Redepp, v. 8, n. 1, p. 48-57, 2024

Revista de Desenvolvimento e Políticas Públicas

Recent perspectives on wind energy financing in Brazil

Perspectivas Recentes sobre o Financiamento da Energia Eólica no Brasil

Filipe de Castro Vieira [a] Luiz Fernando de Paula [b]

RESUMO

O presente artigo objetiva analisar a dinâmica e as características do financiamento da energia eólica no Brasil, destacando a atuação de seus principais agentes e buscando avaliar a hipótese de substituição dos bancos de desenvolvimento (BD) pelo mercado de capitais.

Palavras-chave: Bancos de Desenvolvimento; Energia Renovável; Energia Eólica; Financiamento Ambiental.

JEL: B59; G24; Q4.

ABSTRACT

This article aims to analyze the dynamics and characteristics of wind energy financing in Brazil, highlighting the role of its main actors and seeking to evaluate the hypothesis of the replacement of development banks (DBs) by the capital markets.

Keywords: Development banks; renewable energy; wind energy; environmental financing

Submetido em: 10-11-2024.
Aceito em: 20-12-2024.

[a] PhD Candidate in Economics at the Universidade Federal do Rio de Janeiro (PPGE/UFRJ). E-mail: filipe.dc.vieira@gmail.com

[b] Professor of Economics at the Universidade Federal do Rio de Janeiro (IE/UFRJ), and Researcher of CNPq and FAPERJ. Email:. luizfpaula@terra.com.br

DOI: 10.31061/redepp.v8n1.48-57
ISSN: 2447-360X

1. Introduction

In Brazil, the wind energy sector, in particular, has gained prominence, with an increase in its share of Brazil's electricity matrix. From 2010 onwards, the wind sector saw an acceleration in its investment rate and, consequently, its demand for financing. In this context, the National Bank for Economic and Social Development (in Portuguese Banco Nacional de Desenvolvimento Econômico e Social - BNDES)—a large federal development bank—became the main financier, being virtually the only entity operating in this segment until the mid-2010s.

However, transformations in Brazil's long-term financing market have resulted in a relative weakening of BNDES due to changes in its financing strategies starting in 2016, particularly in infrastructure and sustainable energy financing. At the same time, there was a significant increase in the participation of the capital market in infrastructure financing, driven by the growth of incentivized debentures, leading some market analysts to hypothesize that the capital market was replacing the role of development banks (DBs).

Nevertheless, the role of another Brazilian development bank, the Northeast Bank of Brazil (in Portuguese Banco do Nordeste do Brasil - BNB) —a universal state-owner bank (federal government) operating as both a commercial and development bank in the Northeast region—, has been overlooked. Since 2017, BNB entered the wind energy financing market, leading the sector for a period and consolidating itself as a key financing source. On the other hand, despite its importance as a financier of sustainable infrastructure, the capital market maintained a modest role in the wind sector compared to DBs.

This paper aims to analyze the dynamics and characteristics of wind energy financing in Brazil, highlighting the role of its main actors and assessing the controversial hypothesis of the capital market replacing development banks. Through quantitative and qualitative analysis of sustainable energy financing, focusing on the wind sector, it is argued that development banks continue to prevail in the financing system for the climate transition, especially for renewable energy.

In addition to this introduction, the paper is divided into three sections. Section 2 examines recent transformations in Brazil's long-term financing market, while Section 3 provides an overview of the wind energy financing market. Section 4 summarizes some interpretations of recent trends in wind energy financing and presents key arguments against the substitution hypothesis. Finally, Section 5 offers concluding remarks for the paper.

2. Recent changes in Brazil’s development financing system

Recently, significant changes have been observed in Brazil’s long-term financing market. As a result of the political-economic crisis that began in 2014 and the subsequent impeachment of President Dilma Rousseff, there was a shift in economic policy direction starting with the Temer government, which adopted neoliberal policies, including a radical change in the management of BNDES that had a decisive impact on long-term financing. Historically the main agent of long-term financing in Brazil’s economy, BNDES, after a period of record financing growth from 2009 to 2013, went through a downsizing that resulted in a sharp reduction in its role.

