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Financing the ecological transition in Morocco: a comparative analysis of green bonds and sustainable bank credit

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ABSTRACT

This research investigates the trade-offs between green bonds and sustainable bank credit as mechanisms for financing the ecological transition of Moroccan firms. Based on a qualitative and comparative analysis of academic literature, institutional documentation, and regulatory frameworks, the study examines four key dimensions: accessibility, costs and incentives, reporting requirements, and contractual flexibility. The findings indicate that green bonds are better suited for large-scale enterprises possessing the requisite organizational and informational capabilities. Conversely, sustainable bank credit offers broader accessibility, particularly for SMEs and mid-tier companies, albeit subject to rigorous solvency constraints, ESG monitoring, and compliance standards. Furthermore, the analysis suggests that the existence of a "greenium" cannot be directly substantiated within the

Moroccan market based on the corpus examined. Ultimately, this study demonstrates that the optimal financing choice is contingent upon both the firm's specific characteristics and the broader institutional environment.

Keywords: Sustainable finance; green bonds; sustainable bank credit; ecological transition; ESG; Moroccan firms.

1. Introduction

The climate emergency and the transition toward a low-carbon economy necessitate a profound and structural revision of corporate investment, financing, and governance strategies. Long perceived in a reductionist manner as a mere exogenous regulatory constraint or an additional financial burden weighing on short-term profitability, sustainability has progressively emerged as a strategic and financial imperative. Faced with the acceleration of decarbonization requirements and the increasing investment needs associated with the ecological transition, organizations are confronted with a critical challenge: mobilizing adequate, substantial, and sustainable financial resources to fund transition projects characterized by high capital requirements, long investment horizons, and technological and regulatory uncertainties.

Traditionally, corporate investment financing architecture has relied heavily on self-financing and bank credit, in accordance with the principles of the Pecking Order Theory. However, the progressive institutionalization of sustainable finance has profoundly transformed the international and national financial landscape. New sustainable debt instruments have emerged, among which green bonds hold a significant position by enabling the mobilization of capital on financial markets to fund or refinance projects meeting predefined environmental criteria.

Concurrently, sustainable bank financing has evolved through green loans and sustainability-linked loan mechanisms, which allow for the integration of environmental and ESG objectives into credit granting conditions or pricing. This diversification of financing sources creates new trade-offs for financial managers, who can no longer consider solely the apparent cost of debt; they must also integrate structuring costs, transparency and reporting requirements, ESG constraints, contractual flexibility, and potential impacts on reputation and institutional legitimacy.

The literature dedicated to financing the ecological transition has, however, developed in a relatively fragmented manner. Research on green bonds has primarily focused on their issuance determinants, performance, investor reactions, their contribution to funding environmental projects, and the potential existence of a "greenium"; a cost advantage over conventional bonds (Gianfrate & Peri, 2019; Flammer, 2021; Bhutta et al., 2022). Conversely, studies on green loans and other forms of sustainable bank financing have emphasized intermediation mechanisms, financing conditions, and the integration of environmental criteria into the bank-firm relationship. A recent systematic literature review on green debt confirms that research has predominantly studied green bonds, green loans, and, more recently, sustainability-linked instruments in isolation, while highlighting the merit of more integrated approaches that allow for the comparison of various sustainable debt instruments (Flottmann et al., 2026).

This fragmentation leaves a research gap regarding the comparative analysis of these various financing channels from the perspective of the trade-offs faced by firms. This gap is particularly significant in emerging economies, where capital market depth, access to bond instruments, ESG reporting capabilities, and the degree of sustainable finance development may differ substantially from those observed in developed economies. In this regard, the Moroccan context provides a particularly relevant terrain for analysis due to the progressive structuring of its sustainable finance framework, the emergence of the green bond market, and the historically central role of bank intermediation in corporate financing. Consequently, the issue is not merely to determine whether green bonds or sustainable bank credit offer distinct financial advantages, but to identify the conditions under which each instrument constitutes a relevant solution regarding the firm's profile, size, and organizational capabilities.

Against this backdrop, this research seeks to address the following question: to what extent do green bonds and sustainable bank credit constitute differentiated mechanisms for financing the ecological transition of Moroccan firms? More specifically, the study examines three complementary dimensions: access conditions and barriers related to firm size; financing costs and associated incentive mechanisms; and requirements for transparency, reporting, and contractual flexibility. The objective is to determine how the organizational characteristics of firms and the Moroccan institutional architecture influence the trade-off between green bond financing and sustainable bank financing.

The originality of this research lies not in the isolated study of green bonds or sustainable bank credit, which have been widely addressed in the literature, but in their confrontation within a single analytical framework applied to the Moroccan institutional context. The purpose of this article is to propose a multi-criteria comparative analysis to identify the advantages, costs, regulatory constraints, governance requirements, and risks associated with each instrument.

Theoretically, the study articulates the Pecking Order Theory, signaling theory, and the institutional approach to explain the differentiated choices of firms. From a managerial perspective, it proposes a trade-off matrix that relates the firm's profile to the characteristics of the studied financing instruments. This approach thus contributes to a better understanding of the conditions under which sustainable finance can support the ecological transition of firms in an emerging economy.

To structure this scientific endeavor, this article is organized into three main sections. After presenting the theoretical and conceptual foundations of financing the ecological transition, we outline the methodology of the comparative documentary analysis and the criteria used to contrast the two instruments. We then present the results of the comparative analysis and discuss their significance in light of the research hypotheses and prior studies. Finally, the article highlights the theoretical, managerial, and institutional implications of the findings, before presenting the study's limitations and primary avenues for future research.

2. Theoretical and Conceptual Foundations of Financing the Ecological Transition

Analysing the mechanisms for financing the ecological transition requires a re-examination of the theoretical foundations of capital structure and financial intermediation. Given climate imperatives, modern financial management is no longer confined to the mere maximization of shareholder value but integrates the assessment of environmental risks as a strategic component of organizational sustainability. This perspective is also structured around theoretical choices regarding resource allocation and national institutional pressures. This section establishes the conceptual basis for the relationship between the cost of capital, the green bond market, and sustainable bank credit.

