equation (3),  $i = (1+r)/\bar{\pi}_{j\text{sb}} - 1$ , then the break-even interest rate is (concavely) decreasing in relationship lending, specialization, and stewardship,  $\frac{\partial i}{\partial \pi^m} < 0$  for  $m \in [\text{relat}, \text{spec}, \text{stew}]$ , consistent with [Blickle et al. \(2024\)](#), [Paravisini et al. \(2023\)](#), and [Degryse and Ongena \(2005\)](#).

## 2.2 The Firm

We model the firms as a risk neutral and having reached its stationary growth rate,  $g$ , with a valuation governed by the Gordon growth model and a long-run market discount rate,  $r$ . For simplicity, we assume that if the firm wants to continue operations in its stationary focus, it maintains investment in line with depreciation. As such, the firm's earnings will grow at  $g$ , and it will pay out all earnings as dividends. We denote a baseline earnings at period  $t = 0$  as  $E_0$  and dividends at time  $t$  by  $d_t$ .

Rather than applying the Gordon growth valuation for the long term valuation today, at  $t = 0$ , we introduce a medium term period as  $t = 1$ . We apply the long-run perpetuity at period  $t = 1$ . In this setup, the stationary valuation at time  $t = 0$ ,  $V_0^{\text{stationary}}$  can be written as:

$$\begin{aligned} V_0^{\text{stationary}} &= d_0 + \frac{1}{(1 + \zeta_j)} V_1 & (4) \\ &= d_0 + \frac{1}{(1 + \zeta_j)} \frac{d_2}{(r - g)} \\ &= E_0 + \frac{1}{(1 + \zeta_j)} E_0 (1 + g) \frac{1 + g}{r - g} \end{aligned}$$

A key attribute of the firm is the discount rate  $\zeta_j$ , which we assume has the property  $\zeta_j \geq r$ . We subscript  $\zeta$  with  $j$ , indicative of a particular firm, to emphasize that this is an attribute whose variation in the cross section is a focus of the model. In particular, we built off the large literature showing that firms may pass-up profitable longer-term investment opportunities because of high discount rates, either caused by short-termism in the investor pool ([Amihud and Lev \(1981\)](#); [Narayanan \(1985\)](#); [Stein \(1989\)](#); [Bolton et al. \(2006\)](#); [Graham et al. \(2005\)](#); [Kumar and Purnanandam \(2023\)](#)) and agency challenges ([Holmstrom and Costa \(1986\)](#); [Shleifer and Vishny \(1989\)](#); [Hirshleifer and Thakor \(1992\)](#); [Stein \(2003\)](#); [Bertrand and Mullainathan \(2003\)](#)) hinder investment. Managers who themselves prefer the quiet life or those who face a short-termist board (and its punishment mechanisms) are loathe to cultivate longer-term opportunities, thus have a

higher discount rate.

**Decisions:** We consider two decisions for this firm at a time  $t = 0$ . The first decision is whether or not the firm should make an investment today toward a transition economy expansion into new technologies or processes. The second decision is whether or not the firm prefers to use bank financing, rather than retained earnings, for this expansion investment. The second decision may affect the initial choice to invest.

### 2.3 Transition Investment

Some firms have a transition investment opportunity at  $t = 0$ . We refer to these firms as opportunity firms. To take advantage of the transition opportunity, the firm invests  $kE_0$  out of current earnings, holding back on dividends.  $k$  is the capital intensity, which we consider to be industry determined, not a decision parameter. We assume that the market can see when a firm makes a transition investment. With our empirical focus on energy, mining, and materials, we have large, visible projects in mind. For example, in energy, a transition investment might be a hydrogen infrastructure project. In mining, a firm might greenfield a new emissions-light mine for transition need critical minerals. Both of these investments are large and visible.

In return for the investment, the transition opportunity increases the firm's long-run growth rate at  $t = 2$  from  $g$  to  $g^*$ , a fixed incremental difference for the long-run. We have in mind a firm grabbing new market share as transitioning existing processes or in an expansion division in the long-term growing segment of the economy.

Note that our simple formulation abstracts from the possibility that the company risk profile changes when a firm invests in transition opportunities. From a practical sense, we keep the model simple intentionally as a way to fix thoughts. The intuition of our model predictions hold when considering extensions that add in transition investment shifting the overall riskiness of the firm (embedded in the risk as to the success of reaching  $g^*$ ), a point to which we return later. Our rationale, however, is more fundamental: in settings where firms face industry transitions, it may be that firms not undertaking transition (the Kodaks of the digital camera transition era) put themselves at greater risk from remaining solely in the stationary economy.

### 2.4 Firm Investment Choice without Bank Financing

If an opportunity firm chooses to make the transition investment, it pays out  $(1-k)E_0$  as dividends, rather than  $E_0$  in the no investment scenario. From period 1 to period 2, the transition investing firm grows at the baseline growth rate of  $g$ . Thus, the dividend at  $t = 1$  is  $E_0(1 + g)$ , as in the no investment scenario. But over the longer-term the firm grows at an opportunity growth rate

of  $g^*$ , where  $g^* > g$ . In this scenario, the valuation today can be expressed as:

$$\begin{aligned} V_0^{Invest|NoBankDebt} &= d_0 + \frac{1}{(1 + \zeta_j)} d_1 \frac{1 + g^*}{(r - g^*)} \\ &= E_0(1 - k) + \frac{1}{(1 + \zeta_j)} E_0(1 + g) \frac{1 + g^*}{r - g^*} \end{aligned} \quad (5)$$

The transition opportunity firm will choose to invest if  $V_0^{Stationary} < V_0^{Invest|NoBankDebt}$ . This simplifies to the inequality:

$$\underbrace{\frac{1 + g^*}{r - g^*}}_{\text{Expansion perpetuity factor}} - \underbrace{\frac{1 + g}{r - g}}_{\text{Stationary perpetuity factor}} > \underbrace{k \frac{(1 + \zeta_j)}{(1 + g)}}_{\text{Capital intensity wedge valued at discount rate relative to growth}} \quad (6)$$

Equation 6 has a natural interpretation; the firm will make the transition investment if the excess growth from transition or expansion over the stationary growth outweighs the investment capital intensity  $k$  times the cost in the short-termism augmented discount rate relative to stationary growth.<sup>11</sup>

We are particularly interested in when a high discount rate hinders otherwise value-creating investment. We flip equation 6 to isolate this effect:

$$\begin{aligned} Neglected &:= 1 + \zeta > \frac{(1 + g)}{k} \Delta^{perpetuities} \\ \text{where } \Delta^{perpetuities} &= \frac{1 + g^*}{r - g^*} - \frac{1 + g}{r - g} \end{aligned} \quad (7)$$

To provide more intuition, we provide a graphical representation. Figure 1 depicts the relationship between the discount rate and the probability of a firm investing, conditional on that firm having an expansion opportunity. We parameterize as follows. We set the market rate as  $r = 0.07$ , and the stationary growth as  $g = 0.02$ . We draw  $g^*$  as uniform distributed between  $[0.0205, 0.0215]$  and capital intensity  $k$  as normally distributed with mean 0.4 and standard deviation of 0.05. Finally, we draw  $\zeta$  as the market  $r$  of 0.07 plus a  $(0.75, 1.5)$  beta distribution draw with upper bound of 0.22 to simulate short-termism along a bounded right tail.

Because we focus on opportunity firms, the question is what hinders a firm from wanting to

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<sup>11</sup>Firms know whether they have a transition expansion opportunity; thus, it is straightforward that firms without a transition opportunity will never invest since the left hand side of 6 will be zero.

invest in expansion. At the lowest discount rate – that of no short termism, – 48 percent of firms do not choose to invest. Either the  $g^*$  is too low, or the  $k$  is too large to warrant investment. As the discount rate increases along the horizontal axis, the investment probability declines – and neglected opportunities rise – as short termism hinders investment.