During the Michel Temer government (2016-2022), there was a change in the understanding of development banks' role in a market economy, which is aligned with the theory of financial repression, according to which the main problem with financial repression in developing economies is the maintenance of artificially low subsidized interest rates. It was argued that BNDES had grown

too large during the 2009-2014 period—when it was used as a countercyclical policy instrument to sustain investment rates, with infrastructure financing being the main sector supported—and that this situation should be reversed in favor of more efficient resource allocation and the development of private financial intermediation.

The shift in BNDES management was accompanied by two key measures that contributed to its downsizing: the early repayment of National Treasury funds that made up the bank's assets and the replacement of the Long-Term Interest Rate (TJLP) with the Long-Term Rate (TLP). The former drastically reduced the resources available for BNDES to make disbursements. The latter replaced a subsidized rate[1] (TJLP) that served as a reference for loans with one determined by the market (TLP), thus eliminating the public policy component from the bank's reference rate . These changes were reflected in disbursed volumes, with a sharp contraction starting in 2016 (Figure 1).

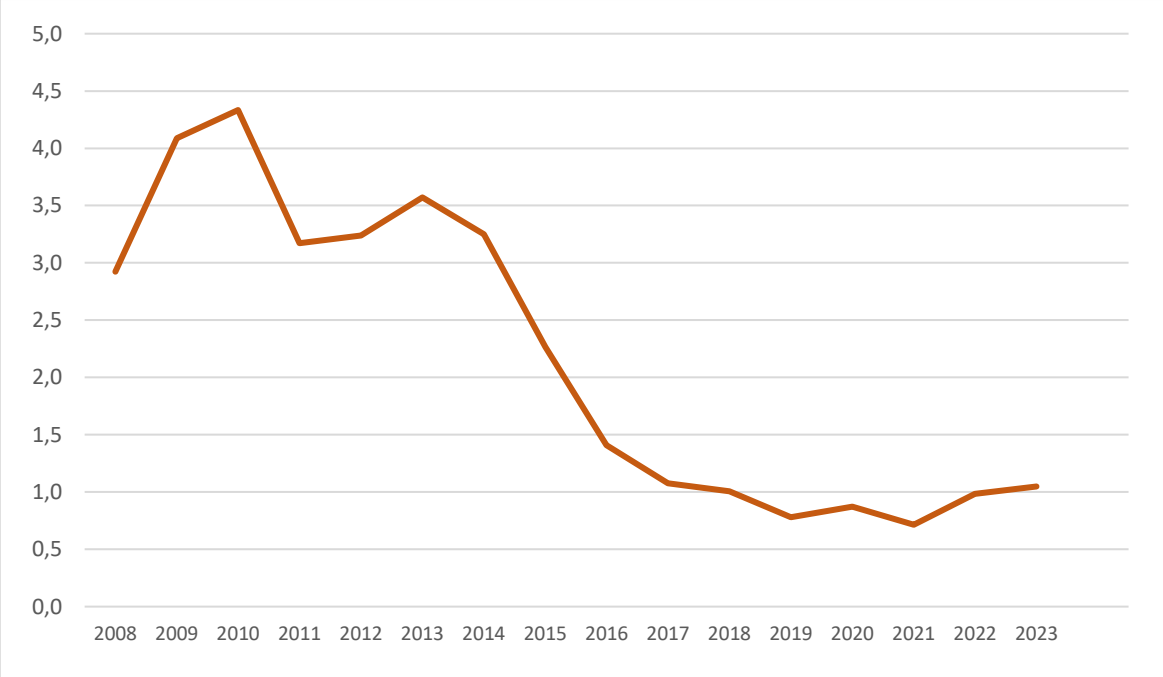

Figure 1. BNDES' disbursement as percentage of GDP – 2008-2023
Source: Authors' elaboration with data from BNDES and IBGE, 2024.