2.1. Financing the Ecological Transition and the Evolution of the Cost of Capital

The increasing consideration of climate and environmental risks in corporate financial management has profoundly renewed the traditional theory of capital structure. Long dominated by classical trade-offs between the tax benefits of debt and bankruptcy costs, following the seminal work of Modigliani and Miller (1958), the corporate finance literature now incorporates a systemic dimension: exposure to climate-related financial risks. According to Li and Duca (2024), the explicit integration of environmental objectives alters the perception of risk by institutional investors and creditors. This reassessment of the risk profile directly impacts the firm's overall cost of capital, incentivizing companies to adapt their financial structures to preserve their attractiveness in the markets.

In this perspective, green finance has been structured not merely as a tool for regulatory compliance, but as a genuine strategic lever for creating stakeholder value. By adopting sustainable practices, firms send a strong signal to the market regarding their long-term resilience and their capacity to anticipate regulatory and energy shocks. This dynamic is grounded in both the Pecking Order Theory (Myers & Majluf, 1984)—which explains why Moroccan SMEs, faced with information asymmetries and the absence of a direct bond market, naturally turn to bank intermediation—and signaling theory (Flammer, 2021), which enables large structures to validate their environmental legitimacy. Consequently, the choice of financing channel, whether issuing dedicated instruments on the markets or resorting to bank intermediation, becomes a central managerial decision to optimize the Weighted Average Cost of Capital (WACC) while funding the ecological transformation of productive assets (Sartzetakis, 2021). Furthermore, these organizational choices are not solely matters of economic efficiency; they also respond to the normative and coercive pressures defined by institutional theory (DiMaggio & Powell, 1983), embodied in Morocco by the promotional role of the AMMC and the prudential directives of Bank Al-Maghrib regarding climate risks.

Putting these three theoretical approaches into perspective allows for the construction of an integrated framework for interpreting the choice of financing instruments for the ecological transition. Table 1 summarizes the theoretical mechanisms mobilized and their respective contributions to explaining the trade-offs between green bonds and sustainable bank financing.

Table 1. Articulation of Theoretical Frameworks with the Choice of Sustainable Financing Instruments

Theoretical Framework	Central Concept Mobilized	Explanatory Mechanism
Pecking Order Theory	Information asymmetry and financing source hierarchy	Firms generally favor internal resources, followed by debt, over external financing that entails higher information costs.
Signaling Theory	Credible signal, asymmetric information, and certification	A financial instrument accompanied by verifiable commitments enables the firm to communicate its environmental quality to investors.
Institutional Theory	Coercive, normative, and mimetic pressures	Organizations adapt their practices to regulatory and professional requirements as well as to dominant practices within their institutional environment.
Integrated Reading of the Three Approaches	Size, information asymmetry, signaling, and institutional constraints	The financing choice results from the interaction between the firm's internal characteristics and its institutional environment.

Source: Authors' elaboration based on Myers and Majluf (1984), Flammer (2021), and DiMaggio and Powell (1983), adapted to the context of sustainable finance.

This theoretical synthesis leads us to consider that the choice between green bonds and sustainable bank financing is not merely a matter of comparing their financial costs. It also depends on the firm's size, its level of informational asymmetry, its capacity to produce and certify ESG data, and the institutional constraints to which it is subject.

2.2. The Green Bond Market and the Standardization of Sustainable Finance

Green bonds are fixed-income debt instruments issued on capital markets, specifically tailored to fund or refinance projects with positive environmental impacts, such as renewable energy development, energy efficiency, sustainable resource management, or pollution prevention (Gianfrate & Peri, 2019). Since the pioneering issuance by the European Investment Bank (EIB) in 2007, this market has experienced exponential growth, evolving from a marginal niche into a cornerstone of global finance, driven by the increasing appetite of institutional investors for environmental criteria (Flammer, 2021).

To secure the integrity of this asset class and safeguard the market against the risks of greenwashing, the architecture of private regulation has been structured around benchmark international standards, primarily the Green Bond Principles (GBP) developed by the International Capital Market Association (ICMA, 2021). These guidelines are built upon four fundamental pillars: the transparent use of proceeds, the process for project evaluation and selection, the rigorous management of financial flows, and the mandatory production of post-issuance extra-financial reporting (Reboredo & Ugolini, 2020).

Regarding financial performance, numerous recent empirical studies highlight the existence of a yield discount at issuance, commonly referred to as the "greenium." This phenomenon reflects an excess demand from investors for sustainable securities, enabling issuers to benefit from a potentially lower cost of capital compared to the conventional bond market, although this discount varies depending on macroeconomic conditions and the issuer's credit rating (Li & Duca, 2024).

2.3. Traditional Bank Credit and the Rise of Sustainable Lending

In contrast to open, disintermediated capital markets, traditional bank credit has historically remained the central pillar of corporate external financing, particularly for small and medium-sized enterprises (SMEs) and mid-tier firms that lack the critical size required to access bond markets. Traditional bank credit is built upon a strong and close bilateral relationship between the borrower and the lending institution, necessitating the provision of real or personal collateral, an in-depth assessment of counterparty risk, and interest rates indexed to the firm’s creditworthiness and financial solvency.

However, under dual pressure from prudential regulators; notably through the requirements of central banks and banking supervision authorities, and the expectations of their own stakeholders, financial institutions are now systematically integrating Environmental, Social, and Governance (ESG) criteria into their credit granting and pricing processes, thus giving rise to the concept of "green loans" or sustainable lending.

Unlike green bonds, which entail significant fixed issuance costs (labeling fees, external audits, and market structuring expenses) and require substantial financial volumes, bank credit maintains a structural superiority in terms of contractual flexibility. It allows for ongoing dialogue and agile restructuring possibilities throughout the contract's duration, although its overall cost may prove higher or more volatile depending on the borrower's risk profile and initial ESG rating.

To guide our multi-criteria comparative analysis, two opposing research hypotheses are formulated:

- Hypothesis 1 (H1): Access to the green bond market generates a measurable pricing advantage (the "greenium") but imposes restrictive entry barriers in terms of critical size and structural costs, effectively reserving this instrument for large corporations.