## 2.5 Firm Investment Choice with Bank Debt

We have just plotted how some firms with a transition opportunity might neglect the opportunity because of their high discount rate. Now imagine that the firm has the option to borrow  $kE_0$  from a bank to finance the transition investment, allowing it to maintain its short-term shareholder payouts. Our question is whether this bank access implies that some neglected opportunities become investable.

In this case, the firm can pay shareholders the full dividend equal to earnings  $E_0$  in the base period, invest  $kE_0$  into the transition investment, and repay the loan at  $t = 1$  at the interest rate  $i$ . The value of the firm is given by:

$$V_0^{Invest|BankDebt} = E_0 + \frac{1}{1 + \zeta_j} \left[ \frac{E_0(1 + g)(1 + g^*)}{(r - g^*)} - kE_0(1 + i) \right]. \quad (8)$$

Comparing this valuation to  $V_0^{stationary}$  leads to the decision relationship that the firm will now choose to make the transition investment with bank debt when:

$$\Delta^{perpetuity} > \frac{k(1 + i)}{(1 + g)} \quad (9)$$

Our interest is in when the bank option overcomes neglected opportunities. Applying the neglected inequality in equation 7, bank lending overcomes neglected opportunities when:

$$1 + i \leq \frac{(1 + g)}{k} \Delta^{perpetuities} \leq 1 + \zeta_j,$$

or, replacing the endogenous interest rate at the hurdle condition and dividing the system by  $(1 + r)$ :

$$\frac{1}{\bar{\pi}_{jsb}} \leq \frac{(1 + g)}{k(1 + r)} \Delta^{perpetuities} \leq \frac{1 + \zeta_j}{1 + r}. \quad (10)$$

The left hand side is the inverse of the expected performance of the loan, including the role of stewardship and specialization. The right hand side is the gross percentage change of the short

termist discount rate over the market rate. Scenarios in which bank lending can overcome neglected opportunities are increasing both in  $\bar{\pi}_{jkb}$ , making the left hand side of the inequality smaller, and in  $\zeta_j$ , making the right hand side larger.

In other words, banks' ability to overcome neglected opportunities relies on settings in which the expected loan performance (because of specialization and stewardship as well as firm and bank effects) is high. This allows for a project affordable interest rate offer. At the same time, how extreme the firm's short-termism in discounting matters too. The discount rate cannot be so high to overly discount future benefits from added future growth.

Figure 2 plots this relationship, conditioning the sample to neglected opportunity firms.<sup>12</sup> As the contour legend conveys, when  $\bar{\pi}_{jkb}$  (the y-axis) and  $\zeta_j$  (the x-axis) are both high, which is captured in the yellow and green (lighter) regions, the probability of bank financing overcoming neglected opportunities rises to over 25%. This leads to a prediction, perhaps surprising, that a bank's role in financing transition is most expected in firms with high agency entrenchment frictions and investor short-termism. In such settings, stewardship advantages are most valuable.

## 2.6 Testable Predictions

The model provides a number of empirical predictions for firms. Observationally, the econometrician cannot distinguish firms with no opportunities from those with neglected opportunities. Thus, we focus our testable predictions on the empirical content found within the dataset of bank loans, avoiding the question of what a lack of borrowing means for the firm.

In this dataset, we can see three primary outcomes:

- Whether or not a bank loan is a loan for a transition project (denoted *Transition Loan*),
- Whether or not a bank loan is a loan for an expansion project, meaning a project in a new sector for the firm (denoted *Expansion Loan*), and
- The interest rate on the loan.

We focus on the model's predictions within the bank loan data as follows:

Prediction (Ia): Transition loans will be more likely to be extended by banks with a specialization in transition industries. Prediction (Ib): Expansion loans will be more likely to be extended by banks with the ability to steward projects based on prior specialization with other firms.

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<sup>12</sup>We draw  $\bar{\pi}_{jkb}$  from a beta(2,4) distribution, then centered at mean 1, with a standard deviation of 0.04, resulting in a range of [0.94,1.14].

The model highlights that bank specialization and stewardship are particularly important for firms neglecting investing in transition opportunities with retained earnings. When firms do not have access to bank credit or are not engaging with banks able to offer stewardship-induced attractive interest rates, firms will invest less in transition projects when they are short-termist in their discount rates. Thus, empirically, Prediction I should hold with a greater strength in the subsample of firms that are short-termist. That is, bank financing will be more important for inducing transition investment for firms that would not have done it in the absence of bank financing. This intuition leads to the second empirical prediction:

Prediction (II): If a firm with a high discount rate invests in a transition or expansion projects, it is more likely it is that the bank lender participating in the transition investment is a specialized or stewarding lender.

These predictions rely on a mechanism assumption of how specialized lender price transition loans, influencing the cost of credit for such project. This leads to our final prediction:

Prediction (III): Transition loans from banks with higher specialization and expansion loans with firms with higher stewardship will have a lower interest rate than other firm-bank financing of transition or expansion.

### 3 Empirical Methodology

**Scope:** Thus far, we have used the language ‘transition opportunity’ generally to refer to transitions in technology, energy, AI, etc. The same language could easily characterize the role of merchant bankers in transportation, electrification, agricultural automation, and factory lines from the 19th and 20th centuries. Likewise, our concepts of expansion stewardship have been very general. Our anecdotes of stewardship in the introduction concerned the different technologies from quantum to agriculture and communications.

Empirically, we will consider two variants of opportunities, motivated by our needing to isolate samples of bank loans meeting a definition of transition or expansion. To isolate the notion of transition, we focus on clean energy transition opportunities for firms. This choice is partially motivated because the green transition offers opportunities to both firms and banks ([Morse and Sastry \(2024\)](#)), but primarily motivated by our being able to build off the Bureau of Labor Statistics lists to isolate very detailed sector codes for clean energy and other green technologies.

When we test expansion, our dependent variable becomes a transition expansion loan (or, sometimes broadening to just an expansion loan). We use the word expansion to mean a firm taking out a loan into a sector new to their business line. In robustness, we generalize beyond the clean energy sector.

**Specifications**<sup>13</sup> We begin with a strawman specification of a two-way fixed effects (TWFE) model or, more accurately, multi-way fixed effects (MWFE) of the form:

$$y_{jsbt} = \beta \text{Specialized}_{bt} + \delta_j + \delta_b + \delta_s + \delta_t + \gamma' X_{jbt} + \epsilon_{jsbt} \quad (11)$$

We first think of  $y$  as being an indicator for a Transition Loan in the dataset of all loans. Our analysis will also include  $y$  as an indicator for Expansion Loan and the interest rate.

Included are fixed effects for firm ( $\delta_j$ ), bank ( $\delta_b$ ), sector ( $\delta_s$ ), and time ( $\delta_t$ ). Vector  $X_{bjt}$  includes controls to adjust for the size of a firm’s use of bank debt and for loan use fixed effects – loan purpose, loan type, and syndication – following [Paravisini et al. \(2023\)](#). The firm and bank fixed effects  $\delta_j$  and  $\delta_b$  level each observation to be compared against the average likelihood for the firm and the bank. Invariant unobserved characteristics that may influence transition opportunities at the firm-bank level would include firm idiosyncratic capital intensity ( $\kappa$  in the model) and bank average loan performance ( $\pi$ ). The coefficient of interest  $\beta$  indicates whether transition loans are more likely to be conducted with banks having a transition sector specialization, where Prediction I implies  $\beta > 0$ .

Identification of the model depends on the absence of unobserved dynamic confounders related to the bank offering of a transition loan or to the firm having transition opportunities, either of which could be spuriously correlated with bank specialization. In the context of the model, the firm endogeneity concern would be represented as some firms not having access to  $g^*$  technology, while others do, with this propensity changing over time and being correlated with the likelihood of relying on specialized banks. A bank endogeneity concern would be a bank facing a liquidity shock that affects its  $\bar{\pi}_{jsb}$  that is related, but not causally so, to the timing of the bank’s specialization portfolio.

