

Bank-shareholder welfare and sustainable farm lending

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Sustainable farm lending practices give banks' shareholders direct ESG benefits that offset reductions in bank profitability. Banks' shareholders can also benefit indirectly. Firstly, banks can act as delegated monitors of farms' environmental performance on behalf of farms' customers. Secondly, banks can use sustainable lending to infer borrowers' private information about default risk. Thirdly, facilitating changes in farming practices can increase farm values. Fourthly, farmers can reduce short-termism by using sustainability-linked loans as commitment devices. Finally, lending programmes that increase a bank's ESG score might increase the price it receives when it sells bonds to institutional investors.

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1 Introduction

The agricultural sector is coming under increasing pressure to adopt more sustainable land-management practices. Many farms carry significant amounts of debt and in many cases increasing sustainability will require additional borrowing. Banks' attitudes to sustainability will therefore potentially influence changes in land-management practices. Indeed, there is increasing evidence in the wider corporate sector that heterogeneity in banks' attitudes to ESG (environmental, social and governance) issues is an important driver of borrowers' ESG performance (Degryse et al., 2023; Houston and Shan, 2022). Banks themselves are coming under increasing pressure to account for their environmental impact via initiatives such as the Taskforce on Nature-related Financial Disclosures (TNFD). The TNFD, which is developing a risk management and disclosure framework for nature-related risks, has an explicit aim of supporting a shift in global financial flows towards environmentally sound activities (Taskforce on Nature-related Financial Disclosures, 2023, p. 3). Banks' farm-lending practices are likely to come under even greater scrutiny as banking regulators treat the topic of sustainability more seriously (Bruno and Lagasio, 2021).

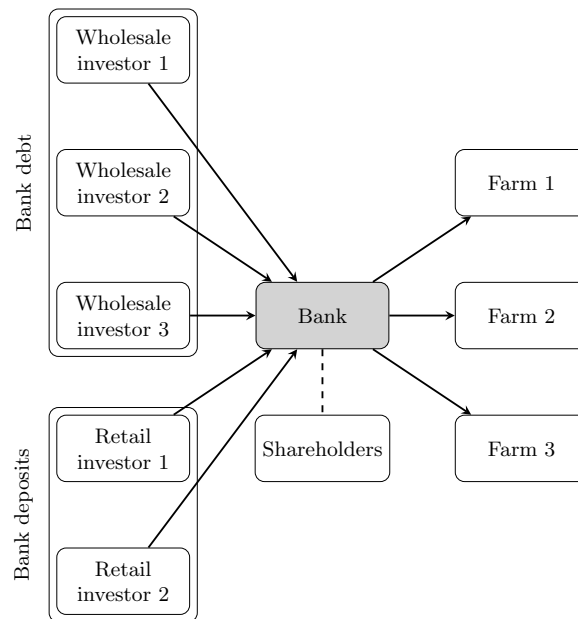
This paper reviews the sustainable finance literature in order to assess whether sustainable lending is likely to increase bank shareholders' welfare and to gain insights into the optimal design of sustainable lending programmes.¹ Sustainable finance involves more than just lending farms the funds they need to improve their environmental performance. In many cases, this could be approached in the same way as any other farm investment. The fact that it relates to environmental performance does not make it "sustainable lending." That label is used here to refer to loans that would not be made as part of ordinary business, involve below-market interest rates, have reduced covenants, or feature extra services that are not part of ordinary loans. In addition to loans used to fund specific projects, banks also offer general purpose loans with repayment schedules that are linked to the borrowers' environmental performance. These so-called sustainability-linked loans are increasingly becoming available to farms. Consider the example provided by New Zealand, a country with an economy heavily reliant on agriculture. In 2021, one bank and a large corporate farm entered into a three-year \$50 million sustainability-linked loan, with the interest rate linked to water quality, biodiversity, and on-farm carbon emissions (Bank of New Zealand, 2021). One year later, the same bank made a similar loan product available to all New Zealand farmers (Bank of New Zealand, 2022). Other banks have followed suit (Westpac NZ, 2021; ANZ Bank New Zealand, 2022).

Sustainable lending is just one example of the wider trend towards corporate social responsibility. There are three main motivations for corporate social responsibility in general (Bénabou and Tirole, 2010). First, such behaviour might be "win-win." That is, some of the actions that a firm undertakes in order to benefit society as a whole might also increase the fundamental value of shareholders' ownership stake in the firm. Second, corporate social responsibility might involve "delegated philanthropy." In this case, a firm undertakes actions that reduce the fundamental value of its shareholders' ownership stake, but shareholders are happy for the firm to engage in philanthropy on their behalf. Third, corporate social responsibility might be a case of "insider-initiated corporate philanthropy." That is, the firm's managers use shareholder resources to increase the managers' own welfare at the expense of shareholders. Only the first two motivations for corporate social responsibility are compatible with management's obligation to work in shareholders' best interests. This survey adopts the viewpoint of Hart and Zingales (2017), who argue that firms (in this case, banks) should only undertake actions such as investing in sustainability if these actions reflect the preferences of their shareholders.

Figure 1 summarises the conceptual framework used in this survey. At a very simplistic level, individuals want to invest their savings in productive enterprises, including ones operating

¹This paper considers the effect of financial factors on farmers' adoption of environmentally sustainable land-management practices. Dessart et al. (2019) review the role of behavioural factors and Candemir et al. (2021) review the role of agricultural cooperatives.

Figure 1: Banks as financial intermediaries



in the agricultural sector. Farmers need capital to buy farms and more capital to enhance farm productivity. Banks sit between these two groups and provide intermediation services, as illustrated schematically in Figure 1. They raise funds from investors—institutional investors who buy bank-issued debt and individual investors who deposit their savings with banks—and allocate them to borrowers in the farming sector. Banks add value by monitoring the performance of the loans they make, by making it easier for investors to diversify their risk across the farming sector, and by providing investors with liquidity. The ultimate responsibility of each bank’s board of directors is to maximise the welfare of its shareholders.

