Banks as Stewards*

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Abstract

Banks may play a more active role in corporate finance than previously documented. We document that banks hire industry experts and then steward firms to undertake investments in expansion (new to the firm) sectors. In supervisory data including detailed regulatory risk measures and granular loan-level industry attribution, expansion loans are double as likely to emerge in bank-firm potential pairs when the bank has a team of 2-3 deep industry experts, measured in PhDs and non-banking advanced degrees in Revelio/LinkedIn data. Results are robust to specifications that build off dynamic comparables strategies (Sun and Abraham (2021)), 'within-firm' (Khwaja and Mian (2008)) and 'within-bank' (Blickle et al. (2024)) analyses, and fully saturated bank-firm-time models (Paravisini et al. (2023)). Conceptualizing our setting, we frame that bank stewarding will be more prevalent when firms neglect expansion investment because of high discount rates. Empirically, the effect of bank expertise unlocking expansion loans is increasing in firms' short termism. Finally, we document the mechanism through loan pricing: banks with experts provide loans at 30-76 bps lower interest rates, with an annual value to firms of $3.3-$8.5 billion. Such expansion stewarding is likely most valuable in moments of transition for an industry. We corroborate our general expansion evidence in the context of firm expansion investments from the energy transition. 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.[1]

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)).[2] 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 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 opportunities in the areas where banks have expertise. We call this bank stewardship.

[1] 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).

[2] See the survey of this literature in Drucker and Puri (2007).

Stewardship may throw long-standing views of the role of banks in corporate finance on its head, taking our thinking back to historical episodes of merchant banking roles, where lead bankers (e.g., Andrew Mellon) were also the industrial experts and visionaries. In current times, the financing tool of stewardship may differ from merchant banking, but the key to either story is bank's incentive to grow financing volume. This lending book growth view of banks goes well beyond the typical corporate finance models of bank lending that focus primarily on loan default and pricing profits per loan.

The 'why' of why stewardship might be emerging now is an interesting overlay. Stewarding language could easily characterize the role of merchant bankers in transportation transitions, electrification, agricultural automation, and factory lines commencements during the 19th and 20th centuries. These are moment of transition, periods when expertise in a bank might be most valuable to clients or potential clients facing Kodak moments, deciding whether to jump to a new technology. The Kodak settings of today are not the advent of the digital camera, but instead economy-wide transitions in technology, energy, labor, and supply chains.

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."[3] 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."[4] 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,"[5] 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."[6]

On the client side, bank stewardship depends on firms' having a need for stewardship. A

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

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

[5]https://www.sc.com/en/corporate-investment-banking/industries/, accessed October 20, 2025

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

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)).

In this paper, we provide four contributions as evidence toward bank stewardship. The first contribution is direct evidence of what must be a necessary condition for stewardship – human expertise. We gather LinkedIn data via Revelio Labs datasets and document the prevalence of Ph.D.s and other deep industry expertise professionals within the banks. We carefully categorize all bank employees, identifying "subject matter" experts as those with a Masters or PhD degree and a job not related to financial intermediation, accounting, risk management, compliance, bank-IT, or sustainability. These experts are not bankers who work in aviation or chemistry, but rather aerospace engineers and materials scientists. We find that banks have been convexly increasing the in-house industry experts in their human capital resources, with the convexity having increasing kinked inflections starting in 2017 and then 2021.

Our other three contributions emerge as we structure bank-client loan evidence. To compel our empirical analysis, 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 firm expansion in a transition opportunity. The tradeoff calculation affected by 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. The model then shows 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 three testable predictions. First, expansion loans will be more likely to be extended by specialized banks with the ability to steward projects. Second, bank stewarding of projects is particularly valuable for firms with high discounting of the future value from investment. Third, expansion loans from banks with higher stewardship will have a lower interest rate than other loans, ceteris paribus.

With access to Federal Reserve loan-level data collected as part of supervisory stress-testing efforts (Y-14-Q schedule H data), we have detailed 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. The data covers more than 70% of U.S. C&I lending.

Our key dependent variable for identifying stewardship is a binary variable indicating whether an expansion loan, defined as loans in sectors previously not a part of the firm's activities, emerges among the potential bank-client pairs of possible loans from historical relationships pre-dating specialization. Our key independent variables are *bank specialization* – the lagged proportion of the banks' lending book directed towards a very precise given industry and *bank experts* at the industry level. Our data allow rich fixed effects controls of loan type (credit line versus installment), the risk rating assessment of the Federal Reserve, a syndication dummy, the quarter-year time, and loan purpose categories. In addition, we step into deeply saturated models that incorporate advances (i) from the two-way fixed effects (TWFE) literature[7] by dynamically comparing potential pairs within industry crossed with time, (ii) from the 'within' banking literature (Khwaja and Mian (2008)) by including firm fixed effects, and from the (iii) bank specialization literature forcing within-bank identification (Blickle et al. (2024)) and within bank-firm-time fixed effects (Paravisini et al. (2023)), while keeping the TWFE dynamic within-industry comparison.

Our second main contribution is the finding that the likelihood that an expansion loan emerging from bank-firm potential pairs of historical relationships is increasing in the bank having experts. Specifically, a bank with a sector focus team with 2 to 3 more experts doubles the likelihood of an expansion loan realizing. This assortative matching we document could be driven by a *credit demand* interpretation, where borrowers seek out stewarding banks for expansion because of their expertise and pricing or a *credit supply* channel, where relationship banks with expert teams are able to steward borrowers towards expansion opportunities with their industry knowledge, akin to merchant banking relationships of old.. 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.

[7] Athey and Imbens (2022); Imai and Kim (2021); Callaway and Sant'Anna (2021); Sun and Abraham (2021); Goin and Riddell (2023)

Our third contribution is demonstrating the role banks play in overcoming borrower short-termism to undertake neglected projects. We measure short-termism using the standard approach of Bushee (2001) that uses the portfolio turnover of the investors holding firm shares as a metric of the short-termist pressure on the firm's decision-making. We include an interaction of this term with experts in our potential pair analysis. We find that the marginal effect of experts on the likelihood of an expansion loan realizing from potential pairs is 34% higher for firms with a standard deviation above the mean short-termism, compared to the firm with a standard deviation below the mean short termism. This is a counterintuitive result, motivated by our model, that a bank's stewardship may be most important for those firms with high hurdle rate constraints on investment. These are firms that may otherwise forego investing in expansion projects but for the stewarding effect of banks.

Our final main contribution is to provide evidence as to the interest rate mechanism of stewardship overcoming neglected investments. Consistent with the literature on specialization (Paravisini et al. (2023), Blickle et al. (2024)), we find that banks with 2 more experts in the sector provide investment financing to firms at 30-76 basis points lower interest rates, even conditioning on regulators' confidential risk assessments of borrowers. These lower rates translate in our sample to $40 billion - $100 billion in lower amortized payments across all years or $3.3 - $8.5 billion annually. These lower rates, interpreted in our model, serve as inducements for firms to overcome settings of possible neglected investment opportunities.

This interest rate result provides two inferences relevant for stewardship. First, as we have phrased above, lower rates implies that stewardship changes firms' willingness to invest in expansion. Second, if we are to extrapolate the finding of Paravisini et al. (2023), which finds that specialized bank loans results in both lower rates to firms and higher bank profits from the loans, we can infer banks' may have both loan performance and lending book volume growth incentives to develop stewardship (advisory) groups.