The significant reduction in BNDES disbursements was also observed in infrastructure financing, as shown in Figure 7. In just two years, there was a 68% reduction in the volume of financing granted to infrastructure projects funded by BNDES. In parallel, there was a consistent increase in the capital market's participation in infrastructure financing, a process that resulted from the creation of Incentivized Debentures through Law 12,431 of 2011. With the justification of

[1] The Provisional Measure (MP) No. 777 of 2006 (later transformed in Law 13,483 of 09/21/2027) by the Senate established the Long-Term Rate (TLP) as the base rate for loans granted by BNDES, replacing the TJLP. From 1994 until July 2018, the revenues from the Worker Support Fund (in Portuguese "Fundo de Amparo ao Trabalhador", the main source of resources for BNDES) that entered BNDES were remunerated by the Long-Term Interest Rates (TJLP), a floating rate that applied during the implementation of projects, determined and managed by the National Monetary Council (CMN), and generally yielded lower interest rates than market ones. With the measure, a five-year period was established to complete the transition from TJLP to TLP, which occurred in 2023. Currently, the TLP follows the risk-free market rates of government bonds, added to the Extended National Consumer Price Index (IPCA).

creating an alternative long-term financing route for infrastructure projects, which had previously been almost entirely dominated by BNDES, the government began granting income tax exemptions and reductions for individuals.

This innovation proved to be an important channel for boosting infrastructure projects via the capital market, significantly increasing its participation in sector financing. In this context, the hypothesis arose in public debate that BNDES was being replaced by the capital market (TORRES FILHO et al., 2021). Indeed, Figure 2 shows a sharp rise in volumes issued through Incentivized Debentures, followed by a period of reduced disbursements by BNDES.

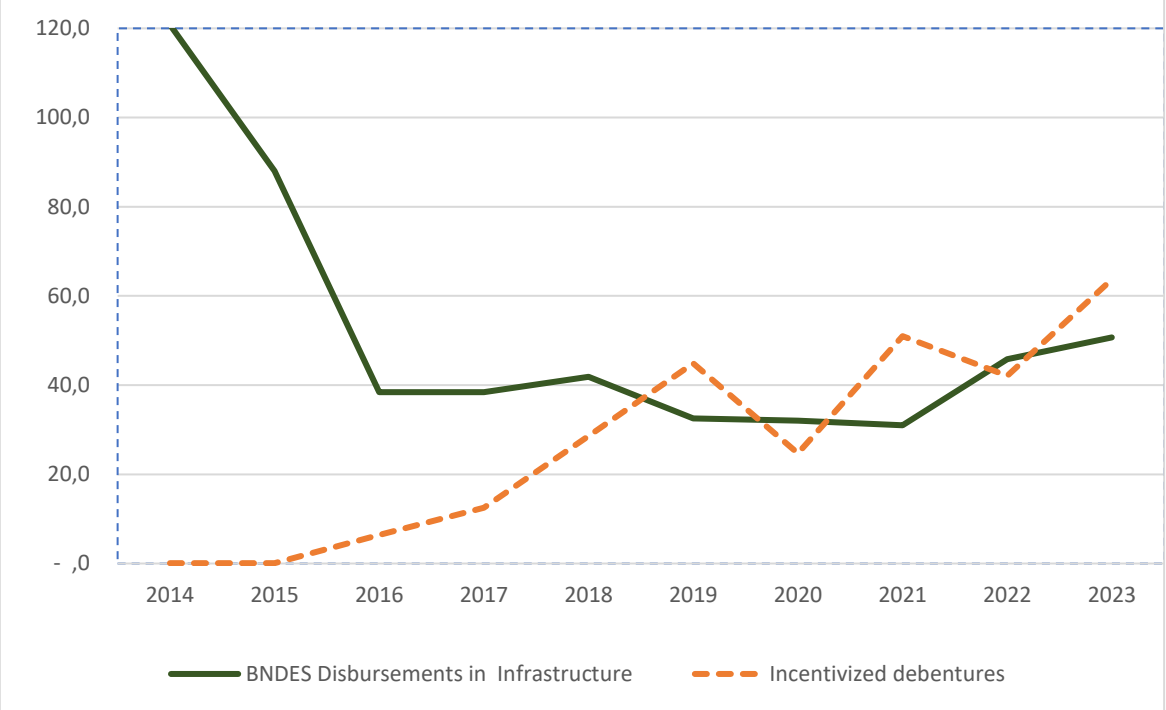

Figure 2. BNDES disbursements in infrastructure and incentivized debentures – R$ billion of December 2023*)
Source: Authors' elaboration with data from BNDES and ANBIMA.
(*) Deflated by IPCA.