We will see that the measurement of firms’ ESG performance is crucial to many of the issues we will meet. The main role of the ESG scores published by ratings agencies is to help outsiders understand the ESG performance of a firm (in our case a bank), in much the same way that a firm’s financial statements help them understand its financial performance. This is most important where the bank interacts with outsiders—that is, with its bondholders and depositors in the left-hand column of Figure 1 and with its shareholders in the middle column. There is now considerable evidence that the lack of comparability and transparency in competing ESG scoring systems is so great that the results do not provide accurate information about firms’ actual ESG performance. For example, Berg et al. (2022) document a significant discrepancy between the ESG ratings issued by six prominent ESG rating agencies. They attribute most of the difference to different rating agencies measuring the same attribute using different indicators.² Therefore it should not be surprising that these rankings are not particularly informative. For example, Basu et al. (2022) demonstrate that banks with higher ESG ratings actually issue *fewer* mortgages in poor localities. Thomas et al. (2022) find that US firms with higher environmental ratings are more likely than firms with lower ratings to increase pollution temporarily in order to meet earnings forecasts. Raghunandan and Rajgopal (2022) find that self-labelled ESG mutual funds tend to invest in companies with *worse* track records for compliance with labour and environmental laws than non-ESG mutual funds. There is an emerging view that firms’ public ESG scores are influenced more by the existence of voluntary disclosures than by the disclosed

²Brandon et al. (2021) and Christensen et al. (2022) also document significant disagreement across ESG rating schemes.

information itself (Drempetic et al., 2020; Raghunandan and Rajgopal, 2022).

There are two lessons to be drawn from this poor performance of ESG scoring systems. First, we need to treat empirical studies involving ESG metrics with a degree of caution. For example, the results of studies that investigate whether banks with stronger ESG performance can raise funds more cheaply may depend crucially on the ESG measure used—so the link between ESG scores and banks' cost of funds is uncertain. The second lesson is a more practical one for banks. Because of the potential for greenwashing, it is important that any sustainable lending programme requiring acceptance by skeptical outside investors uses mechanisms that are credible and transparent.

The rest of the paper is organised as follows. Section 2 focusses on the preferences of the bank's shareholders who appear in the middle of Figure 1. It reviews the evidence that at least some shareholders have ESG concerns in addition to financial ones and it considers the implication of such concerns for the bank's cost of equity capital. Section 3 focuses on the right-hand side of Figure 1—that is, on the interaction between the bank and borrowers. This section investigates what happens to the funds that a bank raises and how this affects the bank's shareholders. In contrast, Section 4 focuses on the left-hand side of Figure 1. It looks at where a bank's funds come from, how future fundraising will be affected by sustainable lending programmes, and the effects this has on the bank's shareholders. Finally, Section 5 concludes the paper with a brief discussion of its insights regarding the optimal design of sustainable farm-lending programmes.

2 Bank shareholder preferences

This section focusses on the middle column of Figure 1; that is, the relationship between a bank and its shareholders. Ultimately, the bank's management should work in the best interests of its shareholders. These shareholders care about the financial performance of their investment in the bank's shares and some of them may care about how the bank achieves this financial performance. In particular, some of them may care about the bank's ESG profile. This section reviews the implications of such concerns for the bank's cost of equity capital.

In traditional asset pricing models, risk-averse investors only care about their financial wealth. A common assumption is that each investor's preferences can be completely described by a function of the mean and the variance of the rate of return on the investor's portfolio. The asset pricing models derive expressions for individual assets' expected rates of return that must hold if demand is to equal supply in asset markets. Fama and French (2007) modified this approach by assuming that some investors also care about non-financial characteristics of the assets in their portfolio. This approach has been adopted recently to better understand what happens when some investors have ESG concerns. For example, Baker et al. (2022) and Pástor et al. (2021) assume that some investors care about the average ESG profile of their portfolio in addition to the mean and variance of the portfolio's rate of return.³ These authors show that when asset markets are in equilibrium, assets with higher ESG scores have lower expected rates of return. Investors with ESG concerns tilt their portfolios towards assets with high ESG scores and away from assets with low ESG scores, resulting in portfolios with relatively low expected rates of return. Doing so is optimal for these investors because the non-pecuniary benefits that their favoured assets provide offset the effects of the lower expected rates of return. In contrast, investors without ESG concerns tilt their portfolios towards assets with low ESG scores, resulting in portfolios with relatively high expected rates of return.

If a bank improves its ESG profile, then the average rate of return required by its shareholders

³Other researchers make slightly different assumptions. For example, Pedersen et al. (2021) allow for investors of three types: some care about ESG scores, some do not care but are aware of these scores, and some are unaware of these scores. Zerbib (2022) assumes that some investors simply do not invest in assets with poor ESG scores. Avramov et al. (2022) allows for uncertainty about firms' ESG profiles.

falls because investors who care about ESG issues will increase their holdings of the bank's shares and those who do not will sell. We can interpret the reduction in the required average rate of return as investors' willingness to pay for better ESG performance. As long as the improvement in ESG profile reduces dividends by less than this willingness to pay then the bank's shareholders are better off. The lower cost of equity capital associated with a bank's improved ESG profile means that when the bank makes its own investment decisions, more projects are value-enhancing. In particular, some actions that would harm shareholders if the cost of equity capital is high will actually benefit shareholders if the cost of equity is lower.

In theory, therefore, adopting sustainable lending has the potential to benefit a bank's shareholders even if it adversely affects the bank's financial performance. Whether or not that will happen in practice is a different matter. A crucial question is how many investors actually behave in the ways needed for this theory to apply. The evidence is not particularly encouraging. At one extreme, Anderson and Robinson (2022) found that pro-environment Swedish households are not more likely to hold pro-environment portfolios. Indeed, they are less likely to own stocks, check pension balances, or make green active retirement planning choices. In contrast, Brunen and Laubach (2022) studied the clients of three German robo advisors and found that households with more sustainable consumption patterns were more likely to choose a sustainable portfolio. However, households that claimed to be sustainable but did not exhibit sustainable consumption patterns did not tend to make sustainable investments. In other words, talk is cheap. At the other extreme, Brandon et al. (2022) studied whether institutional investors that signed the UN Principles for Responsible Investment (PRI) invested in firms with higher ESG ratings, using data from the period 2013–2017. Although non-US signatories have portfolios with higher ESG scores than non-signatories, US ones do not. Indeed, institutional investors that are retail-client facing and joined the PRI late tend to have portfolios with lower ESG scores than non-signatories.⁴