In a final section of the paper, we seek corroborating evidence by homing in on a transition setting. We use the language of digital cameras and Kodak throughout the paper, but our analysis is thus far for expansions that are new to the firm. We would like to corroborate with evidence that corresponds to the transition economy of Andrew Mellon's day of industrialization and transport transitions. In our time, many of these transition are happening, but we focus on the energy transition for a reason of practicality – breadth and data. The Bureau of Labor Statistics has published a list of detailed industry codes for the green transition, which include a wide berth of industries in energy, mining, transport, and a host of other industries. Our last analysis repeats the predictions tests from before, focusing only on firm expansions into the green transition sector, with the word green being used loosely. We find evidence consistent with all of our main contributions.

2 Foundations

We begin by grounding our work in a few foundations. First, we demonstrate that banks are indeed gathering industry experts as stewards. To do so, we collect new data and present evidence on the existence of Ph.D.s and other industry experts inside a bank. Second, we provide a theoretical framing that will result in a counter-intuitive empirical prediction. This prediction we can take to the data to add to the identification of patterns leading to a stewarding interpretation.

2.1 Ph.D.s and Experts

Our story is one of Ph.D.s and other non-banking deep technical industry experts working inside the bank to steward projects for clients with expansion opportunities. The starting point for any such analysis is documenting the existence and prevalence of such experts in the banking sector. We construct a bank-quarter measure of industry experts using LinkedIn workforce data from Revelio Labs. We then conduct a detailed match to attach this data to the Y14-Q schedule H1 data on banks. Specifically, we first assign a common commercial identifier, FactSet Entity ID, to the sample of banks.[8] We then merge the Y14-Q bank list with the Revelio Lab's company mapping, which assigns a unique Revelio company ID to each entity. The ID is at the ultimate parent level, allowing us to capture bank subsidiaries.[9] Next, we use the Revelio Company ID to subset the Revelio positions file to Y14 banks and subsidiaries.

The positions file provides detailed employment data for users, including the company name, role title and broader occupation category, as well as start and end dates. Finally, we merge on each individual their complete education history, including the degree obtained (Bachelors, Masters, PhD, etc.), the field, and university affiliation. We additionally use the publicly available O-NET Job Family Crosswalk to assign each position to a broader "job family."

The resulting data sample encompasses 7.8 million Linkedin users employed at 39 Y-14 banks and 3,103 bank subsidiaries. The reporting spans our full sample period, 2012:Q2-2023:Q2. With these job classifications in hand, we create industry expertise metrics, based on job family/occupation, education, and skills. We keep only people with Master's or PhD degrees (excluding MBAs). Importantly, we remove doctoral degrees and job family titles associated with banking, finance, managerial, or economic expertise. This filter includes any job titles associated with risk management, compliance, accounting, loan origination, loan assessment and monitoring, or even general management. We additionally exclude any natural scientists whose job description

[8] We make use of the CRSP-FRB link provided by the Federal Reserve Bank of New York to go from ID RSSD to permco, followed by CRSP's internal "Linking Factset with CRSP" tool provided by WRDS.

[9] For banks where we do not find a FactSet Entity ID in the CRSP crosswalk, we perform a string search of the Revelio company mapping by bank name (from the FFIEC National Information Center) to locate the Revelio company IDs.

involves the sustainability office of a bank. We exclude medical practitioners if they work in a medical office of the bank (such as onsite doctors). Finally, we exclude any computing specialists or scientists whose job description places them in the bank's own IT department. We assume an individual remains employed by the bank if no new employment is started and no end date for their employment at the bank is given.

We manually assign over 1000 ONET job descriptions to expertise categories. Our categories include computing/software, life science or pharmaceuticals, engineering or manufacturing, energy generation and energy resources, environmental science, agriculture or food science, mining or geological experts, and healthcare experts. These categories are broad but fit the data and people's job descriptions and educational details well.

Figure 1 plots the number of new expert hires per year at Y-14 banks over the period 2000-2024. In the initial decade through 2010, we see a steady growth in expert hires by banks. This growth itself is interesting, but is dwarfed byt the hiring that picks up in 2017 and is followed by a period of rapid hiring through 2024. We view this new data being brought to bear on the question of stewardship as a first finding of the paper. Namely, banks have hired experts aggressively in the last decade, building out advisory departments that sound a bit more like merchant banking times of industry expertise being housed inside financial institutions for lending book growth-oriented reasons.

We observe a similar trend when breaking hires into groups by occupation category (Figure 2). Aligned with the recent trend for technology hiring in banks, software is the most prevalent category of expert hiring in our data. The pattern of a massive recent growth in expert hires across the Y-14 banks is reflected in all job categories with over 100 new hires in a given year across the sample period.[10] Across software, life sciences / pharmaceuticals, and engineering roles, the trend mirrors the aggregate with a slow growth in the early period followed by a steep increase around 2017. The other sectors of energy, environment, and food / agriculture experience a slightly more more focused expansion, with a growth spike aligned potentially with the passage of the Inflation Reduction Act (IRA) and Infrastructure Investment and Jobs Act (IIJA), both of which stimulated policy-related job creation.

For the purposed of the rest of the paper's analyses, we assign experts to NAICS industries at the three digit level. This mapping is broad but enables the final Y14 lending analysis.

[10]We note that expert hires in the software field may include both experts by our definition and employees that are responsible for maintaining the bank's internal technology. We may not be fully able to extricate this from expert hiring if job descriptions or titles are unclear or vague.

2.2 A Theoretical Framing & Empirical Predictions

As our second foundation, we introduce a model of a bank's role in enabling firms to overcome neglected expansion opportunities.

2.2.1 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:

$$-L + \frac{1}{(1+r)} L(1+i)\overline{\pi}_{jsb} \geq 0. \tag{1}$$

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.[11]

The final term, $\overline{\pi}_{jsb}$, 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 π_{jsb} 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 $\overline{\pi}_{jsb}$ could be greater than one.

To further understand the dimensions of $\overline{\pi}_{jsb}$, we write out its decomposed expectation as follows:[12]

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

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

$$\pi^{stew} = \pi^{prior}_{[-j]sb} \times I^{NoExperience}_{js}.$$

[11] 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.

[12] We use the ANOVA notation of a subscripted dot to denote a mean taken over the omitted subscript letter, such as $\pi_{j\cdot b} = \frac{1}{K}\sum_{k=1...,K} \pi_{jsb}$.

If firm j has no experience in sector k, $\{I_{js}^{NoExperience} = 1\}$, 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,[13] as well as returns to relationship lending ($\pi_{j \cdot b}$), industry specialization ($\pi_{\cdot sb}$), and stewardship (π^{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: $\frac{\partial \overline{\pi}_{jsb}}{\partial \pi^m} > 0$ for $m \in [relat, spec, stew]$.[14]

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

$$hurdle\ rate:\ i \geq \frac{(1+r)}{\overline{\pi}_{jsb}} - 1. \tag{3}$$

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

2.2.2 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.

[13] Firm and sector effects might reflect risk, and a bank shifter might reflect market power.

[14] Blickle, Parlatore, and Saunders (2024); Blickle, He, Huang, and Parlatore (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).

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 $t = 0$, $V_0^{stationary}$ can be written as:

$$V_0^{stationary} = d_0 + \frac{1}{(1+\zeta_j)} V_1 \tag{4}$$

$$= d_0 + \frac{1}{(1+\zeta_j)} \frac{d_2}{(r-g)}$$

$$= E_0 + \frac{1}{(1+\zeta_j)} E_0(1+g) \frac{1+g}{r-g}$$

A key attribute of the firm is the discount rate ζ_j, which we assume has the property $\zeta_j \geq r$. We subscript ζ 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.