- Hypothesis 2 (H2): Sustainable bank credit offers superior accessibility and contractual flexibility compared to green bonds for SMEs and mid-tier firms; however, this flexibility remains contingent upon ESG and prudential requirements.

The formulation of these hypotheses establishes the conceptual foundations for our investigation. To test the validity of these propositions against empirical reality, it is now necessary to clarify the analytical approach adopted. The following section thus presents the methodological framework for the multi-criteria comparative analysis utilized in this research.

3. Methodological Framework of the Comparative Analysis

The investigation of the mechanisms for financing the ecological transition does not rely on quantitative econometric modeling, but rather on a qualitative analytical approach aimed at evaluating corporate strategic trade-offs regarding market instruments and financial intermediation. This section lays the groundwork for a multi-criteria comparative analysis based on the critical exploitation of academic literature, benchmark institutional reports, and regulatory standards. The research thus adopts a qualitative, comparative, and documentary design, the objective of which is to identify, structure, and contrast the characteristics of green bonds and sustainable bank financing using academic and institutional sources. The aim is to examine the relevance, operational constraints, and incentive structures of the various financing solutions through a rigorous multidimensional reading grid.

3.1. Epistemological Approach, Research Design, and Methodological Choices

From an epistemological standpoint, this research adopts an interpretative posture, considering that sustainable financing choices are not merely the result of optimizing mathematical calculations, but the outcome of managerial trade-offs shaped by institutional norms, regulatory constraints, informational asymmetries, and contractual relationships.

To analyse and put the various financing instruments for the ecological transition into perspective, this research prioritizes a documentary-based multi-criteria comparative analysis. Far from being limited to a simple literature review, this approach positions itself as a genuine analytical investigation tool in management sciences, allowing for the evaluation of the strategic trade-offs faced by organizations. The choice of a documentary approach is also justified by the nature of the terrain studied: information concerning green bond issuances is relatively accessible through public documents, whereas detailed conditions of sustainable bank credit portfolios remain largely confidential. Documentary analysis thus enables the triangulation of available information and the comparison of the two instruments based on homogeneous criteria.

The constitution of the documentary corpus relies on three main categories of sources. First, academic literature was retrieved from bibliographic and scientific databases such as Scopus, Web of Science, Science Direct, and Google Scholar. Second, institutional and regulatory data were collected from official Moroccan and international sources, notably the Moroccan Capital Market Authority (AMMC), Bank Al-Maghrib, the High Commission for Planning (HCP), and the International Capital Market Association (ICMA). Third, methodological guides, frame of reference documents, and market orientation papers were mobilized to complement the analysis of structuring, certification, reporting, and monitoring practices for sustainable financing instruments.

The documentary analysis period primarily covers 2016 - 2026. The choice of 2016 as the starting point is justified by the progressive structuring of the Moroccan green bond market from this period onward, notably with the first Moroccan green bond transactions, while 2026 serves as the temporal boundary corresponding to the period in which this research was conducted. This timeframe thus captures both the emergence and recent evolution of sustainable finance in Morocco.

The documentary research was carried out using keywords combining the financial, environmental, and contextual dimensions of the study, notably: "green bonds," "green loans," "sustainable lending," "sustainable finance," "green finance," "corporate finance," "Morocco," "SMEs," "ETIs," "greenium," and "ESG." These keywords were used individually or in combination to identify works focusing on the studied financing instruments, their access conditions, their costs, and their environmental and institutional requirements.

To ensure the relevance of the corpus, the selected documents meet several selection criteria: direct relevance to the financing of the ecological transition or the studied instruments; scientific rigor for academic publications; official status for institutional and regulatory sources; availability of information allowing the assessment of at least one of the dimensions included in the comparative grid; and timeliness of the information, particularly for regulatory and institutional data susceptible to rapid evolution. Foundational theoretical works were nonetheless retained when they constitute structuring references for the research's conceptual framework.

By cross-referencing these sources within a multidimensional reading grid, this approach systematically examines the convergences, divergences, and structural specificities of market instruments (green bonds) and intermediated circuits (sustainable bank credit). This triangulation between academic literature, institutional sources, and professional standards aims to limit the risk of dependency on a single category of sources and to strengthen the interpretive robustness of the analysis. It thus provides a comprehensive view of the financial incentive mechanisms and organizational constraints associated with the ecological transition.

3.2. Dimensions, Criteria, and Procedure of the Comparative Analysis

To provide a rigorous and structured reading of the dynamics at play, the comparative analysis is built around four fundamental dimensions that characterize corporate strategic trade-offs regarding sustainable financing.

The selection of these four dimensions stems from the confrontation of academic literature, institutional requirements, and the operational characteristics of the studied instruments. They simultaneously cover access conditions, financial implications, transparency requirements, and the flexibility of the financing relationship.

The first axis focuses on market access and firm size. It involves analysing the openness of each instrument according to organizational typology, highlighting the structural divide between access to green bond markets; largely restricted to large corporations and institutional issuers possessing substantial financial resources and critical mass, and the proximity accessibility offered by sustainable bank credit to SMEs and mid-tier companies. The analysis specifically examines eligibility criteria, critical size, fixed market access costs, and the organizational capabilities required to mobilize each instrument.

The second axis examines the cost of financing and the financial conditions inherent to each solution. This dimension assesses overall pricing impact by contrasting the potential pursuit of a yield discount or "greenium" on capital markets (when documented in the literature) with the fixed costs of structuring, certification, and monitoring, weighed against the incentive-based pricing mechanisms of bank credit whose conditions can be adjusted based on the achievement of pre-established extra-financial targets. This dimension thus distinguishes direct financial costs from transaction, certification, reporting, and compliance costs associated with each instrument.

The third axis explores the requirements of transparency, traceability, and ESG reporting. It seeks to decipher the regulatory and normative constraints imposed on market actors, whether regarding compliance with the use of proceeds and post-issuance publication obligations on markets or the requirements for monitoring extra-financial performance associated with sustainable bank financing. Where sources allow, the analysis distinguishes regulatory obligations from contractual commitments and best practices recommended by international standards.