Even if a sizeable proportion of investors care about ESG issues, and the evidence of this is mixed, they will only create effective incentives if they base their portfolio decisions on relevant ESG information. Hartzmark and Sussman (2019) examined the flow of money into and out of more than 20,000 mutual funds during the period after Morningstar first published mutual-fund sustainability ratings. Retail investors responded to the new information on fund sustainability by increasing their investments in high-sustainability funds and reducing their investments in low-sustainability funds. However, Hartzmark and Sussman report that investors focused on Morningstar's simple five-step ranking and largely ignored the more detailed sustainability information that became available at the same time.⁵ There is evidence that ESG-focussed institutional investors also ignore relevant information when making asset-allocation decisions. In particular, ESG funds seem to rely on ESG scores rather than performing their own due diligence about firms' environmental and social practices. For example, Raghunandan and Rajgopal (2022) analysed the portfolio holdings of US mutual funds during the period 2010–2018. They found that although companies held in self-labelled ESG funds have higher average ESG scores than those held in non-ESG portfolios sold by the same institution, the companies in the ESG funds actually had worse track records for compliance with labour and environmental laws than those in non-ESG portfolios.

The accumulating evidence regarding ESG investing paints a mixed picture of the intensity of a typical investor's ESG concerns. In the context of the situation being examined here, the relevant issue is whether investors' ESG concerns are strong enough to cause significant reductions in the expected rate of return of high-ESG assets. This issue arises in the context of various asset classes (some of which we consider later on), but here we focus on the expected stock re-

⁴Nofsinger et al. (2019) find that institutional investors are indifferent to the presence of positive environmental and social indicators, but under-invest in stocks with negative environmental and social indicators, behaviour which they speculate is driven by financial rather than ethical considerations.

⁵Moss et al. (2024) analysed hourly transaction data and found no evidence that ESG disclosures inform retail investors' buy and sell decisions.

turn, which is what is relevant for the middle column of Figure 1. Researchers have investigated whether firms with good ESG performance have a significantly lower cost of equity capital than firms with poor ESG performance. For example, when El Ghouli et al. (2011) analysed data on US firms during the period 1992–2007, they found that firms with better ESG scores had lower ex ante costs of equity capital. A one-standard deviation increase in a firm’s ESG score was associated with a 10 basis point reduction in the firm’s annual cost of equity capital. However, what is more relevant for our purposes is whether *banks* with good ESG performance have a significantly lower cost of equity capital than *banks* with poor ESG performance, because it is this differential that determines the strength of a bank’s incentive to improve its ESG performance. It is possible that even if investors care about ESG performance of firms in general, the difference in performance between good and bad banks is so small that the difference in the cost of equity capital is negligible. Zerbib (2022) examine this issue using US data for the period 2007–2019. For some industries, green investors significantly affect the cost of equity. For example, the presence of green investors subtracts 66 basis points from the annual cost of equity capital for utilities with relatively low emissions and adds two basis points for utilities with relatively high emissions. Thus, the presence of green investors creates strong incentives for utilities to reduce emissions. In contrast, the corresponding figures for the banking industry are 14 basis point and five basis point increases in the cost of equity. The incentives for banks are negligible (and actually imply that greener banks have a higher cost of equity capital).

In summary, a bank’s shareholders care about the financial performance of the bank and its ESG performance. Sustainable lending could benefit shareholders by giving them direct ESG benefits that would offset any reduction in profitability. However, the available empirical evidence suggests there is limited scope to do this as good ESG scores are associated with relatively small reductions in the cost of equity. The greater disclosure afforded by initiatives such as the TNFD might make banks’ cost of equity more sensitive to their environmental performance in the future. However, unless that happens, banks’ focus when designing sustainable lending programmes should be on the financial aspects. This would mitigate the risk of bank insiders blurring the lines between “delegated philanthropy” and “insider-initiated corporate philanthropy” to justify loss-making programmes that reflect insiders’ values rather than the values of the shareholders.

3 Sustainable finance and the bank–borrower relationship

This section focuses on how sustainable lending affects the right-hand side of Figure 1—that is, on the interaction between banks and farmers. It investigates what happens to the funds that a bank raises and how this affects the bank’s shareholders. There are two broad categories of sustainable lending practices. In the first category, a bank lends a farmer funds for a specific purpose that will enhance the farm’s environmental performance. The loan is on more favourable terms than ordinary farm lending. For example, the interest rate might be lower than standard debt or ordinary lending criteria that would otherwise preclude the loan from being issued might be relaxed. Loans in the second category are not tied to particular projects. They are general-purpose loans for funding a farm’s operation, but the terms of the loan are tied to specific aspects of the farm’s environmental performance. For example, the interest rate might be linked to local water quality. The crucial question is whether the bank’s shareholders benefit financially from arrangements such as these.

This section considers four ways in which some form of sustainable lending programme can create value for a bank. First, a loan can be designed in such a way that a bank monitors the borrower’s environmental performance and provides valuable certification that some aspect of sustainability has been achieved. Second, a loan can be designed in such a way that it provides the bank with valuable information about the farmer’s willingness to make sacrifices to avoid default. Third, loans to finance investments in sustainability might increase the value to the bank of the farm’s existing debt, giving lenders an incentive to set interest rates on sustainable loans

below the lenders' funding costs. Fourth, existing debt can be replaced with a sustainability-linked loan that creates incentives for a farm to adopt practices that are in the farm's best long-term interests and which it would not adopt if standard loan contracts remained in place.