We consider two decisions for this firm at a time $t = 0$. The first decision is whether or not the firm should make an expansion investment 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.

2.2.3 Firm Investment Choice without Bank Financing

Some firms have an expansion opportunity at $t = 0$. To take advantage of the expansion 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. In return for the investment, the expansion increases the firm's long-run growth rate at $t = 2$ from g to g^*. 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.[15]

If an opportunity firm chooses to make the expansion investment, it pays out $(1-k)E_0$ as dividends. From period 1 to period 2, the transition investing firm grows at the baseline growth rate of g, with a dividend at $t=1$ of $E_0(1+g)$, 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:

$$V_0^{Invest|NoBankDebt} = d_0 + \frac{1}{(1+\zeta_j)} d_1 \frac{1+g^*}{(r-g^*)} \tag{5}$$

$$= E_0(1-k) + \frac{1}{(1+\zeta_j)} E_0(1+g) \frac{1+g^*}{r-g^*}$$

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

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

Equation 6 has a natural interpretation; the firm will make the investment if the excess growth from 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.[16]

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

$$Neglected := \; 1+\zeta > \frac{(1+g)}{k} \Delta^{perpetuities} \tag{7}$$
$$\text{where } \Delta^{pertpetuities} = \frac{1+g^*}{r-g^*} - \frac{1+g}{r-g}$$

[15] Note that our simple formulation abstracts from the possibility that the company risk profile changes when a firm invests in transition opportunities. At moments of economic transitions, one can also imagine that the risk profile of expansion works both ways – riskier in the technology, but risk reducing in the economic exposure in not being left behind in transition moments.

[16] 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.

2.2.4 Firm Investment Choice with Bank Debt

Now we imagine that the firm has the option to borrow kE_0 from a bank to finance the 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:

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

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

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

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 $(1 + r)$:

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

The left hand side is the inverse of the expected performance of the loan, including the role of stewardship. 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 $\overline{\pi}_{jkb}$, making the left hand side of the inequality smaller, and in ζ_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.

2.2.5 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.

The model highlights that bank specialization and stewardship are particularly important for firms neglecting investment. Banks with specialization can offer low enough interest rates – due to specialization performance – to overcome expansion frictions for the firm. This leads directly to our first empirical prediction.

> Prediction (I): Expansion loans will be more likely to be extended by specialized banks with the ability to steward projects.

Our second prediction builds off the possibility that firms may have more neglected opportunities when they are highly discounting the future. Hence, these same firms are more likely to have an opportunity that benefits from stewarding. The lower interest rate from stewardship-specialization helps the firm with the tradeoff of dividends versus long-term valuation.

> Prediction (II): Bank stewarding of projects is particularly valuable for firms with high discounting of the future value from investment.

These predictions rely on a mechanism assumption of how specialized lender price expansion loans with their stewardship.

> Prediction (III): Expansion loans from banks with higher stewardship will have a lower interest rate than other loans, ceteris paribus.

3 Data

Our empirical predictions focus our analysis on loan originations. A different approach might be to study firm investment with and without bank lending. Yet, as econometricians, we cannot see instances when the firm neglects investment or firm investment bring itemized as an expansion activity. Thus, we focus on bank lending as the base dataset. In the bank loan dataset, we see very precise loan-level industry subsectors to speak to whether a loan represents an expansion for a firm. We can determine bank-client relationships to consider loans that did and did not happen. In addition, we can relate loan originations to specialization in that bank, controlling for the bank, the firm, and relationships. Attached to that bank loan dataset, we will pull in human resources data on Ph.D.s and experts and short termist measures for the publicly-traded firms.

Y-14 Bank Loan Data Our sample is that of the Y14-Q, schedule H1 data from the Federal Reserve System. The dataset contains detailed quarterly information on the commercial and industrial (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. Table 1 reports the key metrics for our sample. The average loan size is $16 million, reflective of lending at the large and small scale.

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 end our analysis looking for corroborating evidence from a transition setting, akin to the Kodak moment of digital cameras. We focus on green economy transition opportunities for firms for which the Bureau of Labor Statistics (BLS) provides a list of affected industry codes.[17] Around 3% of all outstanding or new loan observations are considered transition under the BLS coding.

Data on Short-Termism As our view of the extent to which firms may have a a higher likelihood of having neglected expansion opportunities, we seek a measure of the heightened discount rates caused by agency or short-termism. We focus on short-termism, which we can measure using shareholder rather than firm activities. We measure 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 Com-

[17]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. The list includes a wide range of industries associated with green energy generation, bio-fuels, certain agricultural sectors or agricultural improvements, certain mining, and more.

mission.[18] 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.[19] 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. [20] 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, on average, firms have a 0.62 disposition toward short-termist investors, with a fairly tight standard deviation of 0.07. This may imply that a core set of indexing or otherwise market-covering investors have a short termist vantage. The variation of interest will be firms exposed to larger pressures from active participants.

4 Empirical Methodology

We take three lenses to the bank data to test for evidence identifying stewardship. First, we create a database of possible loans – those that did and those that could have occurred. This enables us to focus on the likely mechanisms through which stewardship might happen. To build a database of potential bank-firm pairs, we consider the likely mechanisms by which stewardship might happen. Imagine that a bank has gained specialization expertise in a sector, working with clients in the recent past. Now, this bank, working with a different client, may suggest an expansion-oriented project by leveraging this prior knowledge via its advisory department. Indeed, this is how the bank advisory divisions are defined. In this story, expansion loans might happen within existing bank-borrower relationships. Thus, our first test to identify stewardship takes the set complete set of historical bank-client relationships and asks whether new loan originations are more likely to happen with banks that have expertise. In our second lens, we focus specifically on whether

[18] We access 13F filings through WRDS for the post-2013 period, and from Backus et al. (2020) for for the period prior to 2011.

[19] 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.

[20] 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. This includes words associated with a firms corporate structure such as LLC, Holding, Corporation, and abbreviations of these and similar words. 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.

expansion lending happens if a bank has gained expertise in an industry. Methodologically, we create a fictive database that supposes that a borrower might reasonably borrow from any of its prior relationship banks for a specific project. Naturally, we define bank-borrower relationship pairs at the start of our sample – usually before a bank has gained significant expertise in the relevant field – and avoid capturing cases whereby a borrower has sought out a bank because of its specialization.

Our third lens looks only at loan originations that have happened and thus speak to lending terms, especially the interest rate pricing. Because we use the Y-14 data, we have the risk profile of each loan that is part of the Federal Reserve System stress testing efforts. It provides a risk gauge based on observable information rather than proprietary information of the specific bank providing the loan. This, and the detailed industry code, allows us to make apple-to-apple comparisons.[21]

In our last approach, we consider corroborating evidence by honing in on sectors going through a transition akin to the digitization of imagery that the camera industry faced resulting in our "Kodak moment" anecdote. In our present time, one such transition is that of the energy transition with the economic possibilities in green transition spaces. Thus, as corroborating evidence, we consider a deep dive into expansion in action by studying green transition loans. This corroboration evidence serves a role our being able to look for firm expansion into areas where all expertise in the expansion sector is yet evolving.