Finally, the fourth axis explores contractual flexibility and the nature of the relationship with stakeholders. It contrasts the formalization inherent in open financial markets; where investor relations are largely governed by transparency and market requirements, with the possibility of a more direct bilateral dialogue characteristic of bank credit, which can allow for contractual adjustments based on the evolution of the borrower's situation. However, this dimension does not imply automatic flexibility in sustainable bank financing; rather, it aims to determine the extent to which such flexibility remains constrained by covenants, ESG requirements, monitoring mechanisms, and prudential regulations.

Operationally, the gathered information is coded and compared according to these four dimensions: market access and size; cost and financial conditions; transparency, traceability, and ESG reporting; and contractual flexibility and stakeholder relationship. For each dimension, the documented elements are contrasted between green bonds and sustainable bank financing to identify the advantages, constraints, and suitability conditions specific to each instrument. This procedure leads to the construction of a comparative matrix and, subsequently, a managerial trade-off matrix designed to link the characteristics of the instruments to the profile of the firms.

3.3. Justification of the Choice of Context and Institutional Documentary Collection

The choice of a qualitative comparative approach rooted in the Moroccan institutional context is justified by the emerging and evolving nature of the national green finance market. Unlike developed economies, where market data time series are generally more abundant, the Moroccan green bond market; whose structuring dates back to the initial issuances carried out from 2016 onward, and the development of sustainable bank financing necessitate a critical analysis of primary institutional sources.

The selection of Morocco also fulfills the objective of contrasting two financing modes within an environment characterized by the progressive development of sustainable finance instruments and the prominent role of financial intermediation. The institutional sources mobilized primarily comprise publications from the AMMC, Bank Al-Maghrib, and the HCP, complemented by relevant professional documents, notably those from the ICMA.

The triangulation of these sources does not in itself guarantee absolute neutrality, but it makes it possible to confront different perspectives; academic, regulatory, institutional, and professional, and to strengthen the credibility of the interpretation. This approach is particularly important in the Moroccan context, where access to detailed data regarding sustainable bank credit portfolios remains more restricted than public information concerning bond issuances.

Finally, the findings derived from this analysis must be interpreted as the outcomes of a comparative documentary analysis rather than as generalizable statistical estimations applicable to all Moroccan firms. This methodological precision constitutes an assumed limitation of the study and serves to circumscribe the scope of the conclusions to the information accessible within the selected documentary corpus.

4. Results of the Comparative Analysis and Discussion

This section constitutes the analytical core of our contribution. To avoid a purely narrative approach and anchor our methodology in the scientific rigor expected of doctoral research in management sciences, our comparative analysis is based not on simple theoretical assertions, but on the extraction and confrontation of factual data, normative thresholds, and quantitative indicators derived from academic literature, benchmark institutional reports, and financial and banking market data in Morocco (Bank Al-Maghrib (BAM), the Moroccan Capital Market Authority (AMMC), the Professional Group of Moroccan Banks (GPBM), and the High Commission for Planning (HCP)).

Confronting these data through our multidimensional grid allows us to evaluate the validity of our research hypotheses within the national economic context, mobilizing the analytical frameworks of Pecking Order Theory, signaling theory, and the institutional approach.

4.1. Data Extraction and Multi-Criteria Confrontation

To successfully conduct this comparative study applied to the specificities of the Moroccan productive fabric, the analysis relies on four structuring dimensions identified from the documentary corpus: access and critical size, cost structure and financial conditions, transparency and reporting requirements, and contractual flexibility and governance. These dimensions enable us to contrast the characteristics of green bonds and sustainable bank financing based on information available in academic and institutional sources.

Table 2. Matrix of Extraction and Confrontation of Comparative Data

Analytical Dimensions	Green Bonds	Sustainable Bank Credit	Sources Mobilized
1. Access and Critical Size	• Large enterprises / major issuers • Critical mass • Financial and organizational capacity • Issuance structuring • Certification / verification	• Broader accessibility • SMEs and mid-tier companies (ETIs) • Solvency criteria • Collateral/guarantees • ESG eligibility	AMMC; Bank Al-Maghrib; HCP; academic literature
2. Cost and Financial Conditions	• Structuring costs • Certification / verification • Reporting • Greenium: variable results across markets • Relatively high fixed costs	• Interest rates • Risk profile • ESG monitoring costs • Contractual conditions • ESG-linked incentives	Bank Al-Maghrib; AMMC; literature on greenium and sustainable lending
3. Transparency and ESG Reporting	• Use of proceeds • Post-issuance reporting • Traceability • Investor information • Environmental commitments	• Monitoring of ESG indicators • Contractual reporting • ESG performance evaluation • Prudential requirements	AMMC; Bank Al-Maghrib; ICMA; financing documentation
4. Flexibility and Governance	• Standardized documentation • Relations with multiple investors • Issuance covenants • Highly formalized contractual modification	• Bilateral bank-firm relationship • Direct dialogue • Potential renegotiation • Contractual adaptation	Academic literature; financial documentation; institutional sources

Methodological Note: Numerical values that cannot be directly attributed to a primary source or a documented sample are not presented as general characteristics of the Moroccan market. Estimates derived from international literature are explicitly distinguished from observations concerning Morocco.

Source: Authors' elaboration based on the mobilized documentary corpus (AMMC, Bank Al-Maghrib, HCP, ICMA, and academic literature).

The synthetic examination of this matrix highlights a structural differentiation between the two financing channels. Green bonds appear better suited for issuers possessing critical mass, organizational capacities, and sufficient resources to bear the structuring and transparency requirements of the bond market. Sustainable bank finance, on the other hand, presents an intermediation logic likely to suit a broader range of enterprises, subject to solvency, eligibility, and ESG compliance conditions. These contrasts now necessitate an in-depth analysis of the underlying managerial trade-offs, mobilizing the theoretical frameworks of corporate finance and institutionalism.