3.1 Delegated monitoring

One of the arguments often made in support of sustainable farming practices is that consumers are willing to pay more for a farm's output if they know it is produced sustainably.⁶ However, farming sustainably only produces a surplus to share if the customers' willingness to pay for sustainably produced output is greater than the sum of the extra cost of production and the cost of monitoring the farm to ensure production is sustainable. There are potentially many situations in which the monitoring costs are sufficiently high to prevent switches to more sustainable farming practices. However, if a third party can monitor at relatively low cost, then there may be a surplus to share after all. The farm's customers effectively delegate the monitoring to this third party and the surplus from switching to sustainable farming is shared by the farm, its customers, and the third-party monitor.⁷

Banks can potentially perform the role of delegated monitor as part of a sustainable lending programme. For example, a bank that has granted a sustainability-linked loan to a farm will already be monitoring aspects of the farm's environmental performance. If it certifies the results of that monitoring in a credible way then the farm's customers do not need to monitor farm sustainability directly. Instead, they can base their purchasing decisions on whether or not a farm has been certified by its bank. In principle, customers will be willing to pay a higher price for output produced by this farm compared to farms that do not have access to sustainable finance. The primary mechanism for the bank to receive a share of the surplus is the interest rate charged on the funds it lends the farmer, which needs to cover the funding cost and the cost the bank incurs in monitoring the farm's environmental performance.⁸

Delegating monitoring to banks in this way has the potential to change farmer behaviour. A farm's customers will find assessing farm sustainability difficult. Without a credible indication of farm sustainability, (rightly skeptical) customers are unlikely to pay a substantially higher output price for a farm's output, in which case customer preferences give farmers little incentive to farm more sustainably. However, if banks are able to certify aspects of sustainability that are relevant to farm customers, then sustainability-linked loans may create an incentive for farmers to change their behaviour.

Bearing in mind the difficulties in measuring sustainability, in order for such delegated monitoring to be effective the conditions for certification should be simple, transparent, and common across farms. Tailor-made solutions, fine-tuned for each farm, may have other benefits, but they will largely eliminate the potential for a bank to add value as a dedicated monitor. A better approach is to have a simple reduced interest rate for "green star" farms, where the requirements of gaining and maintaining this certification are transparent (and tied to things that customers in particular care about). The viability of this arrangement will vary across farm types. For example, in some situations there might be non-bank third parties that would face lower costs of monitoring sustainability than the banks. In other situations, large purchasers might find it feasible to monitor sustainability themselves. The types of sustainability targeted by banks should therefore reflect the areas in which they have an advantage in monitoring compared to other potential delegated monitors.

⁶For recent reviews of the literature estimating consumers' willingness to pay for sustainable food products, see Yang and Renwick (2019) and Li and Kallas (2021).

⁷The farm's customers may not be the only stakeholders who find it impractical to monitor the farm's environmental performance. For example, when ownership and control are separated, a farm's owners may find it prohibitively expensive to monitor the sustainability of farming operations that are delegated to a farm manager. In this case, the owners may benefit from delegating the monitoring task to a third party.

⁸Other possible sources of value to the bank are discussed in Section 3.3.

3.2 Improved screening of default risk

When a farmer defaults on farm debt she effectively receives a payoff equal to the present value of the avoided remaining loan repayments minus the farm's value to the farmer. The default decision is irreversible and the default option can be exercised only once, so defaulting destroys the option to wait and see what happens in the future. A farmer facing low output prices will therefore not default as soon as this payoff is positive. If she delays default and the output market rebounds, then the farmer is able to benefit; if it does not rebound, then the farmer is still able to default, just somewhat later than would otherwise have been the case. The optimal policy is therefore to wait and exercise the option when the default payoff attains some positive threshold; that is, to wait until the farm's value to the farmer falls sufficiently below the present value of the loan's remaining repayments that it is worthwhile destroying the delay option (Black and Cox, 1976; Leland, 1994).

The probability of default therefore depends on the farm's value to the farmer. This value comes from two sources: the profits generated by the farm and various non-pecuniary benefits such as the value the farmer attributes to living on the farm, maintaining multi-generational ownership of the land, and ties with the local community. The value to the farmer of these non-pecuniary benefits is known to the farmer but not to the bank. The farmer thus has private information about the probability of default.

There is now an extensive literature explaining how loan contract terms can be used as a screening device that elicits borrowers' private information about their default risk. Banks offer borrowers a menu of options that differ in their attractiveness to borrowers with different levels of default risk. For example, high-risk borrowers prefer loans with low collateral (Bester, 1985), long maturity (Flannery, 1986), and high loan-to-value ratios (Brueckner, 2000). When a high-risk borrower chooses their preferred contract terms, they potentially reveal some of their private information to the bank, which is able to charge an interest rate consistent with the revealed level of default risk. For example, if a bank offers suitable low-rate short-maturity and high-rate long-maturity loans, high-risk borrowers will self-select on the high-rate long-maturity loan.

A farmer who knows she will receive relatively low non-pecuniary benefits from farming (and who therefore attaches a relatively low value to servicing the debt and retaining ownership of the farm) knows there is a relatively high probability that she will default in the future. This will affect her choice if she is offered a menu of loan options. For example, suppose a bank offered a dairy farmer two options: a low interest-rate loan that restricted the intensity with which the land could be farmed and a high interest-rate loan that imposed no restrictions on farming intensity. Restricting farming intensity would reduce short-term profitability, but potentially increase the long-run profitability of the land. A farmer with high default risk would find the low-rate low-intensity loan relatively unattractive. In contrast, a farmer with low default risk might be willing to accept restrictions on farming intensity if doing so allowed her to separate herself from otherwise identical farmers with high default risk.

This is one example of the ways in which banks may be able to use sustainable loan products as screening devices to gain insights into farmers' private information about the non-pecuniary benefits they derive from farming. In order to be effective, the sustainable loan products need to be targeted at projects that generate long-term benefits for farmers, possibly at the expense of short-run profitability. Screening only works if borrowers are offered a menu of options, so if this role is to be effective then a bank needs to offer "brown" loans as well as green ones.

3.3 Other channels by which the bank can benefit

Issuing a new farm loan can potentially benefit a bank that already has a lending relationship with the farmer. All that is required is that the new loan finances investment that reduces the original loan's default risk. If the reduction in default risk is large enough, then the bank might even be able to charge an interest rate on the new debt that is less than the sum of the bank's

funding and monitoring costs and still benefit from the transaction.

Consider, first, what happens if there is no possibility of the farmer defaulting on the original debt. Even if the investment financed by the new loan increases the value of the farm, it has no effect on the original loan's value to the bank, which is the present value of the promised repayments. As there is no default risk, this present value is unaffected if the underlying asset (the farming operation) becomes more valuable. All of the benefits of the investment go to the farmer.