Potential Pairs: Main Specification The main estimation lens is that of potential bank-client pairs. The raw Y-14 data contains only bank–firm pairs that exist because a loan was actually originated. To use an identification strategy that identifies the increased likelihood with which specialized banks lend to firms and especially to which specialized banks help firms enter a new industry, it is necessary to expand the sample to include potential lending relationships—that is, bank-firm pairs that could have resulted in a loan during the sample period. Moreover, as discussed above, we want to limit firm-bank combinations to ones that existed in the early portion of our sample. As such, we can exclude new bank-firm relationships that formed later (after the lender became specialized in the field). This serves to limit the possible size of our constructed data set and makes a strong case for active bank stewardship.

To construct this expanded panel, we proceed in three steps. First, we collapse our data to the firm-bank-industry-quarter level (combining instances in which a firm had multiple loans from the same bank in the same field originated in the same quarter). Next, we identify active firm-bank combinations from the first two years of our sample. Third, we extend this data to include all possible combinations of bank-firm interactions that could have followed. Naturally, we limit our

[21] We follow the revealed preference choice argument of 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.

"potential" data to only those industries in which a bank is active and to only those firm-times in which a firm actually borrows. Truly originated loans can take a value of 1 and bank-firm-industry combinations that did not result in a loan take the value of 0.

We begin with a specification of a two-way fixed effects (TWFE) model or, more accurately, multi-way fixed effects (MWFE) of the form:

$$y_{jsbt} = \beta \, Specialized_{bt} + \delta_j + \delta_b + \delta_s + \delta_t + \gamma' X_{jbt} + \epsilon_{jsbt}, \tag{11}$$

where y is an indicator for an expansion loan realized among the bank-historical client potential pairs. Included are fixed effects for firm (δ_j), bank (δ_b), sector (δ_s), and time (δ_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 δ_j and δ_b level each observation to be compared against the average likelihood for the firm and the bank. The coefficient of interest β indicates whether bank specialization impacts the probability of an expansion loan, 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 expansion loan or to the firm having expansion 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 expansion technologies, 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 loan performance for a sector-firm-year that is related, but not causally so, to the timing of the bank's specialization portfolio.

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 Abraham (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 principle 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, our first step is already done in the creation of pairs. We do not want to force our dependent variable to be within relationship or not, but we need to level observations to being all possible within the historical relationship, a leveling in the spirit of Callaway and Sant'Anna (2021).

Second, we level the analysis within a panel cohort to allow for dynamic treatment effects and dynamic control comparisons. Our parallel is a 'control' comparison cohort of all firm-bank potential pairs 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 of 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 implement a saturated firm*bank*time fixed effect model, building off Khwaja and Mian (2008) and Jiménez et al. (2020), and more specifically of the bank interactions included in Paravisini et al. (2023), Banerjee et al. (2021), or Blickle et al. (2024). Such a setup in our application may mask identification of banks with stable specialization across time and variation among firm or bank comparables, but does allow robustness checks as to whether specialization matters for within-firm-bank-time pairs in seeing potential pairs realize into a loan.

Our final (robustness) estimating specification is thus:

$$y_{jsbt} = \beta\, Specialized_{bt} + \alpha_2 Risk_{jbst} + \delta_{jbt} + \delta_{st} + \gamma' X_{jbt} + \epsilon_{jsbt}. \tag{12}$$

5 Main Results

We organize our results around the three predictions for evidence of bank stewardship.

5.1 Prediction I: Expansion Loan Realizations with Stewardship

Prediction I implies that expansion loans are more likely among potential bank-client pairs when the bank has a prior specialization in the industry or industry experts in advisory roles. Table 3 and Table 4 present the potential pair results with experts and bank specialization being the key independent variables, respectively, in each table.

For both tables, the columns step into different degrees of fixed effects saturation, appealing to different models. All columns include loan type (credit line versus installment), the risk rating assessment of the Federal Reserve, a syndication dummy, the quarter-year time effects, and loan purpose categories. In column (2), we borrow from the advances in the TWFE, comparing potential pairs within industry crossed with time. We also include firm fixed effects to level analysis to the firm's average probability of a loan pairing with banks following Khwaja and Mian (2008). Columns (3) forces within-bank identification from Blickle et al. (2024), also keeping the TWFE dynamic within-industry comparison. Finally, column (5) implements bank-firm-time fixed effects

akin to Paravisini et al. (2023), again keeping the TWFE dynamic within-industry comparison.

We start with Panel A of Table 3, where the sample is the full set of potential bank-client historical pairs. The dependent variable is whether a loan is originated – for the moment zooming out and not considering whether the loan is an expansion loan. Our independent variable is the stock of experts in the bank in that industry. We exclude all industries to which we cannot match experts. Given that our matching is fuzzy (see above) this adjustment ensures we are being conservative. We find that bank-historical client potential pairs are more likely to result in originated loans when the bank has experts in the industry sector for which the firm will be using the loan. This result is robust to including bank*year*firm fixed effects, implying that a bank is more likely to extend a loan to an existing borrower-relationship in a given year only in an industry in which it is specialized. The results are similar if we look at our bank specialization measure instead of experts. Using the parallel specification in Panel A of Table 4, we find that loans are more likely to originate in bank-historical client pairs when the bank has developed specialization in that 6-digit NAICS code sector. These results are not surprising given the past literature on specialization.

Panel B changes the dependent variable to being only expansion loans, defined as the loan being a new subsector (i.e. new 3-digit NAICS industry) of investment for the firm. In Table 3 we look to experts as the key independent variable. We find a consistently statistically positive, statistically significant, and stable coefficient on the relationship between experts and the bank-client pair originating an expansion loan. The most stringent saturation of fixed effects in columns (5) of Panel B is our most natural for assessing economic magnitudes. The average potential pair likelihood of a loan originating is almost double if a bank hires 2-3 new experts in an industry. More precisely: hiring 2-3 more experts increases the likelihood by 63-95 basis points, which represents an 86%-113% increase relative to the baseline likelihood of 72 basis (Panel A of Table 2). Reassuringly, we find similar results in Table 4, using our measure of bank specialization.

One might wonder about a confounding channel of whether our data is picking up experts useful for banking operations, rather than for stewardship. For example, a bank having an employee with a Ph.D. in quantum engineering might reflect bank hiring of expertise for bank technology applications. To address this concern, in Table 5, we re-estimate the specification of Panel A column (1) of Table 3 on an industry-by industry basis. The specification in Table 5 is run on the sample of all observed loans, rather than all potential bank-client relationships.[22] While we might expect the quantum argument could hold in our software and technology industry, it should not be so in food and agriculture. Table 5 shows that our results are robust to the concern that in-house banking experts are driving the results, with positive stewarding results holding in all of

[22]We plan to run an additional version of Table 5 on the panel of all potential bank-client relationships.

the industries except manufacturing.

For robustness, we include a more limited sample in the Panel C specifications of both Table 3 and Table 4. We drop all bank-firm pairs that do not reflect a potential pair in an expansion industry – i.e. an industry that represents a new 3-digit NAICS code for the borrower. This is a much restricted sample with a different interpretation. It follows the implicit logic embedded in some high dimensionality non-linear models of removing observation-pairs without relevant variance. If specialization and the presence of experts are most valuable for stewarding to expansion, we would expect the magnitudes of the coefficients to be larger in Panel C compared to Panel B. That is what we find across all specifications, with statistically significant effects.