At first glance, through a purely quantitative analysis, this scenario seems to confirm the substitution hypothesis. However, in contrast, Barboza et al. (2023) argue that the relationship between BNDES and the capital market is only partial[2]. Moreover, according to Teixeira et al. (2024), the financing of sustainable infrastructure through private intermediation by banks and the capital market is inefficient in terms of raising investment levels. According to these authors, citing the Brazilian Infrastructure and Base Industry Association (2022), in 2021 "there was a [financing]

[2] The authors present four main points that contrast with the hypothesis of substitution: more than 200,000 small and medium-sized enterprises stopped receiving financing from BNDES, while the capital market expanded with just over 700 issuers, generally large companies; the funds raised in the capital market are primarily used for working capital and refinancing liabilities, while those of BNDES are for productive investment; the terms offered by BNDES are significantly longer; the capital market behaves pro-cyclically, while BNDES has historically served as an important counter-cyclical policy instrument.

gap of 2.6% of GDP to reach the necessary 4.3% deemed ideal" (TEIXEIRA et al., 2024, p. 119-120).

From a qualitative standpoint, it is observed that in many aspects there was no replacement of financing previously provided by BNDES with that from the capital market. For example, in the renewable energy market and particularly in the wind sector, development banks (DBs) remained the primary financiers. Furthermore, during the period when Brazil's primary sustainable infrastructure financier, BNDES, reduced its role, there was a decline followed by stagnation in investment levels in the sector, despite the need for an acceleration in its rate, as demonstrated by Teixeira et al. (2024, p. 120).

3. Brief overview of the wind energy sector financing market[3]

As an emerging sector with positive externalities, the renewable energy sector typically receives special attention from governments due to the consensus on the need to stimulate the energy transition. In Brazil, one of the main drivers of renewable energy sector growth is BNDES, which has proven to be a fundamental public policy tool. Chan and Freitas (2021) and Ferraz et al. (2022) emphasize the importance of BNDES in the sector, particularly in promoting wind energy. BNDES has largely been the main financing agent, improving its operations through governance practices and financial innovations (RIANO et al., 2022).

Overall, the wind energy financing market has fluctuated significantly, and recently it has been experiencing a period of slowdown due to several factors. Market analysts point out that the main causes of the slowdown in 2022 and 2023 are high long-term interest rates, high CAPEX costs, and lower short- and long-term energy prices (RUIZ, 2024). After record financing volumes of approximately BRL 15 billion and BRL 16 billion in 2017 and 2019, respectively, there was a roughly 50% reduction in financing in 2020 due to the COVID-19 pandemic. The financial market showed signs of recovery in the following year, reaching around BRL 11.2 billion, but fell again in 2022-2023, stabilizing at around BRL 8 billion per year (Figure 3).

In the wake of changes in BNDES management during the Temer administration, the bank's relative weight in total wind energy sector financing decreased between 2018 and 2020. Nonetheless, BNDES was responsible for approximately 53% of financing in the wind sector between 2016 and 2023, totaling around BRL 41.7 billion, with 2017 standing out, when BRL 13 billion was contracted from the bank (BNDES, 2024a).

Historically, BNDES financing conditions were characterized by interest rates below market rates and extended terms. However, with the transition to TLP, the bank lost competitiveness, with its rates aligning with market rates. Final interest rates in the wind energy sector consist of a bank remuneration rate—starting at 1.5% per year—added to the TLP (BNDES, 2024b).

On the other hand, concerning the wind energy sector and considering the transition to TLP, since 2019, there has been an extension of amortization periods. In the 2016-2018 period, the average financing term was around 16 years, while from 2019 to 2023, it increased to around 20 years. Therefore, while BNDES lost some competitiveness due to the increased financial cost of its loans, it recovered some attractiveness by lengthening the amortization periods.

[3] The values considered in this section are deflated by the Extended National Consumer Price Index - IPCA at December 2023 prices.