We do not deploy a bank\*time fixed effect model of [Paravisini et al. \(2023\)](#), [Banerjee et al. \(2021\)](#), or [Blickle et al. \(2024\)](#). Such a setup in our application would mask identification of banks with stable transition specialization across time. Nor would it be appropriate to apply the [Khwaja and Mian \(2008\)](#) firm\*time fixed effects models, also used in [Banerjee et al. \(2021\)](#) and [Jiménez et al. \(2020\)](#), because our interest is not focused on a bank shock such as the credit supply, but rather a two-way match. Firm\*time fixed effects isolates within-firm quarter comparisons among loans, not the emergence of transition investment.

Instead, we draw insights on addressing such confounding effects from the TWFE literature ([Athey and Imbens \(2022\)](#); [Imai and Kim \(2021\)](#); [Callaway and Sant’Anna \(2021\)](#); [Sun and Abra-](#)

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<sup>13</sup>Following the literature, we view predictions in a revealed preference choice argument following [Jiménez et al. \(2020\)](#) that the firm-bank pairs observed are all comparably at an optimal matching, even though one cannot see loan offers turned down.

ham (2021); Goin and Riddell (2023)). In particular, Sun and Abraham (2021) that the key to identification in the presence of potential dynamic confounders lies in isolating the appropriate control group, dynamically. Our study is not a "treatment" per se; yet, the principal is the same. We need to ensure that each observation (firm-bank pair at a point in time) has a dynamic comparables group against which it is compared.

Thus, first we include a continuous relationship banking variable. We do not want to force our dependent variable to be within relationship or not, but we need to control for relationship influence on the transition loan origination, akin to the work of Callaway and Sant’Anna (2021), which discusses, in a treatment version of TWFE estimation, the importance of covariates in allowing for parallel trends assumptions.

Second, we level the analysis within a panel cohort to allow for dynamic treatment effects and dynamic control comparisons.<sup>14</sup> Our parallel is a ‘control’ comparison cohort of all firm-bank pairs of loans operating in the same (precise) industry sector at the same month-year. Thus, critical to our analysis will be a industry\*time fixed effects. We isolate these dynamic industry effects at the highest number of digit level as our data permit.

Third, we tackle the possibility of dynamics confounders due to the risk prospects of the sector loan for that particular firm-sector setting at a point of time. We include an external-to-the-bank risk measure, so that we are not picking up the benefits or relationship or specialization lending and a lagged bank average interest rate. The external to the bank risk rating – for the purpose of stress testing efforts – is comparable across different banks and reflects non-public information about the quality of a borrower’s project and help us make sure our loans are comparable.

Finally, we consider shocks to transition opportunities stemming from the Inflation Reduction Act. The law generates an observable shift in transition opportunities for all firms in sectors benefiting from IRA subsidies. By limiting our sample to IRA-affected firms, we can “hold fixed” investment opportunities, and consider which firms take up the new opportunity.

Our estimating specification is thus:

$$y_{jsbt} = \beta \textit{Specialized}_{bt} + \alpha_1 \textit{Relation}_{jbt} + \alpha_2 \textit{Risk}_{jbt} + \delta_j + \delta_b + \delta_{st} + \gamma' X_{jbt} + \epsilon_{jsbt}. \quad (12)$$

We estimate a similar equation, for  $y \in \textit{TransitionLoan}, \textit{ExpansionLoan}, \textit{and rate}$ .

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<sup>14</sup>In a future version, we will extend this cohort approach to be a weighted TWFE matched cohort, following Imai and Kim (2021). Also see Goin and Riddell (2023) for an application comparison among TWFE estimators.

## 4 Data

**Y-14 Loan Sample** To identify firm-bank relationships, track lender specialization, and conduct loan-level analyses, we make use of Y14-Q, schedule H1 data from the Federal Reserve System. The dataset contains detailed quarterly information on the C&I loans of reporting banks. Reporting institutions must file all loans they hold with a total balance-sheet commitment of more than 1 million USD in a given quarter. In the sample period between 2012:Q2 and 2023:Q2, we observe 40 banks that report several million loan observations. We keep observations for which we observe the amount, maturity, and interest rate. We remove observations with interest rates or maturities that are likely the result of coding errors (i.e. negative or beyond reasonable coding ranges). In our cleaned sample, we thus focus on about 809,000 term loans and credit lines with a total of over 8,000,000 loan-quarter observations. The data includes private as well as public borrowers – unlike many other data sets. Ultimately, our cleaned data contains loan-information for around 70% of C&I lending in the United States.

In our estimations, we look at loans as outstanding and new originations. The reason that outstanding loans are of interest is as a portfolio weighting loans to the duration a bank would agree to retain the loan in its lending book, to quality weight the bank match side.<sup>15</sup>

Banks report a large set of characteristics for each loan they hold that are useful for our analyses. Loan characteristics include the type of loan (credit line vs. term loan), total committed amount, total drawn amount, interest rate, the loan purpose (i.e. the project-type being financed) whether a loan is collateralized or unsecured, loan maturity, a loan’s risk rating as rated by the bank and reported to Federal Reserve examiners, as well as whether a loan has become non-performing or is in arrears. Besides loan characteristics, the data contains additional information on borrower characteristics. These include borrower name, location, and – importantly –, the 6-digit NAICS of the industry to which the loan is directed.

We use the 6-digit industry code associated with each loan to identify whether a loan is directed towards a transition or "green" project or not. The Bureau of Labor Statistics (BLS) provides a list of industries that it identifies as being associated with the transition to a greener economy.<sup>16</sup> It includes – as one may expect – industries associated with green energy generation, bio-fuels, certain agricultural sectors or agricultural improvements, and more. The median firm has loans associated with just over three different two digit-Naics codes but around 15 different industries when counted at the 6-digit level. Around 3% of all loan observations (as well as 3% of new loans) at this 6 digit level are considered transition-loans by our definition.

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<sup>15</sup>Our next version will cluster error terms at the loan level in such specifications.

<sup>16</sup>The full list can be found at , or available from the authors. We refine the list somewhat to remove borderline green industries such as aluminum smelting and tar production.

In [Table 1](#) we outline some additional key metrics for our sample. Three percent of all loans in our sample are transition loans. The degree to which banks "transition specialize" does not vary much over time. The average loan size is \$16 million, with a long right tail, skewed towards some large syndicated loans.

**Measuring Shareholder Short-Termism** We measure shareholder short-termism for each firm with the share of the company’s shareholders are short-termist, utilize 13F filings data. Large institutional investors with more than \$100 million in assets under management are required to report (every quarter) their holdings of U.S. stocks and other related securities to the Securities and Exchange Commission.<sup>17</sup> To identify which institutional investors can be classified as “short-termist”, we follow the literature following ([Bushee, 2001](#)) and consider two measures of short-termism: the share of their investor’s portfolio held for less than 2 years, and the share of the investor’s portfolio that is turned over in each period. We classify an investor as “short-termist” if it is in the top quartile of short-termism using either measure, or whether that investor is classified as short-termist in the [Bushee \(2001\)](#) classification.<sup>18</sup> We then calculate for each firm what fraction of their outstanding shares are held by “short-termist” investors.

We merge Y-14 data with our firm level 13F and Compustat data using a multi-step process. In some cases, public-firm loans are listed with the company’s ticker or tax ID (tin). This allows us to match publicly traded or other large firms to Compustat data directly. In the majority of cases, however, we merge by name and headquarter zip code. Our algorithm first removes common article words and other non-identifying additions to names<sup>19</sup>. We subsequently match firms with one another if they operate in the same four digit zip code and have names with a high similarity score. In a final step we hand check the largest 2500 firms based on their total asset size. Our final matched sample covers 56% of all firms listed in Compustat by count but just over 90% by size. As can be seen from [Table 1](#), around 62% of our loan-quarter observations are directed towards firms with short-termist investors. Naturally, our merged sample of firms for which we have short termist data is somewhat reduced.