5.2 Prediction II: Stewardship More Prevalent when Short-termism Causes Neglected Investment

The model predicts that bank specialization and expertise for stewardship is particularly valuable for firms with overcome short-termism issues, as well as similar constraints that might otherwise limit their ability to invest. Table 6 and Table 7 follow the same specification as Panel A of Table 3 and Table 4, respectively, but also include an interaction of the borrower's short-termism with experts (in Table 6) or with bank specialization (in Table 7). The sample size is much smaller, because our measure of short-termism relies on shareholder data in public firms. Moreover, we include some firm-level controls, which are available for only a subset of our data. The independent variable of experts in these columns are divided by 100 to make the table read more easily.

We find that bank experts (or specialization) interacted with short-termism is statistically significant and positively economically related to a bank-firm potential pair realizing a loan. While on its own this result might be surprising, however this is exactly what our theory implies: short-termism provides a setting where bank stewardship might help the firm overcome neglected investment opportunities, making stewardship even more important for such firms. Looking across the columns in both Table 6 and Table 7, we now see that the added stringency of the bank and bank-firm fixed effects somewhat diminishes the economic magnitude of our coefficients. However, in almost every case the importance of experts or specialization are most evident for short-termist firms.

Furthermore, the magnitude of our results are instructive. Looking at our most stringent specification of Column 5 in Table 6, the marginal effect of hiring three experts increases by nearly 60 basis points when moving short-termism standard deviation below the mean (.55) to one standard deviation above the mean (.69).[23] This represents a 34% increase relative to the

[23]The calculation is: 0.60 = 3 experts × 1.419/100 × (0.69-0.55). The mean short-termism is 0.62, and one standard deviation is 0.07 (see Panel A of Table 2).

baseline mean loan origination level of 1.77% (from Panel A of Table 2). Interpreting the most stringent result as our third main finding contributes to understanding how bank specialization overcomes high discounting by firms and thus neglected investment opportunities – the Kodak moments.

5.3 Prediction III: Lower Pricing with Stewarding Banks

The final prediction comes from the mechanism of loan pricing. In Table 8, we consider whether pricing of loans made by banks stewarding with experts or with specialization is different compared to loans ceteris paribus on a host of characteristics. These characteristics include fixed effects of industry-time and bank, and importantly also control for the levels of the risk rating of the loan made by the Federal Reserve System. In these specifications, we change the scope of the data to looking only a loans originated, not at the potential pair setup, since one can only observe interest rates for loans that are actually originated. The independent variable of experts in these columns are divided by 100 to make the table read more easily.

In Table 8, columns (1) and (2), we consider the effect of experts on interest rates. In Columns (3) and (4), our independent variable of interest is bank specialization . Columns (2) and (4) differ from (1) and (3) in including bank fixed effects, bank size controls, loan size controls, and maturity controls. It is unclear which is the better column – with or without bank fixed effects – in that bank specialization in a sector is not especially dynamic. A bank may become specialized but it does not become un-specialized in our dataset. Likewise for experts in that the rise of experts is generally late in the sample. Hence, the even numbered columns are identifying off the time dimension of how long the firm has had specialization or experts. This duration will affect the average specification for the bank fixed effect "coefficient".

Across all columns, we find that experts and specialization command a statistically significant, negative effect on interest rate pricing. To understand the economic magnitude, we continue to consider the impact of having 2 more experts on the bank staff. Our estimates in columns 1 and 2 imply that the existence of 2 sector experts results in 30-76 basis points lower interest rates ($2 \times$ the coefficient divided by 100). We apply this rate reduction into an amortization for our sample of 663,716 loans with an average loan size of $16 million and a term of 30 months results in firm-level. Our inference is that interest rate inducements by the bank to firms to invest in expansion aggregate to $40 - $100 billion across the entire period or $3.3 - $8.5 billion annually.

In Panel B, we provide a robustness to these estimates. Whereas in Panel A, we restricted the sample to bank-firm pairs that existed at the start of our data, to have a consistent dataset across tables, in Panel B, we re-estimate in all loans. Here, we see that the results are sample independent.

6 Green Expansion: Corroborating Evidence

The final lens we take to the data is a test case of studying the energy transition, looking for corroborating evidence in a "Kodak" transition of our time in the green transition. Specifically, we are looking for firms expanding with the green economy opportunities do so with the aid of bank stewardship. 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 ability to build off the Bureau of Labor Statistics lists to isolate very detailed sector codes for clean energy and other green technologies. The green transition is, in the definition of the BLS, much larger than the (politicized) debates on climate, as the BLS categories include industry codes such as mining, semiconductors, and industrial battery storage as well as the typically green labeled categories of electric vehicles and new energy.

In Tables 9, 10 and 11, we follow the same sequence as before in studying (i) the realization of an expansion loan as a function of bank specialization, (ii) the interaction of specialization with short-termism in predicting the realization of an expansion loans, and (iii) the interest rate of an expansion loan as a function of specialization. In this draft, we focus on realized loans only rather than potential bank-firm pairs. We also focus on bank specialization in expansion areas for the firm as our evidence for stewardship, with the evidence on experts being a work-in-progress.

Stewarding of Green Expansion: Results Table 9 presents evidence as to whether stewardship via bank specialization is more likely to empirically predict expansion borrowing by firms. All columns include loan type (credit line versus installment), a syndication dummy, year time effects, industry code at the NAICS 6-digit level, loan purpose categories, and bank fixed effects. Thus, all columns force within-bank identification as in Blickle et al. (2024). In column (3), we include firm fixed effects to level analysis to the firm's average probability of a loan pairing with banks following Khwaja and Mian (2008) and implement the TWFE dynamic within-industry comparison (Sun and Abraham (2021)). Our identification in this column thus seeks to compare Kodak at the moment of transition investment opportunities to potential pairs for digital cameras with a Fuji Corporation, lined up in risk and other characteristics. Finally, column (4) adds in the important Federal Reserve System risk rating fixed effects.

Across all of these specifications, we find a positive, significant coefficient on specialization. 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 lender specialization is associated with a 3.3 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.

More directly, a firm is slightly more than two times (137%) as likely to do green expansion with a specialized bank.

Short-termism and the Stewarding of Green Expansion: Results Table 10 reports the green expansion findings as they relate to the preponderance of neglected opportunities captured in our measure of high discount rates via short-termism. The table shows 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. These results are strongly consistent with Prediction II of the model, showing that if a firm with a high discount rate invests in a transition or expansion projects, empirically it is more likely it is that the lender is a specialized bank.

An interesting second finding comes out of this focus on a transition sector. For short-termist firms that are not undertaking a loan with a specialized lender, we see that they are less likely to undertake transition expansion projects. 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 pursue 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 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.

Pricing of Loans with Stewardship of Green Expansion: Results Finally, we consider interest rate pricing for green expansion investment in Table 11. In all columns, we include stringent and saturating fixed effects of loan type, risk rating, syndication, loan purpose, industry times year, bank, and firm fixed effects. In columns (1) and (2), we use lagged bank specialization. We use current green specialization in columns (3) and (4). Columns (1) and (3) include all loans – outstanding and new, – to follow the practice of treating outstanding loans on the banks' lending book as an important weighting of the rates. Columns (2) and (4) consider only new originations, and thus are implemented with lower statistical power.

We find that green expansion loans 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. Interpreting column (3), the effect is double the magnitude – a 6.7 basis point effect for a 1 standard deviation higher specialization – of the interest rates result we found in expansion without the green lens, likely because we are honing in on a transition sector where specialization is even more valuable. Again, our results offer affirmation of Prediction III, that specialized banks with more stewarding capacity will offer a lower interest rate than other bank-firm matches.

7 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 new characterization of bank activity that we label bank stewardship. Banks expertise in certain types of investment projects impact their clients' ability (and willingness) to undertake such projects. This expertise is valuable in general for firm expansions, but is particularly valuable we show in moments of transition.