What happens if default is a possibility? As discussed above, the farmer's optimal default policy is to continue servicing the debt (even if the farm is unprofitable) until the payoff from defaulting reaches some strictly positive threshold. That is, the farmer should delay defaulting until the farm's value to the farmer falls sufficiently below the present value of the loan's remaining repayments that it is worthwhile destroying the option to wait and see if the farm's profitability improves. If the investment that is financed by the new loan increases the value to the farmer of staying on the farm then she will wait even longer before defaulting. If the investment increases the value to potential purchasers of the farm, then the farm's liquidation value will be higher as well. Therefore, issuing the new loan can both reduce the default probability and increase the liquidation value of the farm in the event that default occurs anyway.

The loan's value to the bank equals the present value of the repayments assuming no default *minus* the cost to the bank of the farmer's default option. As the investment makes default less likely, it makes the farmer's default option less valuable. As the present value of the repayments assuming no default is unaffected, the new investment increases the value to the bank of the loan. In summary, lending the farmer the funds needed to make an investment that reduces default risk will increase the value to the bank of the farm's *existing* debt.⁹

In practice, these effects are likely to be compounded by an indirect benefit of a sustainable lending programme. A bank that operates such a programme will have to monitor the environmental performance of its borrowers closely. With environmental monitoring in place, the incremental cost of additional financial monitoring will be lower, which will induce the bank to increase the effort it exerts in monitoring farms' financial performance. This increased monitoring will allow the bank to identify problematic loans earlier and take remedial action. The risk of default should fall, increasing the value to the bank of the farm borrower's existing debt.

3.4 Debt overhang problem

The news is not all good, however, because the benefit sharing described in Section 3.3 can lead to a debt overhang problem (Myers, 1977).¹⁰ Changes in farming practices are good for the farming operation as a whole if the benefits shared by the farmer and the bank are greater than the cost of making the changes. However, making these changes only benefits the farmer if the farmer's share of the benefits is greater than the cost. If a project that changes farming practices costs more than the farmer's benefit but less than the combined benefits of the farmer and the bank, then the farmer will not undertake the project even though the project is good for the farm as a whole.¹¹

Debt overhang is more serious in situations in which the farmer's default option is likely to have considerable value and when investment is likely to lead to a substantial reduction in that value (Pawlina, 2010; Guthrie, 2024b). This occurs when the farmer has a high level of bargaining

⁹The benefits of this increase in value of the bank's existing loan portfolio will be shared by the bank's shareholders, its depositors, and the owners of its bonds. However, due to bank regulation and diversification reducing the bank's own default risk, most of the benefits will flow to shareholders.

¹⁰The debt overhang problem is usually studied in the context of corporate investment. However, the phenomenon extends to other settings such as investment in home-improvements by mortgaged homeowners (Melzer, 2017), labour-market participation (Donaldson et al., 2019), resource extraction policies (Wittry, 2021), and farming investment (Guthrie, 2024b).

¹¹If investment timing is flexible, this also creates an incentive for the farmer to delay investment as the farmer receives all of the benefits of delaying the expenditure, but shares some of the costs of delay with the bank.

power during future financial distress, bankruptcy costs are high, the non-pecuniary benefits of farm ownership are low, the marginal operating cost is high, and the output price is highly volatile. The severity of debt overhang also varies with the characteristics of the investment under consideration. In particular, debt overhang is more serious if a larger proportion of the investment costs will be incurred up front.

Banks have an incentive to reduce the debt overhang problem facing their existing farm clients because doing so encourages value-enhancing investment and potentially increases the existing farm debt's value to the banks. This is true even if banks are not financing the new investment themselves. The simplest ways to reduce the debt overhang problem are for banks to share some of the short-term costs of investment or to divert some of the long-term benefits of investment back to farmers. For example, a bank can share some of the short-term costs of investment by making a direct capital contribution or by offering a low-interest rate loan to help finance the new investment. In the latter case, the bank's loss on the new loan is offset by the increase in the outstanding loan's value to the bank. The bank's shareholders benefit from this because, by subsidising this investment, the bank facilitates the farmer taking actions that make the outstanding debt more valuable.

One way for the bank to return some of the long-term benefits of investment to the farmer is to refinance some of the farm's existing debt so that repayments are sensitive to the farm's performance (Sarkar and Zhang, 2015; Ming et al., 2018; Bensoussan et al., 2021). This could involve the farm's environmental performance, its financial performance, or a combination of them both, with loan repayments being lower if the farm's performance is better. Such a change would mean that a farmer who improves her farm's performance will receive a larger share of the benefits (because the reduced loan repayments mean the bank receives a smaller proportion of the benefits). If carefully designed, such a change to a farm's existing debt could reduce the severity of the debt overhang problem.¹²

Guthrie (2024a) has proposed a new form of farm debt that can facilitate changes in land use by highly indebted farms. The proposed form of debt features an early repayment provision that alleviates the debt overhang problem by allowing farmers to retain a greater share of the benefits of land-use changes. Under traditional debt arrangements, a farmer continues paying an agreed coupon until the debt is repaid. If the farmer stops paying this coupon, the bank takes ownership of the farm. Guthrie (2024a) proposes including an innovative form of early-repayment option, which allows the farmer to repay the loan early, any time after a change in land use has occurred, by paying the bank an amount equal to the estimated value of the farm if the land-use change did not occur *and could not occur in the future*. With this arrangement in place, the bank receives little benefit from profitable land-use changes. Instead, the farmer keeps most of the benefits and the severity of the debt overhang problem is greatly reduced.

A more subtle solution is to provide farmers with greater opportunities to hedge the risks that they face. Greater cash-flow volatility is associated with a more serious debt overhang problem (Guthrie, 2024b). Hedging output-price risk (probably the main contributor to cash-flow volatility) can therefore reduce debt overhang, potentially benefitting the farmer and the bank (Bessembinder, 1991).¹³ Some hedging opportunities are already available in some sectors.

¹²There is another possibility suggested in the corporate finance literature, although it is not directly applicable to farm debt. Convertible debt gives a lender the option to convert its loan into an ownership stake in the borrowing firm. This gives the borrower an incentive to accelerate investment and dilute the lender's quasi-ownership stake in the farm (Lyandres and Zhdanov, 2014; Flor et al., 2023). This type of loan is impractical for the farming sector because it would require banks taking partial ownership stakes in farms. However, something similar could be achieved if the bank is granted the option to be paid interest in the form of either cash or a fraction of the farm's output. When the farmer invests (and injects new equity capital), the fraction of the farm's output that the bank is entitled to will fall—which transfers some of the bank's share of the investment benefits to the farmer.