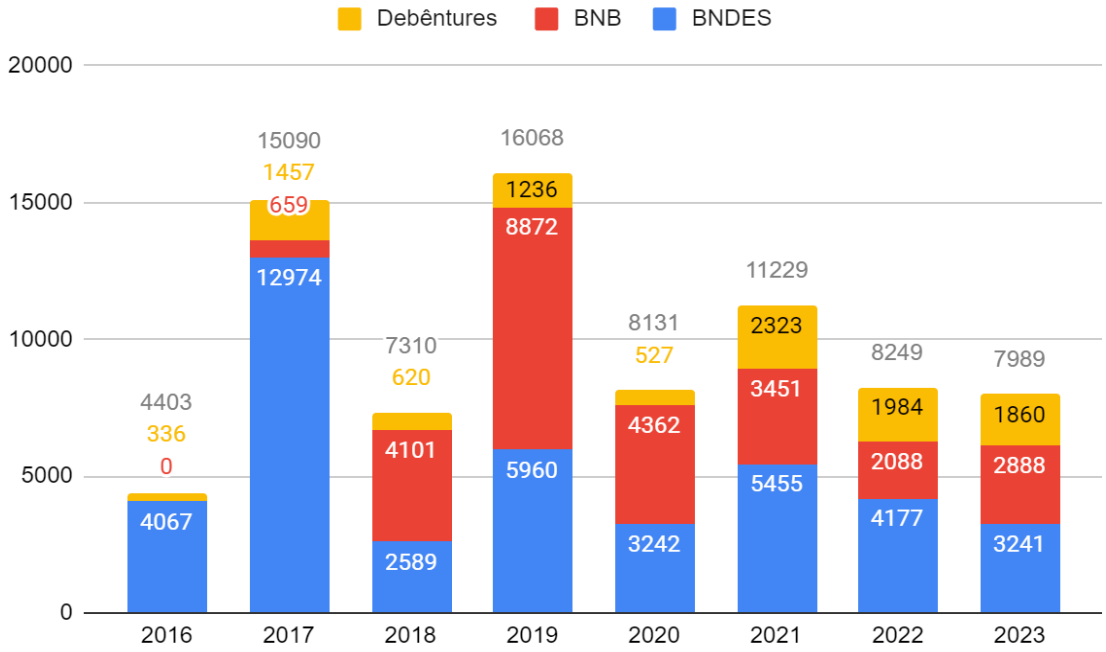

Figure 3. Wind energy financing market - R$ millions at December 2023 prices*
Source: Authors' elaboration with data from BNDES, BNB and ANBIMA.
(*) Deflated by IPCA.

Lastly, the average contract size between 2021 and 2023 was around BRL 435.2 million, the highest in the sector of wind energy. This is partly explained by the high leverage allowed by the bank's operations, which cover up to 80% of projects without limitations on eligible items. The high average contract size also reflects the profile of borrowers, which are generally large companies and large-scale projects. Additionally, it is important to note that BNDES also acts through the subscription of debentures issued by sector companies, having gained prominence in recent operations in the domestic market.

Until 2018, BNDES was virtually the only financing agent in the renewable energy market, particularly in the wind sector. This scenario changed with the involvement of another financing wind energy projects. BNB became the main financier in this market between 2018 and 2020, maintaining a prominent position since then. Between 2017 and 2023, BRL 26.4 billion in credit operations were contracted by the wind sector with BNB (BNB, 2024a), representing around 36% of financing in that period. The entry of BNB into wind energy financing more than compensated for BNDES's reduced participation between 2018 and 2020 (Figure 8).

The main advantages of BNB financing include terms that can extend up to 24 years and, especially, interest rates, which are lower than the rest of the market (Figure 4). This is due to the source of funds used by the bank, the Constitutional Fund for Financing the Northeast (in Portuguese Fundo Constitucional de Financiamento do Nordeste - FNE[4]), which is used as a public policy tool to reduce regional inequality and promote sustainable development, consequently offering

[4] Provided with federal resources, the FNE finances long-term investments and, additionally, working capital or operating costs, covering various sectors of the economy, such as agriculture, industry, agro-industry, tourism, trade, services, culture, and infrastructure, among others.

subsidized rates. Through the FNE-Verde program[5], funds are used to promote the development of sectors such as renewable energy in the Northeast—where most wind energy generation in Brazil is concentrated (BNB, 2024b).