Throughout the paper, we have used the language of a transition moment in time generally to refer to transitions in digitization of cameras, 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, the application of our paper – and our anecdotes of stewardship in the introduction – concerned the different technologies from quantum to agriculture and communications.

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.

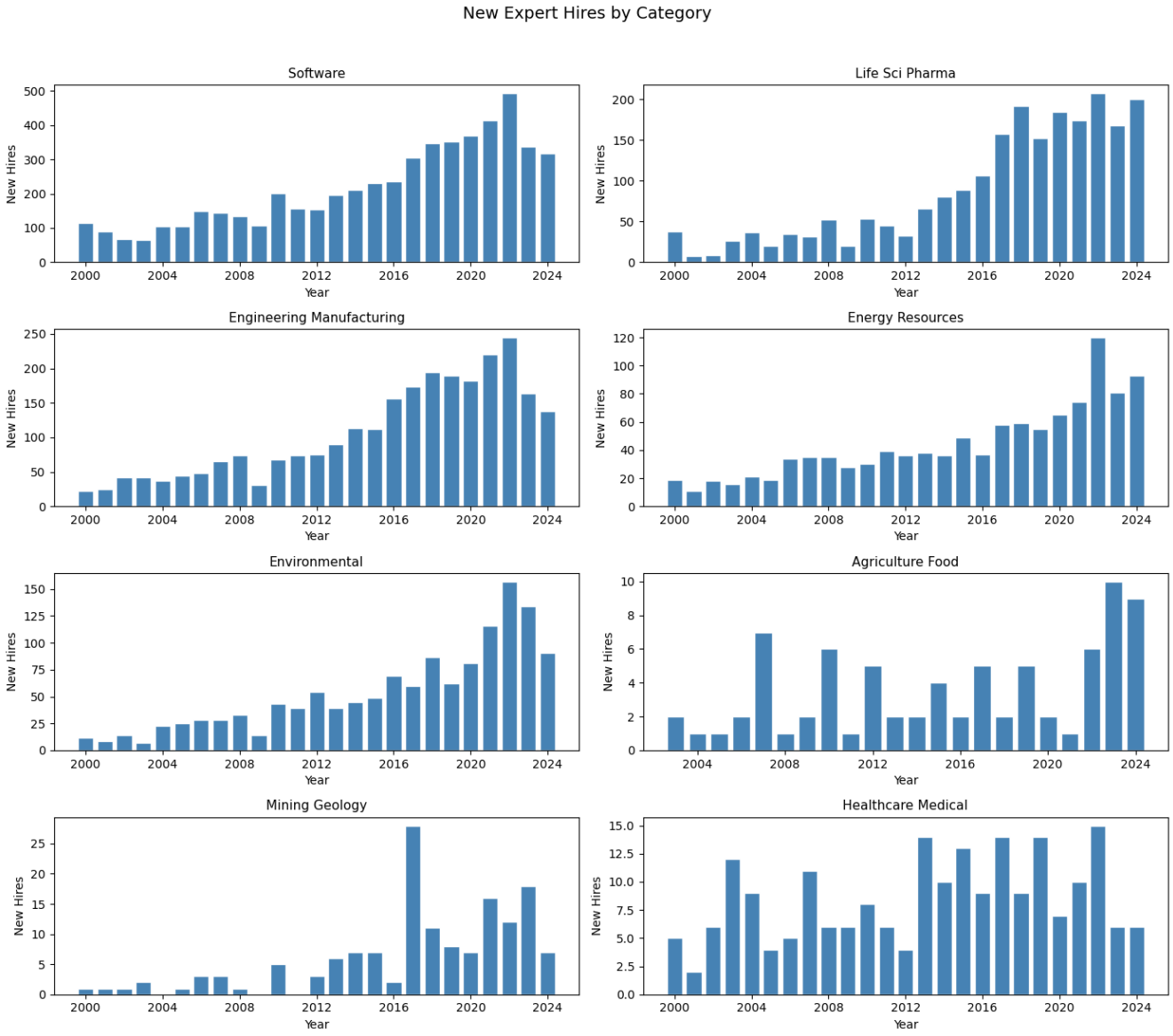
8 Tables and Figures

8.1 Figures

Figure 1: Expert Hires by Y-14 Banks



Figure 2: Expert Hires by Occupation Category (Aggregated from O-NET Code)



8.2 Tables

Table 1: Summary Statistics for All Loans

Note: This table produces summary statistics for the variables used in the paper. Panel A shows the origination rate of loans in a constructed "possible loan" universe of bank-firm relationships. We focus on the years 2014-2024 and limit to bank-firm pairs that interacted in the first two years of our sample (2012-2013). Panels B-C make use of all loan observations that can be observed in the actual Y14 data. We include new origination and renegotiation.

	N	Mean	SD	p25	p75
Panel A: Potential Bank-Firm Pairs					
Loan actually originated	9,758,914	0.025	0.10	0	0
Loan to new Industry Originated (3 digit)	9,758,914	0.006	0.064	0	0
Loan to new Industry Originated (5 digit)	9,758,914	0.010	0.09	0	0
Industry Specialization	9,758,914	0.01	0.02	-0.01	0.02
Experts	2,030,896	12.1	15.7	1	19
Panel B: Loan Variables					
Committed exposure (loan size)	5,648,974	16,344	49,270	17,112	13,375
Log committed exposure	5,648,974	8.57	1.35	7.44	9.50
Interest rate	5,648,974	3.77	3.06	2.43	4.65
Maturity	5,648,974	16.56	18.41	4	20
Internal risk rating	5,648,974	4.69	1.17	4	5
Syndicated loan flag	5,648,974	0.12	0.33	0	0
Short-Termist Firm	1,087,579	0.62	0.07	0.59	0.67
Panel C: Bank Specialization					
Industry Specialization	5,648,974	0.03	0.04	0.01	0.02
Experts	1,664,863	19.5	25.4	1	28
Green Specialization	5,648,974	0.015	0.02	0.01	0.02
Panel D: Industry and Loan Purpose					
Expansion Loan	5,648,974	0.012	0.11	0	0
Transition loan	5,648,974	0.03	0.16	0	0
Working Capital	5,648,974	0.54	0.49	0	1
Real Estate	5,648,974	0.19	0.39	0	0
Capex	5,648,974	0.07	0.26	0	0
Trade Finance	5,648,974	0.03	0.16	0	0
Project Finance	5,648,974	0.01	0.05	0	0
Leasing	5,648,974	0.03	0.18	0	0
Agriculture	5,648,974	0.01	0.08	0	0
Other	5,648,974	0.12	0.33	0	0

Table 2: Summary Statistics for the three samples of interest

Note: This table produces summary statistics for the key variables used in the paper for each of the three samples of interest (three lenses of the data). Panel A shows statistics for the sample of all loans in a constructed "possible loan" universe of bank-firm relationships. We focus on the years 2014-2024 and limit to bank-firm pairs that interacted in the first two years of our sample (2012-2013). Panel B limits to potential pairs in sectors that ar enew to the firm (expansion sectors). Panel C then limits to all new originations and renegotiations observed in the Y14 data.