¹³A problem analogous to debt overhang arises here. If the farmer adopts a hedging policy, this will reduce the value of her default option, which transfers wealth from the farmer to the bank. This happens because hedging reduces the farmer's upside risk (by reducing the farm's profitability during high-price periods) and has little effect on her downside risk (when she would default or renegotiate the loan). Increasing hedging *once debt is*

For example, NZ dairy farmers can hedge price risk using futures contracts traded on financial markets and fixed price contracts offered by Fonterra, a large dairy cooperative. However, the farming sector would benefit from increased availability of hedging products, in terms of both the amount of output that can be hedged and how far out into the future hedging is possible.¹⁴ Banks can potentially facilitate increased hedging activity by explicitly offering hedge contracts or, more ambitiously, altering the way that farm debt is designed. For example, one way to reduce farmers' sensitivity to output-price risk would be to make loan coupons increasing functions of the output price (Jin and Turvey, 2002; Turvey, 2006). During low-price periods, the reduced interest rate on loans would mitigate some of the reduction in farm revenue; during high-price periods, the increased interest rate would offset some of the increase in farm revenue.¹⁵ If suitably priced, the bank could break even on such arrangements. One way to operationalise this—which has precedents in sovereign debt markets—is to allow the bank to choose whether to be repaid in cash or in output (milk in this case). If the output price is high, the repayment will be made in milk, costing the farmer more; if the output price is low, the repayment will be made in cash. In practice, the repayments could be cash-settled, so that physical delivery of milk does not occur.¹⁶

3.5 Green loans as a commitment device

One of the most important steps to be taken to put agriculture on a more sustainable footing is for farmers to reverse the increase in farming intensity that has occurred over the last few decades.¹⁷ However, doing so requires overcoming a debt overhang problem because reducing farming intensity is effectively an investment in a farm's natural capital. This type of capital can take many forms, but they all ultimately determine the intensity with which land can be farmed. For example, for a dairy farm, natural capital could be local groundwater, which is degraded by the farm's use of nitrogen fertiliser. For concentrated animal feeding operations, it could also be local groundwater, with animal waste leaching into groundwater or running off the land into waterways following heavy rainfall. For applications involving arable farming, the natural capital variable can measure the farm's capacity for growing its primary crop, with more use of the primary crop accelerating the decline in the farm's natural capital and more use of a "break crop" accelerating its recovery. In all of these situations, the rate at which natural capital regenerates determines the sustainable level of production.

Reducing farming intensity decreases the rate at which a farm's stock of natural capital is depleted. Like other forms of investment, this is vulnerable to the debt overhang problem. Indeed, Guthrie (2024c) shows how farmers with moderately high debt levels have a strong incentive to under-invest in natural capital—that is, to adopt a high level of farming intensity. Farmers would incur all of the cost of doing otherwise (via the reduction in their farms' short-run profitability), but would share the benefits with their banks (via the increase in their farms' liquidation values). However, refinancing a farm's existing debt with a sustainability-linked loan tied to the farm's stock of natural capital can weaken this incentive. Such a loan increases the marginal cost of production because each extra unit of farming intensity leads to a decrease in the stock of natural capital, and therefore to an increase in the loan coupon. The higher marginal cost induces the farmer to reduce farming intensity.¹⁸

already in place might therefore not be in farmers' best interests. It may require cost sharing from the bank to facilitate the change. This could be implemented via a reduced interest rate that reflects the reduction in the farm loan's default risk.

¹⁴Fernandez-Perez et al. (2022) analyses the opportunities to hedge milk-price risk in New Zealand.

¹⁵Dahlen et al. (2024) analyses a similar loan arrangement with the coupon based on the carbon price.

¹⁶Pricing models for commodity-linked bonds already exist (Schwartz, 1982; Carr, 1987; Miura and Yamauchi, 1998; Ma et al., 2022).

¹⁷Evidence of the environmental damage caused by increased dairy production in New Zealand during the last two decades is steadily accumulating (Basset-Mens et al., 2009; Foote et al., 2015; Chobtang et al., 2017).

¹⁸There is a natural interpretation in terms of the debt overhang problem. By reducing use of the input, the

As long as a standard loan is in place, the farmer has a strong financial incentive not to reduce farming intensity. Replacing standard debt with a sustainability-linked loan acts as a commitment device, locking the farmer into a future characterised by lower farming intensity. With the farmer's incentives realigned, the bank has the confidence to agree to a new coupon arrangement.

4 Banks' funding costs

Section 3 looked at the interactions between banks and the farms they lend to. In contrast, this section, which focuses on the left-hand side of Figure 1, looks at how future fundraising will be affected by sustainable lending programmes and what effects this has on banks' shareholders. All else equal, shareholders of green banks will benefit if such banks will find it cheaper to raise funds.

4.1 Potential sources of value from sustainable lending

This section discusses some aspects of bank-investor interactions that potentially allow a bank's shareholders to benefit from the bank making its lending programme more sustainable. First, investors might have non-financial reasons for wanting to hold ESG assets and so be willing to pay more for green debt or ordinary debt issued by a bank with a good ESG score. These might be individual investors who derive additional (non-financial) benefit from "good" assets compared to "bad" ones. They might be socially responsible funds and other institutional investors with a green mandate, seeking to boost their own ESG scores. The presence of such investors in the market could increase demand for "good" assets, thereby increasing the price high-ESG banks receive when they issue bonds. Equivalently, for any given amount of capital to be raised, the banks will have to pay bondholders less in future interest, leaving more for future dividend payments to the banks' shareholders.

Banks' role as intermediaries is thus multi-dimensional. Not only do banks monitor borrowers' financial performance on behalf of the investors in the left-hand column in Figure 1, but they also monitor borrowers' environmental performance on behalf on some of these investors. This complements their role as delegated monitors for borrowers' stakeholders that was discussed in Section 3.1. Banks should aim to maximise the value they extract from these delegated-monitoring roles when they design their sustainable lending programmes.