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<sup>17</sup>We access 13F filings through WRDS for the post-2013 period, and from [Backus et al. \(2020\)](#) for for the period prior to 2011.

<sup>18</sup>We thank Brian Bushee for making this data publicly available on his website. [Bushee \(2001\)](#) classifies institutional investors into “dedicated” (DED), “quasi-indexer” (QIX), and “transient” (TRA) types based on their portfolio characteristics. The “TRA” types are short-termist.

<sup>19</sup>This includes words associated with a firms corporate structure such as LLC, Holding, Corporation, and abbreviations of these and similar words.

## 5 Results

We analyze evidence of bank stewardship in loan realization following out predictions.

### 5.1 Prediction I: Transition and Expansion Loan Realizations

If banks are active in stewarding, loans in the transition space, and especially loan in transition that are expansion for firms, should be more likely to have specialized lender. [Table 2](#) reports the results of linear probability estimates with dependent variable taking a value of 1 if the loan is associated with a project whose 6-digit NAICS code was identified as being associated with the transition economy by the BLS. The columns vary in the intensity of the fixed effects, allowing us to consider robustness and signing changes in bank and borrower characteristics/fixed effects. We always also account for the type of loan being made, the 4-digit industry of the borrower, the total debt and total relationship debt of the firm, the purpose of the loan, whether the loan is syndicated, bank, time and industry fixed effects. We step in adding firm (column (2)), sector-time effects (column (3)), and risk column (4). The variable of interest is the log of lender specialization.

Our identification in column (4) thus seeks to compare Kodak at the moment of transition investment opportunities to digital cameras with a Fuji Corporation, lined up in risk and other characteristics.

Importantly, the coefficient of interest does not vary greatly as we add more controls and fixed effects, honing in on a precision comparison group. Interpreting the significant, positive coefficient on specialization in column (4), a 1 standard deviation increase in a lender’s specialization increases the likelihood of a loan being a transition loan by 3 basis points, which represents 10% of the unconditional probability of any given loan being associated with a transition industry (around 3%).

[Table 3](#) reports results focusing only on new originations. Column (4) shows that an increase in the measure of lender specialization is associated with a significant increase in the propensity of a new loan origination being a transition loan.

In the next step, we focus on a sub-sample of firms that may have all received the same shock to their ability to make invest in transition projects. Thus, we are refining our comparison group to ensure we are dynamically able to place companies at their, figurately, Kodak moment relative to other camera or film companies with similar opportunities at the moment in time. To this end, we make use of the passage of the Inflation Reduction Act (IRA). [Table 4](#) includes only those firms whose industries were positively affected by the passage of the IRA, in the period after the IRA passed. We find results almost identical in magnitude and significance to [Table 2](#).

The assortative matching we document could be driven by two channels: a credit demand-

side explanation and a supply-side one. In a credit demand interpretation, borrowers seek out specialized lenders to do a transition investment, perhaps because of advisory expertise that can come with obtaining a loan or more competitive interest rates coming from lenders that are better able to gauge the success of a project. The credit supply interpretation is that specialized lenders are able to steward borrowers towards transition projects. We note that *either* interpretation is consistent with our notion of bank stewardship, since in either case lenders offer an industry expertise, value-added benefit that goes beyond their role as mechanical providers of credit.

To help shed light on these competing demand and supply explanations, we consider a different outcome variable that comes closer to lender stewardship, consistent with our testable predictions and earlier discussion. We now look at situations where a firm does a project in a transition industry *for the first time*—our transition expansion loans. Our outcome variable is now a dummy variable that equals one if the borrower takes out a loan in a six-digit NAICS code for the first time, and it is in a transition industry. We then consider the propensity to do an expansion loan varies with lagged lender specialization.

Table 5 shows the results. We find that borrowers are more likely to do a transition expansion loan with specialized lenders. We show these results are robust to the use of the full set of controls and fixed effects. A 1 standard deviation increase in lender specialization is associated with a 35 basis point increase in the probability that a new loan origination is a transition expansion loan, a large effect given that on average only 1.2% of all loans are expansion loans.

Table 6 shows this result holds in the sub-sample of IRA borrowers. That is, leveling on only firms comparable in being positively exposed to IRA effects in increasing the returns of undertaking transition investments, we find that borrowers are more likely to undertake an expansion loan if the loan transacts with a specialized bank. In Table 7 we show that the IRA result is also robust to limiting to the sample of new loan originations.

## 5.2 Prediction II: Short-termism

The model predicts that bank specialization is particularly valuable for firms with overcome short termism issues, as well as similar constraints that might otherwise limit their ability to invest. In Table 8 we consider how the effect of lender specialization varies by the short-termism of the firm. Interestingly, we find that when firms are not short-termist, lender specialization is *negatively* correlated with undertaking transition projects. However, for firms that are short-termist, we find that lender specialization is strongly and positively related to undertaking a transition project. For short-termist firms that are not undertaking a loan with a specialized lender, we see that they are far less likely to undertake transition projects. These interaction effects show that, all else equal, a firm with high short-termism is *unlikely* to undertake a transition project, consistent with

the notion that these pay off over the longer-term and may be less attractive for high discount rate firms. However, we find that specialized lenders make it *more likely* for a short-termist firm to do a transition project. This helps support the idea that the effect of lender specialization is *most* pronounced for firms that are otherwise constrained by short termism, firms that would not have done these projects in the absence of lender specialization. These findings are robust to a range of controls and fixed effects across the four columns. These results also help to shed light on the credit supply and credit demand dynamics from earlier. Since, all else equal, short-termist firms are less likely to undertake transition projects, these results help support a view that lenders may play a particularly important role in unlocking transition investments. We argue this holds because short-termist firms would not necessarily be the ones to approach the bank seeking to undertake these investments.

In [Table 9](#), we also show that these patterns hold when looking at transition expansion loans. Short-termist firms are in general less likely to undertake expansion loans in transition industries, and the effect of lender specialization is particularly pronounced for short-termist firms. We also note that these results are robust across our controls and fixed effects.

Taken together, these results are strongly consistent with Prediction III of the model, showing that if a firm with a high discount rate invests in a transition or expansion projects, empirically it is the case that it is more likely it is that the bank lender participating in the transition investment is a specialized lender.

### 5.3 Prediction III: Pricing

We extend our analysis by looking at the cost of transition loans made by specialized versus those made by less specialized lenders. We limit the sample to transition loans, and then regress the interest rate of the loan on both lagged and contemporaneous measures of specialization. [Table 10](#) shows the results. In Columns (1) and (2), we consider the baseline controls and fixed effects, and in Columns (3) and (4) we also control for the firm's short-termism. The results find that on average transition loans undertaken with specialized lenders carry lower interest rates. This result becomes even stronger In Columns (3) and (4) after accounting for the fact that specialized lenders are more likely to match with short-termist borrowers, which we address by controlling for the borrower's short-termism.

In [Table 11](#), we drop the control for short-termism but consider the more saturated specification that also includes firm fixed effects, industry-time fixed effects, risk rating fixed effects, as well as the borrowers previous average interest rate, all of which are intended to account for lender perceptions of default risk and industry trends. Columns (1) and (3) show that, in the sample of new originations, transition loans generally carry lower interest rates with specialized banks.

The magnitudes are highly similar in the sample of new loan originations only, although we lose power because the sample size significantly shrinks. These results are consistent with Prediction III, that specialized banks with more stewarding capacity will offer a lower interest rate than other bank-firm match.

## 6 Conclusion

We argue that banks are not merely fungible, mechanical providers of credit, but rather integral guides who enable firms to undertake long-term, value-creating investments. We synthesize work in banking and corporate finance into a novel concept that we denote: bank stewardship. Banks expertise in certain types of investment projects impact their clients' ability (and willingness) to undertake such projects. We focus on "transition opportunities", whereby firms must invest in novel industries to remain relevant.