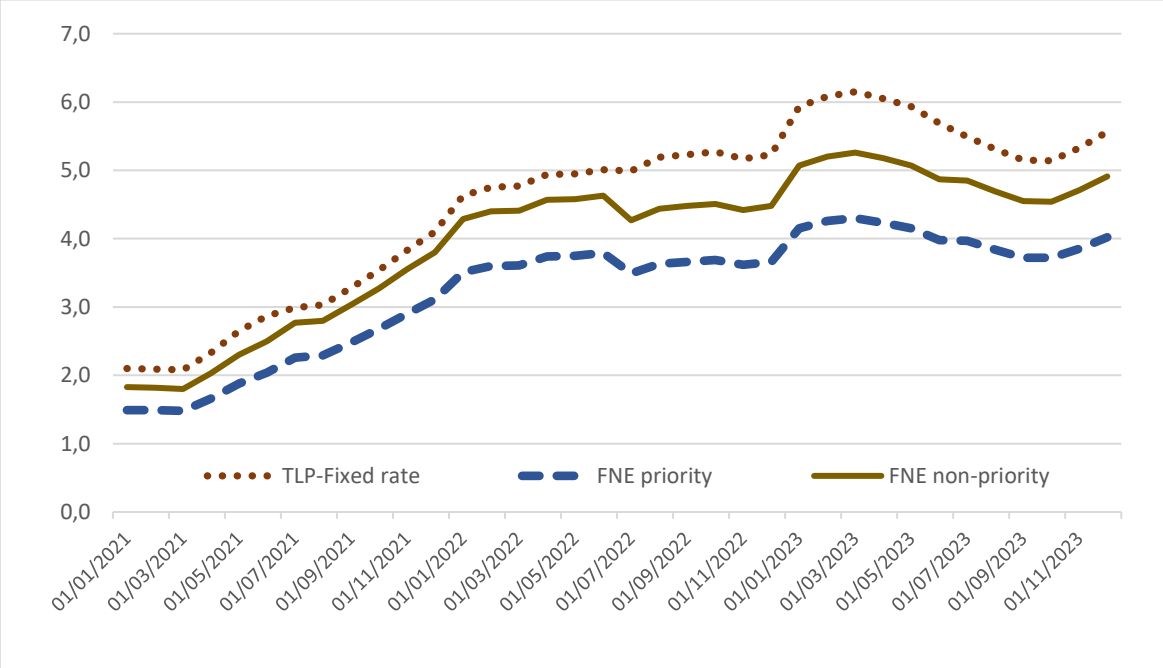

Figure 4. Interest rates of BNDES-TLP and BNB-FNE* (percentage p.a.)
Source: Authors' elaboration with data from BNDES and BNB.
*The priority and non-priority FNE rates refer to projects classified as priority and non-priority, primarily depending on the municipality where the project will be developed.

In parallel with the significant increase in BNB's participation in wind energy financing, the capital market, through Incentivized Debentures, also increased its role. From 2017 to 2023, approximately BRL 10.3 billion was raised through Incentivized Debentures [6](ANBIMA, 2024), representing about 14% of the total financing in the sector. The growth of the capital market in wind sector financing resulted from the Brazilian government's creation of these long-term securities.

4. Substitution or Complementarity?

Analytically, the financing profiles of the different sources of financing discussed in this paper vary (Table 1). In terms of target market, BNB is the only institution that serves smaller companies. In 2023, 36% of its contracts were directed to micro, small, and medium-sized enterprises (MSMEs). BNDES only allocated a significant portion of its financing to MSMEs in 2016—around 10%—but has since focused exclusively on large companies. Similarly, the capital market has not financed MSMEs in the wind sector, as it requires a minimum scale for debt securities

[5] This program aims to develop enterprises and economic activities that promote the preservation, conservation, control, and recovery of the environment, focusing on sustainability and the competitiveness of companies and production chains.
[6] In January 9th, 2024, Law 14,801/24 was sanctioned by the Brazilian President, creating "infrastructure debentures". The main difference between this bond and incentivized debentures is that the new debentures benefit the issuing companies in terms of income tax, while in incentivized debentures the tax benefit goes to the investor.

to be operational. Large companies typically dominate this market, largely due to the high investment amounts required for projects. Nonetheless, there is also a niche in which MSMEs operate, requiring special financing conditions, and they, as seen, are served by DBs, mainly BNB. This dynamic is mirrored when analyzing infrastructure financing in general, as noted by Barboza et al. (2023).