	Mean	SD
	(1)	(2)
Panel A: Potential Pairs		
N	2,065,957	
Loan originated	1.77%	12.4%
Expansion loan originated	0.72%	7.36%
Experts (Stock)	16	27
Experts (Flow)	2.5	8.5
Short-termism	0.62	.07
Panel B: Potential Pairs in Firm Expansion Sectors		
N	46,358	
Expansion loan originated	22%	41%
Experts (Stock)	23	33
Experts (Flow)	2.6	9.3
Panel C: Loan Originations (Pricing)		
N	633,716	
Interest rate	3.87%	2.75
Experts (Stock)	19.6	24.9
Experts (Flow)	4.15	12.18

Table 3: The effect of bank experts on new loan origination

Note: This table considers the effect of bank expert hiring on loan origination for different measures and samples. Our measure of experts is defined as the number of PhD or Master level employees hired by a bank in roles not related to financial intermediation, risk management, or internal technical support. In Panel A, our dependent variable is loan origination, which is a binary variable that takes the value of 1 for new loan originations. This regression is conducted on the sample of all potential bank-client pairs constructed from historical relationships ("potential pairs."). In Panel B, we limit the dependent variable to expansion loan originations, where a firm takes a loan in new industry (6-digit NAICS sector) for the first time. Here we use the same sample as in Panel A. Panel C uses the expansion loan dependent variable from Panel B but limits the sample to bank-client pairs in new industries for the firm ("potential pairs in firm expansion sectors"). All specifications include the fixed effects listed in "controls." We include additional fixed effects as indicated. T-statistics are shown in brackets; *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)	(4)	(5)
Panel A					
Dependent Variable: Loan Originated					
Sample: Potential Pairs					
Experts	0.0201***	0.0217***	0.0152***	0.0165***	0.0174***
	[34.19]	[35.31]	[15.35]	[16.18]	[16.37]
N	2,065,957	2,065,957	2,065,957	2,065,957	2,065,957
Panel B					
Dependent Variable: Expansion Loan Originated					
Sample: Potential Pairs					
Experts	0.00260***	0.00316***	0.00271***	0.00297***	0.00319***
	[7.59]	[8.72]	[4.68]	[4.90]	[5.10]
N	2,065,957	2,065,957	2,065,957	2,065,957	2,065,957
Panel C					
Dependent Variable: Expansion Loan Originated					
Sample: Potential Pairs in Firm Expansion Sectors					
Experts	0.497***	0.149	0.810***	0.624***	0.659***
	[3.29]	[0.82]	[4.91]	[2.59]	[2.65]
N	46,358	36,618	46,358	34,804	17,921
Controls	Loan Type, Risk Rating, Syndicated Loan, Time & Purpose FE				
Firm FE	-	Y	-	-	-
Industry*Time FE	-	Y	Y	Y	Y
Bank FE	-	-	Y	-	-
Bank*Firm FE	-	-	-	Y	-
Bank*Firm*Time FE	-	-	-	-	Y

Table 4: The effect of bank specialization on new loan origination

Note: This table considers the effect of bank specialization on loan origination for different measures and samples. Bank specialization is measured as the lagged portfolio share of loans extended by a bank to a single NAIC 4-digit industry. In Panel A, our dependent variable is loan origination, which is a binary variable that takes the value of 1 for new loan originations. This regression is conducted on the sample of all potential bank-client pairs constructed from historical relationships ("potential pairs."). In Panel B, we limit the dependent variable to expansion loan originations, where a firm takes a loan in a new industry (6-digit NAICS sector) for the first time. Here we use the same sample as in Panel A. Panel C uses the expansion loan dependent variable from Panel B but limits the sample to bank-client pairs in new industries for the firm ("potential pairs in firm expansion sectors"). All specifications include the fixed effects listed in "controls." We include additional fixed effects as indicated. T-statistics are shown in brackets; *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)	(4)	(5)
Panel A					
Dependent Variable: Loan Originated					
Sample: Potential Pairs					
Bank Specialization	0.683***	0.679***	0.681***	0.677***	0.675***
	(220.61)	(220.45)	(216.13)	(216.94)	(216.31)
N	9,758,914	9,758,914	9,758,914	9,758,914	9,758,914
Panel B					
Dependent Variable: Expansion Loan Originated					
Sample: Potential Pairs					
Bank Specialization	0.346***	0.344***	0.339***	0.339***	0.321***
	(183.17)	(181.69)	(175.97)	(175.64)	(175.64)
N	9,758,914	9,758,914	9,758,914	9,758,914	9,758,914
Panel C					
Dependent Variable: Expansion Loan Originated					
Sample: Potential Pairs in Firm Expansion Sectors					
Bank Specialization	0.785***	0.480***	0.706***	0.427***	0.499***
	[28.04]	[7.84]	[18.72]	[7.82]	[8.76]
N	184,101	151,350	184,065	149,031	110,315
Controls	Loan Type, Risk Rating, Syndicated Loan, Time & Purpose FE				
Firm FE	-	Y	-	-	-
Industry*Time FE	-	Y	Y	Y	Y
Bank FE	-	-	Y	-	-
Bank*Firm FE	-	-	-	Y	-
Bank*Firm*Time FE	-	-	-	-	Y

Table 5: The effect of bank experts on new loan origination by industry

Note: In this specification we split the data into loan originations across seven sectors. We then regress a dummy variable for a new loan origination in that sector on bank experts in that sector. Specifically, we re-estimate the specification of Panel A column (1) of Table 3 for each industry sub-sample. As earlier, experts are defined the number of PhD or Master level employees hired by a bank in roles not related to financial intermediation, risk management, or internal technical support. We aggregate from ONET-Code to divide experts into the following categories: "Agriculture Food Experts," "Energy Resource Experts," "Engineering or Manufacturing Experts," "Environmental Experts," "Life-Sciences of Pharmaceutical Experts" and "Healthcare Experts." All specifications include the fixed effects listed in "controls." We include additional controls for bank size as indicated. T-statistics are shown in brackets; *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

	Dependent Variable: Loan Originated						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Agriculture Food	0.0177***						
	[5.53]						
Energy Resources		0.0115***					
		[11.55]					
Engineering or Manufacturing			-0.00209***				
			[-6.08]				
Environmental				0.00619***			
				[7.29]			
Life-Sciences or Pharmaceutical					0.00544***		
					[7.61]		
Healthcare						0.0293***	
						[9.77]	
Software							0.00513***
							[7.10]
N	406,284	520,545	520,794	201,444	104,230	312,660	208,487
R^2	0.040	0.007	0.004	0.001	0.020	0.006	0.001
adj. R^2	0.040	0.007	0.004	0.001	0.019	0.006	0.001
Controls	Loan Type, Risk Rating, Syndicated Loan, Time, Purpose, Industry, Bank FE						
Bank Size Control	Y	Y	Y	Y	Y	Y	Y

Table 6: Effect of experts on new loan origination by borrowing firm short-termism

Note: We regress loan origination on experts, the number of PhD or Master level employees hired by a bank in roles not related to financial intermediation, risk management, or internal technical support. We also interact the stock of experts with a continuous variable, "Short-Termist," 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. All specifications include the fixed effects listed in "controls." We include additional fixed effects as indicated. T-statistics are shown in brackets; *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

	Dependent Variable: Loan Originated				
	(1)	(2)	(3)	(4)	(5)
Experts	0.0133***	0.0172***	-0.00141	0.00109	-0.000319
	[7.65]	[10.15]	[-0.33]	[0.26]	[-0.08]
Experts * Short-Termist	2.026***	2.097***	1.404***	1.419***	1.447***
	[32.33]	[34.30]	[18.78]	[20.02]	[20.30]
Short-Termist	0.00513**	0.00127	0.00249	0.00364	
	[2.37]	[0.38]	[1.16]	[1.04]	
N	252,159	252,159	252,159	252,159	252,159
Controls	Loan Type, Risk Rating, Synd. Loan, Time, & Purpose FE				
Firm	-	Y	-	-	-
Industry*Time	-	Y	Y	Y	Y
Bank	-	-	Y	-	-
Bank*Firm	-	-	-	Y	-
Bank*Firm*Time	-	-	-	-	Y