The synthetic examination of this matrix highlights a striking structural duality within the Moroccan financial system. On the one hand, the green market positions itself as an elitist instrument, reserved for a restricted fringe of issuers capable of bearing heavy fixed structuring costs and achieving the required liquidity thresholds. On the other hand, sustainable bank credit asserts itself as the universal channel for ecological inclusion for the national productive fabric. These factual contrasts now require an in-depth analysis of the underlying managerial trade-offs, mobilizing the theoretical reading grids of corporate finance and institutionalism.

4.2. In-Depth Analysis of Strategic and Managerial Trade-offs in Morocco

Before addressing the specific dimensions of our analytical grid in detail, these results must be contextualized within the strategic trajectory of Moroccan firms. The cross-examination of market factual data and the national productive fabric reveal that choosing a green financing instrument is not merely a technical decision, but a true managerial trade-off constrained by organizational structure, firm size, and the country's institutional architecture.

An in-depth analysis of the advantages and limitations inherent to each instrument provides a clearer view of corporate behavioral patterns regarding green financing. On the one hand, green bonds can meet the needs of large structures seeking substantial funding volumes, investor base diversification, and enhanced visibility regarding environmental commitment. Their primary advantage lies in the ability to mobilize significant resources on capital markets while potentially strengthening the issuer's environmental visibility. However, this instrument presents structural constraints related to critical mass, structuring costs, documentation requirements, and transparency and reporting obligations.

On the other hand, sustainable bank credit constitutes a particularly crucial intermediation channel for firms that do not necessarily possess the organizational or financial capabilities required to access the bond market directly. Its potential advantage lies in the bilateral relationship with the lending institution and the possibility of adapting contractual conditions to the borrower's profile. Nevertheless, this flexibility should not be considered automatic: it remains conditioned by the company's solvency, the bank's prudential requirements, contractual covenants, and, when financing is linked to ESG objectives, extra-financial performance monitoring mechanisms.

4.2.1. Access to Financing and the Structural Market Divide through the Lens of Financial Hierarchy

The analysis of the first dimension highlights a significant difference between direct access to the bond market and access to bank financing, echoing the Pecking Order Theory of Myers and Majluf (1984).

On one side, the green bond market, regulated by the AMMC, appears primarily accessible to issuers possessing sufficient size and organizational capacity to bear the requirements associated with a bond issuance. The issuances identified in the documentary corpus predominantly involve major institutional actors or large-scale enterprises.

However, this observation should not be interpreted as a 0% access rate for SMEs and mid-tier companies (ETIs). This study is not based on an exhaustive survey of all Moroccan SMEs and ETIs. The scientifically appropriate formulation is therefore as follows: "no green bond issuance by an SME or an ETI has been identified within the documentary corpus selected for this study." This observation suggests very limited direct access by these enterprise categories to the green bond market, without making it possible to establish a zero statistical access rate.

On the other side, sustainable bank credit offers potentially broader accessibility thanks to the role of financial intermediation in corporate financing. Nevertheless, this accessibility remains conditioned by credit criteria, solvency, collateral, repayment capacity, and, in the case of sustainable financing, environmental or ESG eligibility criteria.

4.2.2. Trade-offs Between Transaction Costs, Signaling, and Pricing Incentives

From a financial standpoint, cost structures and financing conditions constitute an essential determinant of the trade-off between green bonds and sustainable bank credit. This dimension can be illuminated by signaling theory (Flammer, 2021), inasmuch as utilizing a sustainable financing instrument can also help communicate the firm's environmental commitment to investors, lenders, and other stakeholders.

On the green bonds side, documentary analysis highlights a cost structure characterized by specific costs related to structuring, external certification or verification, and reporting. These costs add to the ordinary expenses associated with a bond issuance and can represent a significant constraint for firms lacking critical mass or sufficient organizational capacities. Conversely, issuing a green bond can enable a firm to access capital markets directly, diversify its funding sources, and enhance the visibility of its environmental commitment.

International literature also examines the possibility of a "greenium," corresponding to a yield differential between a green bond and a conventional bond exhibiting comparable characteristics. However, the existence and magnitude of this phenomenon vary across markets, time periods, issuer characteristics, asset quality, and market conditions. Within the framework of this research, the greenium is therefore regarded as a potential mechanism identified by international literature rather than a systematically observable financial advantage on the Moroccan market. The documentary analysis conducted does not, on its own, allow for the establishment of the existence or magnitude of a greenium specific to Moroccan issuances.

On the sustainable bank credit side, the cost structure differs from that of a bond issuance. The enterprise does not face the same fixed capital market mobilization costs, but it may bear costs related to the assessment of its environmental eligibility, the monitoring of ESG indicators, and compliance with contractual commitments. The financial conditions of the credit depend notably on the borrower's risk profile, the duration and structure of the financing, the collateral provided, general market conditions, and the lending institution's policy.

Certain sustainable bank financing arrangements may also incorporate incentive mechanisms linked to the achievement of environmental or social performance objectives. These mechanisms can take the form of an adjustment to financial conditions based on the realization of pre-defined ESG indicators. Their existence and modalities, however, depend on the financial product and the contractual clauses adopted. It is therefore inappropriate to consider a bonus or malus margin as a uniform characteristic of sustainable bank financing in Morocco.

The comparison thus highlights two distinct financial logics. Green bonds can offer direct access to capital markets and an opportunity to diversify financing sources, but at the price of more complex structuring and specific certification and reporting requirements. Sustainable bank credit relies more heavily on an intermediation relationship and can incorporate incentive mechanisms linked to ESG performance, while remaining subject to the lending institution's risk criteria and contractual conditions.

Consequently, the trade-off cannot be reduced to a mechanical comparison of interest rates or the pursuit of a potential greenium. It must be approached through the total cost of financing, integrating direct financial costs, structuring and compliance costs, reporting requirements, the firm's organizational capacities, and the potential benefits associated with signaling its environmental commitment.

4.2.3. Transparency, Traceability, ESG Reporting, and Institutional Pressures

The third dimension illustrates the profound impact of institutional pressures, as defined by Institutional Theory (DiMaggio & Powell, 1983), on the practices of both corporations and financial institutions. More specifically, it focuses on the transparency, traceability, and reporting requirements associated with the two financing instruments under investigation.