Building on the literature around bank specialization ([Paravisini et al., 2023](#); [Blickle et al., 2024, 2025](#)) we develop a model, which showcases that banks with more expertise in certain types of projects can help firms make such investments. Specialized banks familiar with financing transition opportunities would charge lower rates to their clients. We show that particularly firms with high short-termism (or similar constraints) may find bank expertise necessary to engage in value-creating investments.

We corroborate our theory empirically using supervisory – and highly detailed – stress-testing data. For these empirical tests, we use investments into greener technologies, which were relevant to the growth of some sectors during our sample period, as transition opportunities. We find that our empirical predictions map onto the data well. Borrowers associated with lenders that are specialized in transition lending are themselves more likely to take transition loans and enter in new transition industries for the first time. These findings are highly robust across a range of specifications. Moreover, we can also leverage the passage of the IRA – which created a shock to transition opportunities – and show that this also favored more transition projects with specialized lenders.

Consistent with the model, we find empirically that it is high discount-rate firms—those with high short-termist shareholders— that seem to benefit the most from bank specialization. Their propensity to undertake transition investments is significantly higher if it involves a specialized bank. We also show that without a specialized bank, short-termist firms are less likely to undertake such projects on their own. That is, specialized lenders are indeed most critical in the case of larger short-termist borrowers. Lastly, We find that transition lenders charge less for transition loans. These results hold even in the face of restrictive risk-controls and borrower as well as lender fixed

effects.

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# 7 Tables and Figures

## 7.1 Figures

Figure 1: Model relationship between the discount rate and the probability of a firm investing

Note: This figure plots the model-implied relationship between the firm's discount rate and the probability of a firm undertaking the transition investment under the parameters discussed in the text.

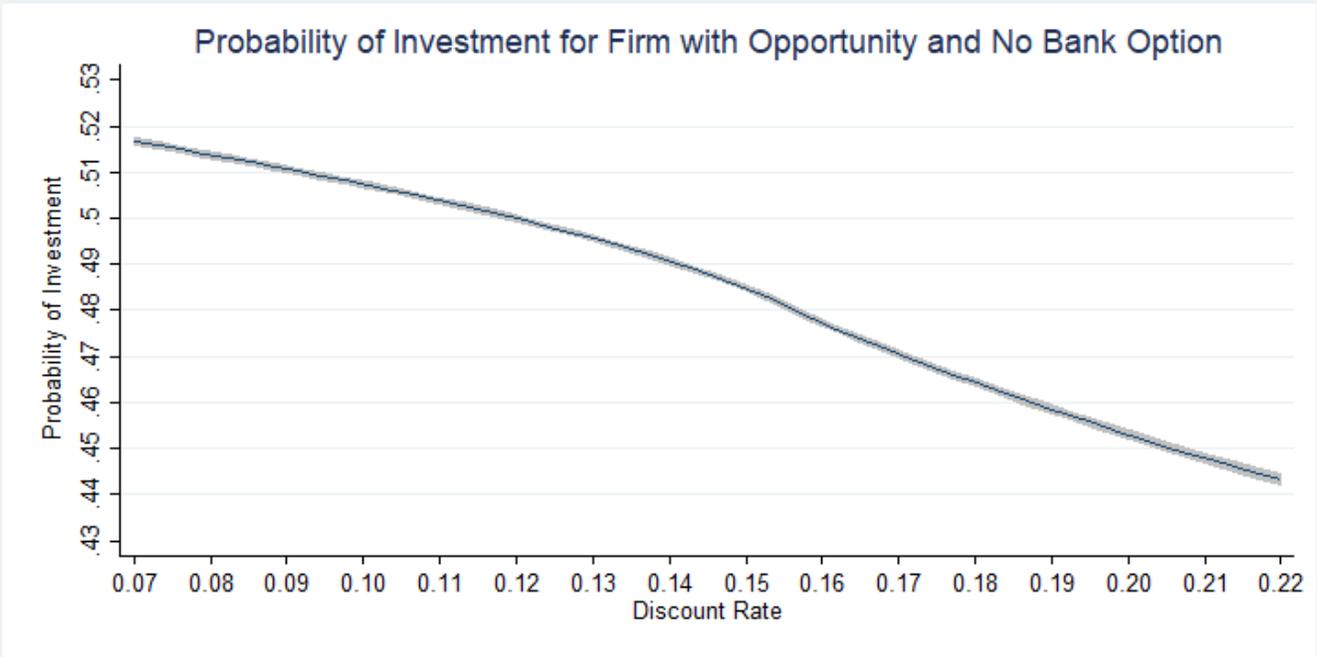


Figure 2: The model-implied relationship between investor short-termism and bank specialization for neglected opportunity firms

Note: This figure plots the model-implied relationship between the firm's likelihood of undertaking the transition investment with bank financing and the firm's discount rate after conditioning on neglected opportunity firms – the ones who would not undertake the transition investment without banking finance. This figure uses the parameter assumptions discussed in the text.

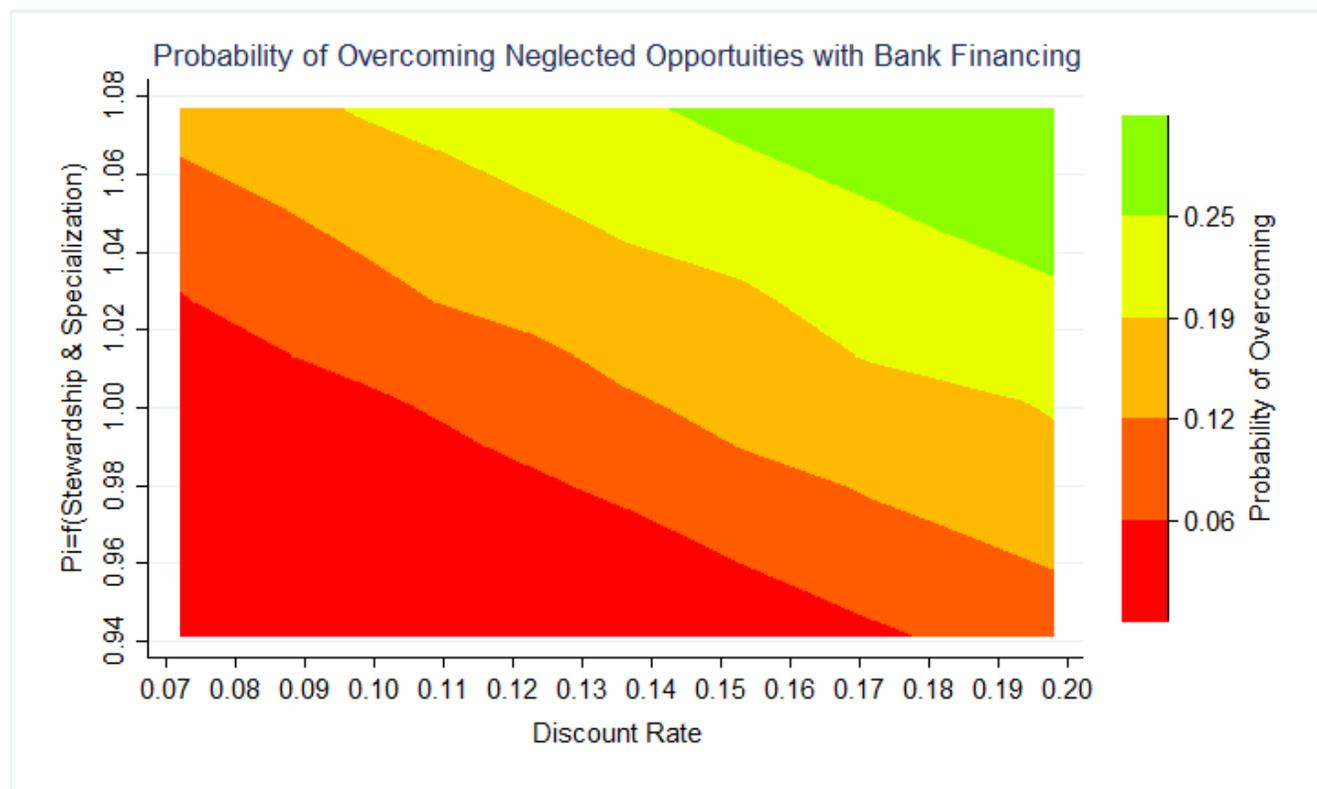
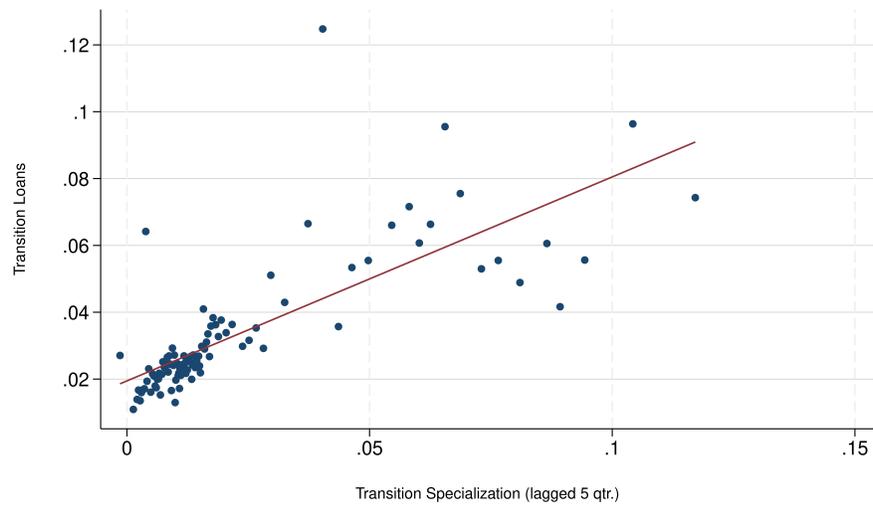