Another significant difference in financing profiles is term length. Although Incentivized Debentures have occasionally issued bonds with amortization terms similar to those of DBs, the average terms offered by the capital market (17 years) are shorter than those offered by BNB and BNDES, which are 23 and 20 years, respectively, for the 2021-2023 period. Additionally, BNB and BNDES offer grace periods—BNB up to eight years, and BNDES up to six months after the commercial operation of projects begins.

Table 1. Wind Sector Financing Profile by Source

	BNDES	**BNB**	**Capital market**
Financing tool	Finem	FNE-Verde	Incentivized debentures
Size	Large	Micro/Small/Medium/Large	Large
Amortization			
Maximun term	24 years	24 years	–
Average term	20 years	23 years	17 years
Grace period	Up to 6 months after the beginning of the project	Up to 8 years	–
Interest rate	6.60%	3.86%	6.49%
Ticket Size (avg)	BRL435.2 million	BRL110.4 million	BRL 336.5 million
Leverage of the projects	Up to 80%	Up to50%	–
Financing limit	100% of financeable items	Up to BRL 150 million per economic group	–

Source: Authors' elaboration with data from BNDES, BNB and Anbima

Regarding the average ticket size of operations, there is a difference in BNB's policy compared to other institutions. The 50% leverage limit, the BRL 150 million cap per economic group, and MSME support mean that BNB's average contract size is smaller than that of other sources. On average, the bank's contracts amounted to BRL 110.4 million between 2021 and 2023, compared to BRL 435.2 million for BNDES and BRL 336.5 million for Debentures.

Finally, another key differentiator is interest rates. Notably, the rates offered by BNB are significantly lower than those in the rest of the market. The average interest rates for wind sector financing by BNDES, BNB, and the capital market were 6.6%, 3.86%, and 6.49%, respectively, in the 2021-2023 period. This asymmetry gives BNB a wide competitive advantage, though it is worth

noting that the limited budget of the FNE-Verde Program, which was around BRL 10 billion in 2023 (BNB, 2023), narrows the credit opportunities for borrowers.

Therefore, the substitution hypothesis proves to be fragile, both regarding long-term financing for the infrastructure sector and its subsectors, such as renewable energy. As argued by Barboza et al. (2023), when discussing infrastructure financing in Brazil, considering the dynamics of financing the wind sector from a qualitative perspective, the capital market does not replace the role of development banks (DBs), as it does not cover SMEs and also offers higher interest rates and shorter terms. Moreover, DBs have remained leaders in this market. When BNDES scaled back its operations between 2018 and 2020, BNB filled a gap in wind energy financing, preventing a contraction in credit market at a time of high credit demand. Starting in 2021, BNDES resumed its leadership, accounting for approximately 47% of the total volume financed from 2021 to 2023. Between 2016 and 2023, DBs accounted for about 87% of total financing for wind energy projects.

While the capital market has emerged as an important source of financing for wind energy activities, its role is restrictive and insufficient to replace DBs. Structural and cyclical factors hinder greater growth of the capital market in financing sustainable infrastructure in Brazil. The history of high real interest rates, partly due to the inflationary trauma experienced in the 1980s and 1990s and the prevalence of a conservative convention of maintaining high interest rates by the Central Bank of Brazil (BRESSER PEREIRA et al, 2022), limits the development of the private securities market. This is because lower-risk assets frequently become more attractive, such as government bonds indexed to Selic or IPCA, compared to private ones.

Recently, between 2017 and 2020, the reduction in Brazil's basic interest rate, the Selic rate set by the Central Bank, followed a downward trajectory, making Incentivized Debentures more attractive (TORRES FILHO et al, 2021). However, there was a reversal of this trend, with the basic interest rate rising again from 2021, threatening the growth trajectory of the Debentures. In general, low interest rates seem to be a *sine qua non* condition for a thriving capital market.

Additionally, the capital market in developing countries, like Brazil, faces difficulties in gaining depth and liquidity due to the high macroeconomic instability of the economy and competition from government bonds, which combine liquidity and profitability. This is exacerbated by Brazil’s broad capital account liberalization in the 1990s, leading to high volatility in capital flows, affecting both exchange and interest rates.