Regarding green bonds, the documentary analysis highlights specific requirements concerning the allocation of proceeds, the traceability of their utilization, investor disclosure, and the monitoring of environmental commitments. These requirements may stem from multiple normative levels: the Moroccan regulatory framework governing capital markets, the provisions and documentation associated with the issuance, and international market standards, notably the ICMA’s Green Bond Principles. Consequently, it is imperative to distinguish legally binding obligations from voluntary commitments undertaken by the issuer and broader market recommendations.

Transparency thus constitutes a central pillar of green bond credibility. The firm must be capable of documenting the use of mobilized resources and, depending on the applicable framework and issuance commitments, disclosing information that enables investors to assess the alignment of the financed projects with the stated environmental objectives. While this requirement enhances the traceability of financing, it concurrently demands substantial organizational and informational capabilities on the part of the issuer.

Conversely, in the case of sustainable bank credit, reporting requirements operate under a different logic. The monitoring of environmental criteria and ESG indicators can be integrated directly into the contractual relationship between the firm and the credit institution. The borrower may thus be required to provide data regarding the achievement of environmental objectives stipulated in the financing agreement. However, the specific monitoring modalities depend on the financial product, the contractual covenants, and the internal policies of the lending institution.

The comparison thus reveals a fundamental divergence in information governance: green bonds are embedded in a logic of transparency directed toward a broad investor base and the open market, whereas sustainable bank financing relies predominantly on a mechanism of bilateral monitoring between the firm and its lender. In both instances, however, the quality and availability of ESG data remain critical conditions for the credibility and effective oversight of sustainable financing.

This distinction enables the application of Institutional Theory beyond mere regulatory coercion. Green bonds are shaped by the mandates of market authorities, professional standards, and investor expectations, whereas sustainable bank credit is concurrently influenced by prudential requirements, banking industry practices, and the internal policies of credit institutions. Collectively, these diverse institutional pressures are driving the progressive integration of environmental considerations into corporate financing practices.

4.2.4. Contractual Flexibility, Governance, and the Nature of the Financing Relationship

Finally, the fourth dimension of the analysis focuses on contractual flexibility and the nature of the relationship between the firm and its capital providers. It allows us to distinguish the market-based financing logic associated with green bonds from the intermediation relationship inherent in sustainable bank credit.

In the case of green bonds, the financing relationship rests on a formalized issuance documentation and a plurality of investors. The financing conditions, the issuer's commitments, and the monitoring mechanisms are defined within the documentation applicable to the transaction. This arrangement can render subsequent modifications to the financing conditions more formalized, as they depend on contractual covenants and, where applicable, consultation or consent mechanisms provided for with respect to investors.

Nevertheless, this formalization presents a governance advantage: it helps clarify the issuer's commitments, the rights of investors, and the procedures for monitoring the use of proceeds. Flexibility does not necessarily constitute a weakness of bond financing; rather, it is framed within a more formalized contractual and informational architecture.

Conversely, sustainable bank credit is based on a bilateral relationship between the borrower and the lending institution. This relational proximity can facilitate dialogue concerning financing conditions, the monitoring of ESG indicators, and the evolution of the firm's needs. Opportunities for maturity adjustments, renegotiation, or the adaptation of certain clauses may thus exist, subject to the agreement of the lending institution and compliance with contractual conditions.

However, this potentially superior flexibility must not be equated with unlimited contractual freedom. It remains conditioned by the firm's solvency, potential collateral, covenants, ESG objectives defined in the contract, and the prudential constraints to which the banking institution is subject.

The comparison thus highlights two distinct forms of financing governance. Green bonds favor governance based on formalization, transparency, and the relationship with a plurality of investors, whereas sustainable bank credit relies more heavily on relational proximity, bilateral monitoring, and potential contractual flexibility. Consequently, the choice between the two instruments depends not only on the firm's financial needs, but also on its capacity to satisfy the governance, transparency, and monitoring requirements associated with each mode of financing.

4.3. Synthesis of Trade-offs and Managerial Modeling

To formalize the strategic vision incumbent upon corporate leaders in Morocco facing the dual ecological and financial transition, the matrix below synthesizes the conditions of managerial suitability for each instrument according to the organizational profile of the firm. It does not constitute a deterministic rule of choice, but rather a decision-support grid constructed from the results of the documentary analysis.

Table 3. Decision and Managerial Trade-off Matrix for Green Financing Instruments in Morocco

Firm Profile	Potentially Favored Instrument	Dominant Managerial Trade-off Logic	Cost Structure and Incentives	Regulatory and Reporting Constraints	Contractual Flexibility	Major Organizational Risk
Large enterprises, listed groups, and major institutional issuers	Green Bonds	• Large funding volumes • Financing diversification • Environmental visibility • Access to capital markets	• Structuring costs • Certification / verification • Reporting • Potential greenium depending on market conditions	• Investor disclosures • Allocation of proceeds • Traceability • Reporting per applicable framework • ICMA standards	• Formalized documentation • Plurality of investors • Issuance covenants • Regulated modifications	• Reputational risk • Environmental non-compliance • Greenwashing risk
SMEs and mid-tier companies (ETIs)	Sustainable bank credit	• Relational proximity • Intermediated financing • Direct dialogue • Potential adaptation to needs	• No bond issuance costs • Potential ESG monitoring • Conditions based on risk and contract • Potential ESG incentives	• Monitoring of ESG indicators • Contractual reporting • Eligibility criteria • Prudential constraints	• Bilateral relationship • Direct dialogue • Potential renegotiation • Contractual adaptation	• Rising ESG requirements • Solvency constraints • Breach of commitments • Potential cost escalation
Firms with high ESG and informational capabilities	Green bonds or sustainable bank credit depending on needs	• Valorization of ESG performance • Reporting capacity • Credibility with funders • Resource diversification	• Capacity to bear reporting costs • Structuring costs depending on instrument • Potential ESG incentives	• ESG reporting • Traceability • Documentary requirements • Monitoring of commitments	• Dependent on the financing mode • Organizational capacity facilitating monitoring	• Gap between ESG commitments and actual performance • Reputational risk

Note: The expression "potentially favored instrument" designates the instrument exhibiting a relative adequacy with the profile under consideration. It does not constitute a deterministic recommendation. The actual choice depends notably on the firm's size, solvency, financing needs, ESG capabilities, market conditions, and contractual requirements.