Figure 3: Correlations of Transition Loans to Bank Transition Specialization

Notes: We relate the share of transition loans (relative to all loans) made to a borrower to the average transition specialization of their lenders. We lag lender specialization by 5 quarters and absorb time fixed effects.



## 7.2 Tables

Table 1: Summary Statistics for All Loans

Note: This table produces summary statistics for the variables used in the paper in the sample of all loans

	N	Mean	SD	p25	p75
<i>Panel A: Loan Variables</i>					
Committed exposure (loan size)	5648974	16344	49270	17112	13375
Log committed exposure	5648974	8.57	1.35	7.44	9.50
Interest rate	5648974	3.77	3.06	2.43	4.65
Maturity	5648974	16.56	18.41	4	20
Internal risk rating	5648974	4.69	1.17	4	5
Syndicated loan flag	5648974	0.12	0.33	0	0
Short Termist Firm	1087579	0.62	0.07	0.59	0.67
<i>Panel B: Lender Specialization</i>					
Green Specialization	5648974	0.015	0.02	0.01	0.02
Industry Specialization	5648974	0.03	0.04	0.01	0.02
<i>Panel C: Industry and Loan Purpose</i>					
Expansion Loan	5648974	0.012	0.11	0	0
Transition loan	5648974	0.03	0.16	0	0
Working Capital	5648974	0.54	0.49	0	1
Real Estate	5648974	0.19	0.39	0	0
Capex	5648974	0.07	0.26	0	0
Trade Finance	5648974	0.03	0.16	0	0
Project Finance	5648974	0.01	0.05	0	0
Leasing	5648974	0.03	0.18	0	0
Agriculture	5648974	0.01	0.08	0	0
Other	5648974	0.12	0.33	0	0

Table 2: Effect of Bank Green Specialization on Transition Projects: All Loans

Note: We regress whether a loan is considered a transition loan, which is a binary variable that takes the value of 1 if the 6-digit NAICS code of the loan can be considered a transition-related industry, on the degree to which the associated lender is specialized in transition lending. We lag the specialization of the lending institution by 5 quarters. Baseline controls refers to controls for the total loan volume, and log of the total past lending from that bank to that firm. We include additional controls and fixed effects, as indicated. We run this regression on the sample of all outstanding loans. Standard Errors are shown in parentheses; \*, \*\*, and \*\*\* indicate significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)	(4)
		Transition Loan		
Lagged Green Specialization	0.0176*** (0.000760)	0.0182*** (0.000886)	0.0165*** (0.000895)	0.0165*** (0.000896)
Log Relationship Lending	-0.0000549*** (0.00000660)	-0.0000404** (0.0000161)	-0.0000429*** (0.0000163)	-0.0000423*** (0.0000163)
Log Total Bank Lending	0.0000532*** (0.00000760)	-0.0000168 (0.0000133)	-0.0000244* (0.0000133)	-0.0000251* (0.0000133)
Lagged Average Interest Rate				0.000000773 (0.00000259)
<i>N</i>	5383988	5347369	5347349	5339431
adj. <i>R</i> <sup>2</sup>	0.004	0.031	0.043	0.043
TimeFE	Y	Y	Y	Y
BankFE	Y	Y	Y	Y
IndustryFE	Y	Y	N	N
PurposeFE	Y	Y	Y	Y
LoanTypeFE	Y	Y	Y	Y
SyndicatedLoanFE	Y	Y	Y	Y
FirmFE	N	Y	Y	Y
IndustryTimeFE	N	N	Y	Y
RiskratingFE	N	N	N	Y

Table 3: Effect of Bank Green Specialization on Transition Projects: New Loan Originations

Note: We regress whether a loan is considered a transition loan, which is a binary variable that takes the value of 1 if the 6-digit NAICS code of the loan can be considered a transition-related industry, on the degree to which the associated lender is specialized in transition lending. We lag the specialization of the lending institution by 5 quarters. Baseline controls refers to controls for the total loan volume, and log of the total past lending from that bank to that firm. We include additional controls and fixed effects, as indicated. We run this regression on the sample of new loan originations. Standard Errors are shown in parentheses; \*, \*\*, and \*\*\* indicate significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)	(4)
		Transition Loan		
Lagged Green Specialization	0.0401** (0.0200)	0.0884*** (0.0151)	0.0772*** (0.0168)	0.0771*** (0.0169)
Log Relationship Lending	-0.000474*** (0.000163)	0.0000548 (0.000251)	-0.000375 (0.000268)	-0.000443 (0.000271)
Log Total Bank Lending	0.000350* (0.000179)	0.000410** (0.000199)	0.000417** (0.000207)	0.000466** (0.000208)
Lagged Average Interest Rate				0.0000649 (0.0000607)
<i>N</i>	317799	259224	258173	256452
adj. <i>R</i> <sup>2</sup>	0.576	0.846	0.850	0.850
TimeFE	Y	Y	Y	Y
BankFE	Y	Y	Y	Y
IndustryFE	Y	Y	N	N
PurposeFE	Y	Y	Y	Y
LoanTypeFE	Y	Y	Y	Y
SyndicatedLoanFE	Y	Y	Y	Y
FirmFE	N	Y	Y	Y
IndustryTimeFE	N	N	Y	Y
RiskratingFE	N	N	N	Y