Even if bondholders do not care about ESG issues, they might pay higher prices for bonds issued by banks with higher ESG ratings because high ratings are signals of things that they *do* care about. For example, as described in Section 3, sustainable lending programmes potentially reduce the riskiness of a bank's farm-loan portfolio, which reduces the bank's own default risk. This implies that bondholders will pay more for bonds issued by banks with better ESG scores (and depositors will accept a lower interest rate on their bank deposits), even if they do not care about sustainability. However, although this reduces the cost to banks of raising funds, it does not reduce the *risk-adjusted cost* of raising funds, which is what matters for shareholders. That is, the increase in the amount that bondholders will pay for new bank debt simply equals the increase in the present value of the future payments that these investors will receive. What shareholders appear to gain up front (higher proceeds from bond sales) they pay for in the future (with a less risky repayment schedule). This effect of sustainable lending therefore does not benefit bank shareholders.¹⁹

farmer is investing in the farm's natural capital and, in return, the reduction in the loan's coupon transfers wealth from the bank to the farmer. That is, the bank shares some of its benefits from the increased investment in natural capital with the farmer who has incurred the cost. This wealth transfer induces greater investment by the farmer.

¹⁹In addition, competition between banks should mean that banks will have to charge a lower interest rate to farmers in line with the reduced default risk on individual farm loans. The reduced default risk therefore pushes down the interest that the bank receives from farmers and the interest that it pays its bondholders. Absent any

The key issue as far as future funding costs are concerned is whether sustainable lending programmes lower banks' costs beyond the reduction attributable to any reduction in the risk of those funds. That is, do bonds sold by a "green" bank sell for a higher price than otherwise identical bonds sold by a "non-green" bank with the same risk profile? The empirical evidence reviewed in the next subsection suggests that this may not be the case.

4.2 Debt securities

Banks raise funds primarily by selling debt securities to wholesale investors and taking deposits from retail investors (Carse et al., 2023). This section considers the effects of sustainable lending on the cost of raising funds by selling debt securities. Deposits are covered in Section 4.3.

Empirical evidence on the relationship between banks' ESG scores and the prices they receive when selling bonds has only recently been reported.²⁰ Agnese and Giacomini (2023) investigate this relationship using over 19,000 bond issues by 63 EU banks during the period 2006–2021. They find that bond prices are higher (that is, the cost of raising funds is lower) for banks with higher ESG scores. However, these results are driven by the governance component of the ESG scores, not the environmental or social components. For example, a one standard deviation improvement in a bank's overall ESG score is associated with the initial yield on its debt being 52 basis points lower. A one standard deviation improvement in just the governance component is associated with a yield that is 47 basis points lower.²¹ This is consistent with the work of Amiraslani et al. (2022, Table 10), who find no relation between environmental and social performance and bond spreads in a sample of more than 500 bond issues during the period 2007–2019.

Given the limited evidence involving bank debt, it is helpful to consider a wider variety of bond issuers, including non-financial corporates, municipalities, and sovereign debt issuers. Amiraslani et al. (2022) find no relation between environmental and social performance and bond spreads for more than 2,200 bonds issued by non-financial corporations over the period 2007–2019. However, they do find one during the Global Financial Crisis, which they suggest is due to investors being more concerned about default risk (and matters of trust more generally) during that period. Hasan et al. (2017) find that US firms headquartered in counties with higher levels of "social capital" measures have lower at-issue bond spreads, which they conjecture is caused by such firms facing societal pressure that constrains opportunistic behaviour. These two papers suggest that good ESG performance might provide additional information about default risk to that contained in conventional credit ratings, in which case sustainable lending might benefit a bank by signalling its true default risk to capital providers. However, banking supervision requirements should mean there is less asymmetry of information for banks than the non-financial corporates studied in these papers, so we need to be careful with the inferences we draw. For example, an earlier study of more than 4,000 bonds issued by non-financial firms during the period 1992–2009 found that the negative relationship between corporate social responsibility performance and at-issue yield spreads was weaker for firms with less information asymmetry (Ge and Liu, 2015).

The studies discussed so far have used data on ordinary bonds. The empirical evidence of the relative pricing of green and ordinary bonds issued by banks is largely limited to a study by Fatica et al. (2021), who analysed almost 170,000 bond issues by financial corporations during the period 2007–2018 (538 of them involving green bonds) and found that the difference between

informational frictions, the two effects cancel, leaving the bank's shareholders unaffected by the increase in loan quality.

²⁰We restrict attention to studies of bond prices in the primary market as we are interested in the cost to banks of raising funds, not the ongoing returns to the owners of bank-issued bonds, which is the focus of studies of bond prices in the secondary market.

²¹The corresponding reduction for the environmental component is 23 basis points, but this result is not statistically significant.

the yields on self-labelled green bonds and standard bonds was not statistically significant. The market response to bonds issued by other types of issuer might shed light on whether banks could lower their funding costs by issuing green bonds of their own. Fatica et al. (2021) analysed more than 94,000 bond issues by non-financial corporations during the period 2007–2018 (631 of them involving green bonds) and found that the difference between the yields on self-labelled green bonds and standard bonds was statistically significant and equal to approximately 22 basis points. In contrast, Flammer (2021) used a matching procedure to examine a sample of international corporate green-bond issues and found the difference between the yields of these bonds and comparable ordinary bonds issued by the same issuer was statistically and economically insignificant. Baker et al. (2022) analysed more than 650,000 US municipal bonds issued between 2013 and 2018, of which almost 4,000 were green bonds, and found that the at-issue yields on green bonds were 5–9 basis points lower than yields on otherwise equivalent ordinary bonds. However, when Larcker and Watts (2020) compared municipal green bonds to nearly identical ordinary bonds issued by the same issuers on the same day, they found the price differences were negligible (and in most cases were zero). Similarly, when Tang and Zhang (2020) investigated an international dataset of green-bond issues between 2007 and 2017, they found that the at-issue yields on green bonds were not significantly different from the at-issue yields on ordinary bonds issued by the same firms in the same years. This evidence suggests that—unless investors’ attitudes to green bonds change, perhaps due to initiatives such as the TNFD creating greater bank disclosure—banks are unlikely to be able to significantly reduce their funding costs by issuing green bonds.