Source: Authors' elaboration based on the results of the documentary analysis and the mobilized corpus (AMMC, Bank Al-Maghrib, HCP, ICMA, and academic literature).

This decision-making synthesis illustrates the complexity of the strategic trade-offs available to corporate leaders in Morocco. Far from constituting simple, interchangeable technical alternatives, green bonds and sustainable bank credit rest on distinct financing configurations characterized by different access conditions, cost structures, reporting requirements, and governance modalities.

The analysis particularly highlights a potentially stronger adequacy of green bonds with enterprises possessing critical mass, sufficient organizational capacity, and a high level of informational and ESG readiness. Conversely, sustainable bank credit may constitute a more accessible financing pathway for firms that favor banking intermediation and relational proximity, provided they satisfy the lender's solvency and eligibility criteria.

However, these results do not establish a universal hierarchy between the two instruments. Rather, they suggest that the optimal trade-off depends on the alignment between the firm's characteristics and the specific requirements of each mode of financing. This managerial reading thus constitutes a synthesis of the insights derived from the documentary analysis and provides a basis for evaluating the research hypotheses.

4.4. Discussion of Results and Validation of Research Hypotheses

In light of the multi-criteria comparative analysis, the managerial modeling synthesized in our decision matrix, and the theoretical frameworks mobilized (Pecking Order Theory, Signaling Theory, and Institutional Theory), the discussion of our results sheds light on the trade-offs involved in financing the ecological transition within an emerging economy such as Morocco. Confronting these results with prior literature also allows us to identify convergences, nuances, and specificities tied to the Moroccan institutional and financial context.

4.4.1. Discussion and Evaluation of Hypothesis 1 (H1): Differentiated Access to Green Bonds and the Potential Role of the Greenium

The documentary analysis globally corroborates our first hypothesis, according to which green bonds present access conditions that are primarily compatible with enterprises possessing critical mass, organizational capacities, and sufficient informational resources. However, this conclusion does not imply that the existence of a greenium on the Moroccan market has been established.

From a theoretical and empirical standpoint, our results align with international literature addressing the determinants of green finance and the greenium, which shows that green bonds can, under certain market conditions, benefit from a specific valuation by investors. The work of Gianfrate and Peri (2019), as well as more recent research dedicated to the greenium, notably highlights the possibility of a yield differential between green bonds and comparable conventional bonds.

However, contrary to an interpretation that would generalize these results to the Moroccan market, our documentary analysis does not directly allow us to establish either the existence or the magnitude of a greenium specific to Moroccan issuances. This analytical caution constitutes a significant difference between the findings of international literature and those of our study. It can be explained notably by the still-limited depth of the Moroccan green bond market, the restricted number of comparable issuances, and the scarcity of homogeneous data allowing for an econometric comparison of yields.

Conversely, the filter of critical mass constitutes a more robust finding of our comparative analysis. The characteristics of green bond financing; operation structuring, documentation, verification or certification, and transparency and reporting requirements, can represent significant organizational constraints for firms with limited financial and informational resources. This observation aligns with research emphasizing that fixed costs and disclosure requirements associated with market instruments can restrict their accessibility to smaller-scale enterprises.

Thus, Hypothesis 1 is considered globally corroborated regarding differentiated access to green bonds and the importance of firm size and organizational capabilities. In contrast, its component regarding a systematic financial advantage linked to the greenium cannot be considered demonstrated within the Moroccan context.

4.4.2. Discussion and Evaluation of Hypothesis 2 (H2): Accessibility and Flexibility of Sustainable Bank Credit

Hypothesis 2 is partially corroborated. The documentary analysis confirms the relevance of sustainable bank credit as an intermediation mechanism capable of offering potentially broader accessibility than the bond market, but it does not confirm the existence of total or systematic flexibility for SMEs and mid-tier companies (ETIs).

This initial conclusion converges with the logic of Pecking Order Theory, according to which firms may favor forms of financing characterized by greater informational proximity and lower market access costs. In the Moroccan context, the central position of banking intermediation in corporate financing reinforces the pertinence of this perspective.

However, this convergence with the literature must be qualified. The potentially greater accessibility of sustainable bank credit does not imply that it is free of constraints. The progressive integration of climatic and environmental considerations into banking risk management leads credit institutions to strengthen their evaluation, monitoring, and reporting frameworks. Sustainable bank financing may thus be associated with requirements regarding ESG indicators, the quality of information provided by the borrower, and compliance with contractual commitments.

This situation aligns with the insights of Institutional Theory: corporate financing decisions are progressively influenced not only by considerations of cost and resource availability, but also by prudential norms, professional practices, and growing expectations regarding environmental performance.

The divergence from a simplified conception of sustainable bank credit as a "flexible" instrument can thus be explained by the gradual transformation of the bank's role. Financial institutions no longer limit themselves to assessing traditional financial risk; they progressively integrate environmental and climate risks into their evaluation processes. While the bilateral relationship may offer potentially superior flexibility compared to a bond issue, it does not eliminate constraints regarding solvency, compliance, and ESG monitoring.

Consequently, H2 is partially corroborated: the potentially broader accessibility of sustainable bank credit is consistent with the characteristics of the Moroccan financial system, whereas the dimension regarding total flexibility is not confirmed.

Table 4. Summary of Research Hypotheses

Hypothesis	Finding	Evaluation
H1	Green bonds are better suited for enterprises possessing critical mass and sufficient organizational capacities.	**Globally corroborated**
H2	Sustainable bank credit presents potentially broader accessibility, but its flexibility remains conditioned by ESG, contractual, and prudential requirements.	**Partially corroborated**

Source: Authors' elaboration based on the results

4.4.3. Managerial Scope, Institutional Implications, and Research Contributions

Beyond the evaluation of the hypotheses, this research sheds threefold light; theoretical, managerial, and institutional, on the architecture of financing the ecological transition in emerging economies, and more specifically in Morocco.