Table 4: Effect of Bank Green Specialization on Transition Loans for IRA firms

Note: We regress whether a loan is considered a transition loan, which is a binary variable that takes the value of 1 if the 6-digit NAICS code of the loan can be considered a transition-related industry, on the degree to which the associated lender is specialized in transition lending. We lag the specialization of the lending institution by 5 quarters. Baseline controls refers to controls for the total loan volume, and log of the total past lending from that bank to that firm. We run this regression on the sample of all outstanding loans but limit the sample to firms benefiting from IRA subsidies and to the post-IRA time period. We include additional controls and fixed effects, as indicated. Standard errors are shown in parentheses; \*, \*\*, and \*\*\* indicate significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)	(4)
	Transition Loan			
Lagged Green Specialization	0.0288*** (0.00594)	0.0173*** (0.00290)	0.0169*** (0.00293)	0.0170*** (0.00293)
Log Relationship Lending	0.000435*** (0.0000510)	0.000132** (0.0000518)	0.0000934* (0.0000527)	0.0000980* (0.0000529)
Log Total Bank Lending	-0.000246*** (0.0000579)	-0.0000133 (0.0000430)	-0.0000137 (0.0000431)	-0.0000160 (0.0000432)
Lagged Average Interest Rate				0.0000117 (0.00000798)
<i>N</i>	3596656	3572321	3572312	3565466
adj. <i>R</i> <sup>2</sup>	0.550	0.926	0.926	0.926
TimeFE	Y	Y	Y	Y
BankFE	Y	Y	Y	Y
IndustryFE	Y	Y	N	N
PurposeFE	Y	Y	Y	Y
LoanTypeFE	Y	Y	Y	Y
SyndicatedLoanFE	Y	Y	Y	Y
FirmFE	N	Y	Y	Y
IndustryTimeFE	N	N	Y	Y
RiskratingFE	N	N	N	Y

Table 5: Effect of Bank Green Specialization on Transition Expansion Loans: All Loans

Note: We regress whether a loan is considered an transition expansion loan, which is a binary variable that takes the value of 1 if the firm does a loan in a transition industry for the first time, on the degree to which the associated lender is specialized in transition lending. We lag the specialization of the lending institution by 5 quarters. We run this regression on the sample of all outstanding loans. We include additional controls and fixed effects, as indicated. Standard errors are shown in parentheses; \*, \*\*, and \*\*\* indicate significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)	(4)
		Transition Expansion Loan		
Lagged Green Specialization	0.0176*** (0.000760)	0.0182*** (0.000886)	0.0165*** (0.000895)	0.0165*** (0.000896)
Log Relationship Lending	-0.0000549*** (0.00000660)	-0.0000404** (0.0000161)	-0.0000429*** (0.0000163)	-0.0000423*** (0.0000163)
Log Total Bank Lending	0.0000532*** (0.00000760)	-0.0000168 (0.0000133)	-0.0000244* (0.0000133)	-0.0000251* (0.0000133)
Lagged Average Interest Rate				0.000000773 (0.00000259)
<i>N</i>	5383988	5347369	5347349	5339431
adj. $R^2$	0.004	0.031	0.043	0.043
TimeFE	Y	Y	Y	Y
BankFE	Y	Y	Y	Y
IndustryFE	Y	Y	Y	Y
PurposeFE	Y	Y	Y	Y
LoanTypeFE	Y	Y	Y	Y
SyndicatedLoanFE	Y	Y	Y	Y
FirmFE	N	Y	Y	Y
IndustryTimeFE	N	N	Y	Y
RiskratingFE	N	N	N	Y

Table 6: Effect of Bank Green Specialization on Transition Expansion Projects for the IRA Affected Sample: All Loans

Note: we regress whether a loan is considered an transition expansion loan, which is a binary variable that takes the value of 1 if the firm does a loan in a 6-digit NAICS code for the first time, on the degree to which the associated lender is specialized in that 6-digit sector. We lag the specialization of the lending institution by 5 quarters. We run this regression on the sample of all outstanding loans but limit the sample to firms benefiting from IRA subsidies and to the post-IRA time period. We include additional controls and fixed effects, as indicated. Standard errors are shown in parentheses; \*, \*\*, and \*\*\* indicate significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)	(4)
	Transition Expansion Loan			
Lagged Green Specialization	0.00102 (0.000702)	0.00115 (0.000808)	0.00166** (0.000817)	0.00162** (0.000818)
Log Relationship Lending	-0.0000163*** (0.00000602)	-0.0000826*** (0.0000145)	-0.0000915*** (0.0000147)	-0.0000906*** (0.0000148)
Log Total Bank Lending	0.0000177*** (0.00000684)	-0.0000113 (0.0000120)	-0.0000116 (0.0000120)	-0.0000129 (0.0000121)
Lagged Average Interest Rate				0.000000135 (0.00000223)
<i>N</i>	3596656	3572321	3572312	3565466
adj. $R^2$	0.005	0.050	0.058	0.058
TimeFE	Y	Y	Y	Y
BankFE	Y	Y	Y	Y
IndustryFE	Y	Y	N	N
PurposeFE	Y	Y	Y	Y
LoanTypeFE	Y	Y	Y	Y
SyndicatedLoanFE	Y	Y	Y	Y
FirmFE	N	Y	Y	Y
IndustryTimeFE	N	N	Y	Y
RiskratingFE	N	N	N	Y

Table 7: Effect of Bank Green Specialization on Transition Expansion Projects for the IRA Affected Sample: New Loan Originations

Note: we regress whether a loan is considered an transition expansion loan, which is a binary variable that takes the value of 1 if the firm does a loan in a 6-digit NAICS code for the first time, on the degree to which the associated lender is specialized in that 6-digit sector. We lag the specialization of the lending institution by 5 quarters. We define transition expansion loans that are specifically expansion loans in transition industries. We run this regression on the sample of new loan originations but limit the sample to firms benefiting from IRA subsidies and to the post-IRA time period. We include additional controls and fixed effects, as indicated. Standard errors are shown in parentheses; \*, \*\*, and \*\*\* indicate significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)	(4)
	Transition Expansion Loan			
Lagged Green Specialization	0.00455 (0.00432)	0.00610 (0.00445)	0.00963** (0.00466)	0.00950** (0.00469)
Log Relationship Lending	-0.0000984*** (0.0000364)	-0.000222*** (0.0000768)	-0.000231*** (0.0000771)	-0.000232*** (0.0000780)
Log Total Bank Lending	0.000111*** (0.0000394)	0.0000464 (0.0000619)	0.0000433 (0.0000604)	0.0000419 (0.0000609)
Lagged Average Interest Rate				-0.0000125 (0.0000163)
<i>N</i>	219237	181120	180360	178771
adj. <i>R</i> <sup>2</sup>	0.034	0.342	0.422	0.422
TimeFE	Y	Y	Y	Y
BankFE	Y	Y	Y	Y
IndustryFE	Y	Y	N	N
PurposeFE	Y	Y	Y	Y
LoanTypeFE	Y	Y	Y	Y
SyndicatedLoanFE	Y	Y	Y	Y
FirmFE	N	Y	Y	Y
IndustryTimeFE	N	N	Y	Y
RiskratingFE	N	N	N	Y

Table 8: Effect of Bank Green Specialization on Transition Projects by Borrower Short-Termism: All Outstanding Loans

We regress whether a loan is considered a transition loan, which is a binary variable that takes the value of 1 if the 6-digit NAICS code of the loan can be considered a transition-related industry, on the degree to which the associated lender is specialized in transition lending. We lag the specialization of the lending institution by 5 quarters. We also interact specialization with a continuous variable (called “ST”) measuring the firm’s short-termism, defined as the share of a company’s shareholders that can be classified as short-termist. This variable is only available for publicly traded companies. We include additional controls and fixed effects, as indicated. We run this regression on the sample of all outstanding loans. Standard errors are shown in parentheses; \*, \*\*, and \*\*\* indicate significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)	(4)
	Transition Loan			
Lagged Green Specialization	-0.0954* (0.0541)	-0.368*** (0.0401)	-0.377*** (0.0405)	-0.371*** (0.0406)
Lagged Green Specialization x ST	0.311*** (0.0852)	0.677*** (0.0624)	0.677*** (0.0629)	0.669*** (0.0630)
ST	-0.00858*** (0.00235)	-0.00890*** (0.00221)	-0.0112*** (0.00229)	-0.0113*** (0.00230)
Log Relationship Lending	-0.00130*** (0.0000953)	-0.000198 (0.000136)	-0.000363** (0.000141)	-0.000378*** (0.000142)
Log Total Bank Lending	0.00119*** (0.000108)	0.000326*** (0.000105)	0.000364*** (0.000106)	0.000379*** (0.000106)
Lagged Average Interest Rate				0.0000994*** (0.0000384)
<i>N</i>	1054339	1036189	1035894	1033314
adj. <i>R</i> <sup>2</sup>	0.543	0.851	0.854	0.854
TimeFE	Y	Y	Y	Y
BankFE	Y	Y	Y	Y
IndustryFE	Y	Y	Y	Y
PurposeFE	Y	Y	Y	Y
LoanTypeFE	Y	Y	Y	Y
SyndicatedLoanFE	Y	Y	Y	Y
FirmFE	N	Y	Y	Y
IndustryTimeFE	N	N	Y	Y
RiskratingFE	N	N	N	Y