5. Conclusion

Given our previous analysis, we argue that the hypothesis of DB substitution, particularly BNDES, by the capital market is premature and fragile. The relationship between DBs and the capital market is complementary, as there are segments not adequately covered by the capital market, such as environmental infrastructure, wind energy activities, and SMEs. It is worth noting that DBs, particularly BNDES, can functionally promote the development of the capital market, as they are increasingly subscribing to debentures related to infrastructure.

Furthermore, during times of difficulty for the renewable energy sector, such as the challenges faced by the wind sector in 2023-2024, when high interest rates discourage the capital market from serving borrowers, the countercyclical role of DBs is essential to sustain activity of this sector.

In light of the urgency of climate transition, it is premature to place the responsibility for leading this transition on private financing. The profile of sustainable infrastructure projects—high

uncertainty and long maturation periods—is not compatible with the current development of Brazil's capital market, which still lacks density in developing long-term financial instruments.

Finally, this paper does not advocate for sidelining efforts to expand the capital market's capacity to finance the climate and energy transition. We understand that this market can be highly valuable, complementing DBs, including leveraging their accumulated expertise in risk assessment, project structuring, as well as cooperation in the structuring and underwriting of private securities. Nor do we consider DBs as a second-best option or mere mitigators of market failures. On the contrary, these institutions have already demonstrated their technical capacity, accumulated expertise, and vocation to be essential components in the process of economic development, with dynamic and allocative efficiency, creating and shaping markets and aligned with the concepts of "mission-oriented" and "patient capital" (MAZZUCATO; PENNA, 2016).

References

ANBIMA. **Projetos e emissões incentivadas (Lei 12.431).** 2024 Disponível em: <https://data.anbima.com.br/publicacoes/projetos-e-emissoes-incentivadas> Acesso: Setembro 2024.

BARBOZA, R. et al. O BNDES e o mercado de capitais: esclarecimentos para o debate público no Brasil. **Texto para Discussão BNDES**, n. 153, ago. 2023.

BNB. **Contratações FNE**. 2024a Disponível em: <https://www.bnb.gov.br/acesso-a-informacao/dados-de-contratacoes/contratacoes-fne> Acesso em: Setembro/2024.

BNB. **FNE Verde**. 2024b Disponível em: <https://bnb.gov.br/fne-verde> Acesso em: Setembro/2024.

BNDES. Operações contratadas na forma direta e indireta não automática. 2024a. Disponível em: <https://www.bndes.gov.br/wps/portal/site/home/transparencia/centraldedownloads> Acesso em: Setembro/2024.

BNDES. **BNDES Finem - Geração de Energia**. 2024b. Disponível em: <https://www.bndes.gov.br/wps/portal/site/home/financiamento/produto/bndes-finem-energia> Acesso em: Setembro/2024.

BRESSER-PEREIRA, Luiz Carlos; PAULA, Luiz Fernando de; BRUNO, Miguel. Financialization, coalition of interests and interest rate in Brazil. **Revue de la régulation. Capitalisme, institutions, pouvoirs**, n. 27, 2020. DOI: 10.4000/regulation.16636

CHAN, I.; FREITAS, M. O papel dos bancos de desenvolvimento na Agenda 2030: o caso do BNDES. **Revista do BNDES**, v. 28, n. 56, p. 11-54. DOI: 10.1590/0101-31572022-3303

FERRAZ, João Carlos; RAMOS, Luma; PLATTEK, Bruno. Development finance innovations and conditioning factors: The case of the Brazilian Development Bank and sustainable industries. **Brazilian Journal of Political Economy**, v. 42, p. 977-997, 2022.

MAZZUCATO, Mariana; PENNA, Caetano CR. Beyond market failures: The market creating and shaping roles of state investment banks. **Journal of economic policy reform**, v. 19, n. 4, p. 305-326, 2016. DOI: 10.1080/17487870.2016.1216416

RIAÑO, Maria Alejandra et al. Scaling up public development banks' transformative alignment with the 2030 agenda for sustainable development. In: GRIFFITH-JONES et al. (Eds.) **Development and Public Banks**. London: Routledge, 2022. p. 96-127.

TORRES, E.; MARTINS, N.; MACAHYBA, L. **Crédito corporativo de longo prazo no Brasil: do BNDES à intermediação privada?** Texto para Discussão IE/UFRJ, n. 12/2021, 2021.