From a theoretical and conceptual standpoint, our study contributes to enriching the literature in corporate finance by articulating three complementary analytical lenses. Pecking Order Theory helps interpret the significance of banking intermediation in corporate financing choices; signaling theory allows for the analysis of the informational and reputational dimensions associated with the use of green finance instruments; whereas the institutional approach explains the growing influence of regulatory frameworks, professional standards, and stakeholder expectations.

This articulation constitutes one of the principal conceptual contributions of the study: the choice between green bonds and sustainable bank credit does not depend exclusively on the apparent cost of financing, but results from the interaction between the firm's financial characteristics, its organizational and informational capacities, institutional requirements, and the nature of the relationship with capital providers.

From a managerial and strategic perspective for executives, the results of our trade-off matrix suggest that financial directions should favor a contingent approach rather than a universal hierarchy of instruments. For large enterprises and groups possessing sufficient organizational and ESG capacities, green bonds can constitute a means to diversify financing sources, access capital markets directly, and enhance the visibility of their environmental commitments. In return, these companies must be capable of bearing the structuring, transparency, traceability, and reporting requirements associated with the transaction.

For SMEs and mid-tier companies (ETIs), sustainable bank credit can constitute a potentially more suitable solution when the firm prioritizes proximity with the lending institution and lacks the capabilities required for a bond issuance. Nevertheless, this solution implies a progressive improvement in the capacity to produce and communicate environmental information, as well as mastery over the ESG commitments integrated into the financing.

The managerial contribution of the research thus lies less in designating a universally superior instrument than in proposing a matching logic between the firm's profile and the characteristics of the financing instrument. Size, solvency, financing needs, ESG and informational capabilities, the level of visibility sought, and the capacity to satisfy reporting requirements constitute key variables likely to guide this trade-off.

Finally, regarding public policies and regulation, the analysis highlights the necessity of facilitating the access of intermediate-sized enterprises and SMEs to financing mechanisms for the ecological transition. The coexistence of a green bond market demanding in terms of structuring and bank financing progressively subjected to environmental criteria reinforces the importance of mechanisms capable of reducing access costs and informational constraints.

From this perspective, public authorities and financial institutions could notably support the development of guarantee mechanisms, pooled financing instruments, technical assistance, and ESG information production systems adapted to SMEs. The development of such mechanisms could contribute to reducing information asymmetry and preparation costs associated with transition financing, while fostering a broader diffusion of sustainable finance.

These implications must nevertheless be considered as recommendations stemming from the documentary analysis rather than causally demonstrated effects. They constitute avenues of action susceptible to being deepened by subsequent empirical research focusing notably on the effective costs of various instruments, the access conditions of SMEs to sustainable financing, and the possible existence of a greenium on the Moroccan market.

5. Conclusion

This research aimed to analyse the strategic and managerial trade-offs associated with the choice of ecological transition financing instruments by enterprises in Morocco, comparing green bonds and sustainable bank credit. Based on a qualitative and comparative documentary analysis mobilizing Pecking Order Theory, signaling theory, and Institutional Theory, the study highlights financing configurations differentiated by firm size, organizational and informational capacities, and the specific requirements of each instrument.

The results show that green bonds appear particularly well-suited for enterprises possessing critical mass, sufficient organizational and informational capabilities, and the aptitude to satisfy the structuring, traceability, and reporting requirements associated with green bond financing. This conclusion aligns with a portion of international literature concerning barriers to capital market access and the role of informational quality in sustainable finance. Conversely, while international literature highlights the potential existence of a "greenium" under certain market conditions, our documentary analysis does not directly allow for the establishment of its existence or magnitude within the Moroccan market.

Sustainable bank credit, on the other hand, presents potentially broader accessibility for firms that favor banking intermediation and proximity to the lending institution. However, this accessibility must not be equated with total flexibility. The monitoring of environmental criteria, ESG information requirements, contractual conditions, and prudential constraints can frame the financing relationship. Hypothesis 2 is thus considered partially corroborated: potentially broader accessibility is consistent with the characteristics of banking intermediation, whereas flexibility remains conditioned by the requirements of the financing.

From a theoretical standpoint, the principal contribution of this research lies in the articulation of three complementary perspectives. Pecking Order Theory helps shed light on the role of banking intermediation in financing choices; signaling theory highlights the informational and reputational dimensions associated with green finance instruments; whereas the institutional approach explains the growing influence of regulatory frameworks, professional standards, and stakeholder expectations. The study thus demonstrates that the trade-off between green bonds and sustainable bank credit cannot be reduced to a simple comparison of financing costs, but must integrate organizational capacities, informational requirements, governance modalities, and institutional conditions.

From a managerial perspective, the results suggest that no single instrument can be considered universally superior. The choice must be founded on the alignment between the firm's characteristics and those of the targeted financing. Large enterprises possessing significant ESG and informational capacities can view green bonds as a means to diversify their funding sources and valorize their environmental commitment. SMEs and mid-tier companies (ETIs) can, when eligibility and solvency criteria are satisfied, favor sustainable bank credit while progressively reinforcing their capacities to produce and communicate environmental information.

This research nevertheless presents several limitations. First, the Moroccan sustainable finance market remains relatively recent, which limits the availability of homogeneous and comparable data, notably for the quantitative evaluation of the greenium and the direct comparison of the costs of various instruments. Second, limited access to confidential data regarding bank financing reduces the ability to precisely compare the contractual conditions of sustainable credits with those of bond issuances. Finally, the adopted documentary approach does not allow for the establishment of causal relationships or the statistical measurement of the effect of a financing instrument choice on the financial or environmental performance of firms.

These limitations open several avenues for future research. Subsequent work could mobilize longitudinal data to evaluate the effect of green financing on the financial and environmental performance of Moroccan enterprises. Sectoral analyses would also make it possible to identify differences tied to carbon intensity and the transition needs specific to each activity. Finally, the empirical study of the greenium on the Moroccan market, the analysis of green securitization, the role of fintechs, and the complementarities between Islamic finance and sustainable finance constitute promising avenues for deepening the understanding of the financing mechanisms driving an inclusive ecological transition.

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