Table 9: Effect of Bank Green Specialization on Transition Expansion Projects by Borrower Short-Termism: All Loans

Note: We regress whether a loan is considered an transition expansion loan, which is a binary variable that takes the value of 1 if the firm does a loan in a transition industry for the first time, on the degree to which the associated lender is specialized in transition lending. We lag the specialization of the lending institution by 5 quarters. We lag the specialization of the lending institution by 5 quarters. We also interact specialization with a continuous variable (called “ST”) measuring the firm’s short-termism, defined as the share of a company’s shareholders that can be classified as short-termist. This variable is only available for publicly traded companies. We include additional controls and fixed effects, as indicated. We run this regression on the sample of all outstanding loans. Standard errors are shown in parentheses; \*, \*\*, and \*\*\* indicate significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)	(4)
		Transition Expansion Loan		
Lagged Green Specialization	-0.0281*** (0.00656)	-0.0262*** (0.00842)	-0.0227*** (0.00834)	-0.0210** (0.00835)
Lagged Green Specialization x ST	0.0670*** (0.0103)	0.0562*** (0.0131)	0.0484*** (0.0130)	0.0456*** (0.0130)
ST	-0.000870*** (0.000286)	-0.000634 (0.000465)	-0.00118** (0.000472)	-0.00113** (0.000473)
Log Relationship Lending	-0.0000452*** (0.0000116)	-0.000102*** (0.0000287)	-0.000151*** (0.0000291)	-0.000148*** (0.0000293)
Log Total Bank Lending	0.0000511*** (0.0000131)	-0.0000355 (0.0000220)	-0.0000404* (0.0000218)	-0.0000433** (0.0000219)
Lagged Average Interest Rate				0.00000380 (0.00000790)
<i>N</i>	1054339	1036189	1035894	1033314
adj. <i>R</i> <sup>2</sup>	0.008	0.035	0.090	0.091
TimeFE	Y	Y	Y	Y
BankFE	Y	Y	Y	Y
IndustryFE	Y	Y	Y	Y
PurposeFE	Y	Y	Y	Y
LoanTypeFE	Y	Y	Y	Y
SyndicatedLoanFE	Y	Y	Y	Y
FirmFE	N	Y	Y	Y
IndustryTimeFE	N	N	Y	Y
RiskratingFE	N	N	N	Y

Table 10: Effect of Bank Green Specialization and Short-Termism on Interest Rates for Transition Loans: All Loans

We limit the sample to transition loans only, and regress the interest rate of the loan on on the degree to which the associated lender is specialized in transition lending. We consider both current lender specialization as well as the lender's lagged specialization. We include additional controls and fixed effects, as indicated. We run this regression on the sample of all outstanding loans. Standard errors are shown in parentheses; \*, \*\*, and \*\*\* indicate significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)	(4)
	Interest Rate			
Lagged Green Specialization	-2.372*** (0.501)		-5.928*** (1.112)	
Curr Green Specialization		-3.226*** (0.648)		-4.739*** (1.036)
Log Relationship Lending	-0.00269 (0.00552)	-0.000500 (0.00663)	-0.0821*** (0.0114)	-0.0785*** (0.0105)
Log Total Bank Lending	-0.0479*** (0.00681)	-0.0561*** (0.00827)	-0.0117 (0.0137)	-0.00838 (0.0127)
ST			-2.524*** (0.227)	-2.569*** (0.210)
<i>N</i>	142458	164527	22455	25576
adj. <i>R</i> <sup>2</sup>	0.270	0.169	0.221	0.221
TimeFE	Y	Y	Y	Y
BankFE	Y	Y	Y	Y
IndustryFE	Y	Y	Y	Y
PurposeFE	Y	Y	Y	Y
LoanTypeFE	Y	Y	Y	Y
SyndicatedLoanFE	Y	Y	Y	Y
FirmFE	N	N	N	N
IndustryTimeFE	N	N	N	N
RiskratingFE	N	N	N	N

Table 11: Effect of Bank Green Specialization on Interest Rates for Transition Loans

We limit the sample to transition loans only, and regress the interest rate of the loan on the degree to which the associated lender is specialized in transition lending. We consider both current lender specialization as well as the lender's lagged specialization. We include additional controls and fixed effects, as indicated. Columns 1 and 3 consider the sample of all outstanding loans, and Columns 2 and 4 consider the sample of new loan originations. Standard errors are shown in parentheses; \*, \*\*, and \*\*\* indicate significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)	(4)
	Interest Rates			
	All Loans	New Loans	All Loans	New Loans
Lagged Green Specialization	-1.914*** (0.370)	-1.657 (3.203)		
Curr Green Specialization			-1.675*** (0.388)	-1.884 (2.985)
Log Relationship Lending	0.0274** (0.0107)	-0.00233 (0.0781)	0.0155 (0.00965)	0.0440 (0.0660)
Log Total Bank Lending	-0.0431*** (0.00930)	0.0410 (0.0635)	-0.0418*** (0.00839)	0.00582 (0.0538)
Lagged Average Interest Rate	0.0477*** (0.00136)	-0.0500 (0.0428)	0.0139*** (0.000663)	0.00286 (0.00461)
<i>N</i>	140940	4608	162821	5516
adj. <i>R</i> <sup>2</sup>	0.738	0.640	0.729	0.641
TimeFE	Y	Y	Y	Y
BankFE	Y	Y	Y	Y
PurposeFE	Y	Y	Y	Y
LoanTypeFE	Y	Y	Y	Y
SyndicatedLoanFE	Y	Y	Y	Y
FirmFE	Y	Y	Y	Y
IndustryTimeFE	Y	Y	Y	Y
RiskratingFE	Y	Y	Y	Y

# A Appendix

Table A.1: Effect of Bank Industry Specialization on Expansion Loans: Interest Rates

We regress whether a loan is considered an expansion loan, which is a binary variable that takes the value of 1 if the firm does a loan in a 6-digit NAICS code for the first time, on the degree to which the associated lender is specialized in that 6-digit sector. We lag the specialization of the lending institution by 5 quarters. We include additional controls and fixed effects, as indicated. We run the specification on the sample of all outstanding loans. Standard errors are shown in parentheses; \*, \*\*, and \*\*\* indicate significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)
	Interest Rate	Interest Rate	Interest Rate
Industry Specialization	-0.179 (0.533)	-1.031* (0.558)	-1.009* (0.541)
Log Relationship Lending	-0.163*** (0.0103)	-0.152*** (0.0105)	-0.126*** (0.0102)
Log Total Bank Lending	0.0804*** (0.0110)	0.0442*** (0.0112)	0.0424*** (0.0109)
Lagged Average Interest Rate	0.00476*** (0.000295)		0.00549*** (0.000312)
<i>N</i>	72343	72426	72340
adj. <i>R</i> <sup>2</sup>	0.361	0.341	0.383
TimeFE	Y	Y	Y
BankFE	Y	Y	Y
PurposeFE	Y	Y	Y
LoanTypeFE	Y	Y	Y
SyndicatedLoanFE	Y	Y	Y
IndustryTimeFE	Y	Y	Y
RiskratingFE	N	N	Y