4.3 Bank deposits

This section considers the effects of sustainable lending on the cost of raising funds by accepting deposits from investors. This is the main source of banks’ non-equity funding. As in the previous section, there are two possibilities: ordinary deposits and special deposits that are earmarked to fund ESG-focussed loans.

The main difference from bond issues is that here the capital is being provided mainly by retail investors. This removes one layer of intermediation compared to bond issues (where institutional investors purchase the bonds using funds ultimately provided by retail investors). As the retail investors are now directly making the investment decision, it is possible that green issues will hold more sway. For example, banks with a good ESG performance might be able to achieve a bigger reduction in their funding costs because they are dealing directly with ESG-motivated investors. However, the reverse might be true instead. That is, institutional investors might be more motivated by sustainability because the fund managers receive the non-pecuniary benefits of responsible investing and shift the costs onto their clients. Ultimately, which story holds is an empirical issue.

The literature exploring bank depositors’ attitudes to ESG issues is still small. However, two recent papers suggest that potential depositors take banks’ ESG performance into account when they make their investment decisions. Chen et al. (2022) analyse branch-level data on US banks during the period 1996–2017 and find a decline in deposit growth following the release of negative regulatory reports on bank social performance under the Community Reinvestment Act, with the deposits affected flowing to nearby banks with high social performance. Homanen (2022) also uses branch-level data on US banks, but he focuses on a specific environmental issue. He finds that banks that financed the controversial Dakota Access Pipeline experienced significant decreases in deposit growth following social protest. The effects were greater in localities with higher support for the protests, higher environmental awareness, and closer proximity to the pipeline.

These studies suggest that depositors’ attitudes to sustainability can influence their financial investment decisions. However, they do not tell us what the depositors’ changed behaviour costs bank shareholders. If the lost capital from depositors is replaced by capital from bond investors

at a similar cost, then shareholders are unaffected. That remains to be determined.

5 Conclusion

In principle, a bank's shareholders care about the bank's financial performance and its ESG profile. Sustainable lending can potentially benefit shareholders by giving them direct ESG benefits that would offset any reduction in profitability. However, a review of the available empirical evidence suggests there is limited scope to do this as improved ESG scores are likely to be associated with only very small reductions in banks' cost of equity capital. That is, shareholders' willingness to pay for improved ESG performance is likely to be relatively small. Banks that are considering sustainable lending programmes therefore need to focus on the financial aspects of these programmes if they are to maximise shareholder welfare.

There are several ways in which a bank's shareholders might benefit when the bank adopts sustainable lending practices. Firstly, banks can play a certifying role, acting as delegated monitors of farms' environmental performance for farms' customers and their (non-manager) owners. Secondly, banks may be able to offer a menu of loans—which differ according to the environmental targets they set and the interest rate they charge—that help screen borrowers' private information about their default risk. Thirdly, facilitating changes in farming practices that increase a farm's value to the farmer potentially increases the existing loan's value to the farm's bank, which will benefit the bank's shareholders. However, the debt overhang problem may mean that the farm's bank has to contribute to the cost of the change in farming practices or forego some of the benefits if the change is to occur. Fourthly, farmers may be able to use sustainability-linked loans to offset problems of short-termism—that is, as commitment devices that give them incentives to adopt farming practices that are in the farmers' best long-term interests. Finally, the presence of a sustainable lending programme can increase a bank's ESG score, which might increase the price it receives when it sells bonds to institutional investors (and reduce the interest rates it needs to pay depositors). This would reduce the cost of raising funds in the future and therefore benefit shareholders. However, the empirical evidence reviewed here suggests that any cost savings will be small. The first four opportunities described here are more likely candidates for benefiting bank shareholders.

These benefits will only be realised if the sustainable loan arrangements are designed appropriately. Consider the example of general purpose loans with interest rates that vary with the borrower's environmental performance. Should the specification of these so-called sustainability-linked loans be tailored to individual borrowers or should common criteria be applied to all farm borrowers? The answer to this question depends on how the loans are expected to create value for the bank and, ultimately, how important external stakeholders are in creating that value. At one extreme, external stakeholders are driving the value creation, as when the bank provides certification services (Section 3.1) or hopes to fund the loans by issuing its own green bonds and receiving a "green" premium (Section 4.2).²² In cases like these, stakeholders' greenwashing concerns suggest that the targets should be simple, transparent, and common across farms (Kim et al., 2022). It may be best to have a simple reduced interest rate for "green star" farms, where the requirements of gaining and maintaining this certification are transparent (and tied to things that customers in particular care about). Banks could increase the certification value to farmers (or reduce compliance costs, at least) if they piggybacked off other ESG certification schemes in the agricultural sector. At the other extreme, external stakeholders are unimportant, as when banks use sustainability-linked loans to screen borrowers on the basis of their private information about their default risk (Section 3.2) or as a commitment device to strengthen the farmer's incentive to engage in long-term value creation (Section 3.5). In cases like these, it

²²Delegated monitoring that certifies a farm's environmental performance is best carried out by the farm's existing lenders rather than a new one, as existing lenders stand to gain from any resulting reduction in default risk.

is best to tailor the terms of the sustainability-linked loans to the specific needs of individual borrowers.

Finally, consider the case of loans for specific projects that increase a farm's environmental performance. The debt overhang problem will appear whenever the highest interest rate a farmer is willing to pay is less than the bank's cost of raising funds. When this happens, the bank needs to explore the possibility that the investment would increase the existing debt's value to the bank by enough to offset any loss it makes on the new loan. If that is the case, then the two parties should explore the possibility of cost-sharing (capital contributions; low-interest loans) or benefit sharing (refinancing the farm's existing debt with performance-sensitive debt). Refinancing farm debt with performance-sensitive debt might be a solution to debt overhang that can be implemented in advance of any specific loan applications. The issue of how the replacement loans should be specified arises here as well. External stakeholders are not directly relevant here, so greenwashing is less of a concern. This might suggest the terms of the loans should be tailored to individual borrowers. However, given that the loans will be created in advance of individual applications for additional lending, adopting a standardised set of loan terms would reduce the cost of designing and administering the replacement debt.

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