Table 7: Effect of bank specialization on new loan origination by borrowing firm short-termism

Note: We regress loan origination on bank specialization. We also interact specialization with a continuous variable, "Short-Termist," 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. All specifications include the fixed effects listed in "controls." We include additional fixed effects as indicated. T-statistics are shown in brackets; *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

	Dependent Variable: Loan Originated				
	(1)	(2)	(3)	(4)	(5)
Bank Specialization	0.302	0.236	0.347	0.406*	0.460*
	[1.13]	[0.94]	[1.32]	[1.70]	[1.96]
Bank Specialization * Short-Termist	1.317***	1.396***	1.185***	1.027***	0.917**
	[2.99]	[3.38]	[2.74]	[2.62]	[2.37]
Short-Termist	-0.0229***	-0.0660***	-0.0257***	-0.0650***	
	[-2.86]	[-3.67]	[-3.30]	[-3.50]	
N	241,023	241,023	241,019	241,019	241,019
Controls	Loan Type, Risk Rating, Syndicated Loan, Time & Purpose FE				
Firm	-	Y	-	-	-
Industry*Time	-	Y	Y	Y	Y
Bank	-	-	Y	-	-
Bank*Firm	-	-	-	Y	-
Bank*Firm*Time	-	-	-	-	Y

Table 8: The effect of bank specialization and expert hiring on loan terms

We regress loan interest rates on bank specialization and the stock of experts employed at banks over the sample of all loans in the Y-14. Experts are defined as the number of PhD or Master level employees hired by a bank in roles not related to financial intermediation, risk management, or internal technical support. Columns 1 and 2 focus on bank specialization, while Columns 3 and 4 count the number of industry experts employed at banks in our sample. We scale these by 100 for ease of viewing. The sample in Columns 3 and 4 is limited to 3-digit NAICS code subsectors where banks employ experts in our data. All specifications include the fixed effects listed in "controls." We include additional controls and fixed effects as indicated. T-statistics are shown in brackets; *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

	Dependent Variable: Loan Interest Rates			
	(1)	(2)	(3)	(4)
Panel A: Existing Bank-Lender Pairs				
Experts (/100)	-0.1510*	-0.383***		
	[1.75]	[-11.74]		
Bank Specialization			-0.980***	-0.463***
			[-9.42]	[-4.01]
N	633,716	633,716	2,839,284	2,839,284
Panel B: All Loans				
Experts (/100)	-0.00254	-0.365***		
	[-0.17]	[-20.21]		
Bank Specialization			-0.519***	-0.410***
			[-7.91]	[-5.25]
N	778,771	778,771	5,383,988	5,383,988
Controls	Time, Industry, Purpose, Loan Type, Risk Rating & Syndicated Loan FE			
Bank Size Control	Y	Y	Y	Y
Loan Size Control	-	Y	-	Y
Maturity Control	-	Y	-	Y
Bank FE	-	Y	-	Y

Table 9: Effect of Bank Green Specialization on Green Expansion Loans: All Loans

Note: We regress whether a loan is considered a green expansion loan, which is a binary variable that takes the value of 1 if the firm does a loan in a green 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. All specifications include the fixed effects listed in "controls." 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)
	Dependent Variable: Green Expansion Loan			
Lagged Green Specialization	0.0176***	0.0182***	0.0165***	0.0165***
	(0.000760)	(0.000886)	(0.000895)	(0.000896)
Log Relationship Lending	-0.0000549***	-0.0000404**	-0.0000429***	-0.0000423***
	(0.00000660)	(0.0000161)	(0.0000163)	(0.0000163)
Log Total Bank Lending	0.0000532***	-0.0000168	-0.0000244*	-0.0000251*
	(0.00000760)	(0.0000133)	(0.0000133)	(0.0000133)
Lagged Average Interest Rate				0.000000773
				(0.00000259)
N	5,383,988	5,347,369	5,347,349	5,339,431
adj. R^2	0.004	0.031	0.043	0.043
Controls	Loan Type, Syndicated Loan, Time, Purpose, Industry & Bank FE			
Firm	-	Y	Y	Y
Industry*Time	-	-	Y	Y
Rating	-	-	-	Y

Table 10: Effect of Bank Green Specialization on Green Expansion Projects by Borrower Short-Termism: All Loans

Note: We regress whether a loan is considered an green expansion loan, which is a binary variable that takes the value of 1 if the firm does a loan in a green 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 ("Short-Termism") 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 run this regression on the sample of all outstanding loans. All specifications include the fixed effects listed in "controls. 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)
	Dependent Variable: Green Expansion Loan			
Lagged Green Specialization	-0.0281***	-0.0262***	-0.0227***	-0.0210**
	(0.00656)	(0.00842)	(0.00834)	(0.00835)
Lagged Green Specialization x Short-Termist	0.0670***	0.0562***	0.0484***	0.0456***
	(0.0103)	(0.0131)	(0.0130)	(0.0130)
Short-Termist	-0.000870***	-0.000634	-0.00118**	-0.00113**
	(0.000286)	(0.000465)	(0.000472)	(0.000473)
Log Relationship Lending	-0.0000452***	-0.000102***	-0.000151***	-0.000148***
	(0.0000116)	(0.0000287)	(0.0000291)	(0.0000293)
Log Total Bank Lending	0.0000511***	-0.0000355	-0.0000404*	-0.0000433**
	(0.0000131)	(0.0000220)	(0.0000218)	(0.0000219)
Lagged Average Interest Rate				0.00000380
				(0.00000790)
N	1,054,339	1,036,189	1,035,894	1,033,314
adj. R^2	0.008	0.035	0.090	0.091
Controls	Loan Type, Syndicated Loan, Time, Purpose, Industry & Bank FE			
Firm	-	Y	Y	Y
Industry*Time	-	-	Y	Y
Rating	-	-	-	Y

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

We limit the sample to green expansion loans only, and regress the interest rate of the loan on the degree to which the associated lender is specialized in green lending. We consider both current lender specialization as well as the lender's lagged specialization. All specifications include the fixed effects listed in "controls." 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)
	Dependent variable: Loan Interest Rates			
	All Loans	New Loans	All Loans	New Loans
Lagged Green Specialization	-1.914***	-1.657		
	(0.370)	(3.203)		
Current Green Specialization			-1.675***	-1.884
			(0.388)	(2.985)
Log Relationship Lending	0.0274**	-0.00233	0.0155	0.0440
	(0.0107)	(0.0781)	(0.00965)	(0.0660)
Log Total Bank Lending	-0.0431***	0.0410	-0.0418***	0.00582
	(0.00930)	(0.0635)	(0.00839)	(0.0538)
Lagged Average Interest Rate	0.0477***	-0.0500	0.0139***	0.00286
	(0.00136)	(0.0428)	(0.000663)	(0.00461)
N	140,940	4,608	162,821	5,516
adj. R^2	0.738	0.640	0.729	0.641
Controls	Loan Type, Risk Rating, Syndicated Loan, Time, Purpose, Industry, Bank, Firm, & Industry*Time FE			

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