EFFECTIVENESS report 2018

BNDES

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The Brazilian Development Bank

EFFECTIVENESS report 2018

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BNDES

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MESSAGE FROM THE PRESIDENT

The Brazilian Development Bank (BNDES), created in 1952, is the main instrument for implementing the Federal Government's investment policy. Since its creation, the Bank has changed its operations several times. Now, it will be no different.

BNDES's current aim involves supporting the public sector in the development of projects and inducing private capital in spaces previously occupied almost exclusively by public credit. This is no small task. It requires articulation with states and municipalities, joint action with the Federal Government's privatization, incentives for sustainable development projects and concern for the impact of each project. Thus, we seek to be the Brazilian State's service bank.

All this work has to be perceived in the daily life of each of us Brazilians. That is why the effectiveness of BNDES's support needs to be constantly evaluated. We need not only to answer the demand of Brazilian society for greater transparency, but also demonstrate how we promote development in its most diverse dimensions: economic, social, environmental and institutional.

The process of monitoring and evaluating public policies is a basic principle of managers who value the use of taxpayer money. In the context of the search for fiscal equilibrium, we aim to improve the quality of the allocation of public resources through BNDES, explaining and measuring the expected and observed effects of its support.

This third edition of the *Effectiveness Report* reinforces the objectives that guide the bank's monitoring and evaluation process: transparency, accountability to society, efficiency in the allocation of public resources and organizational learning.

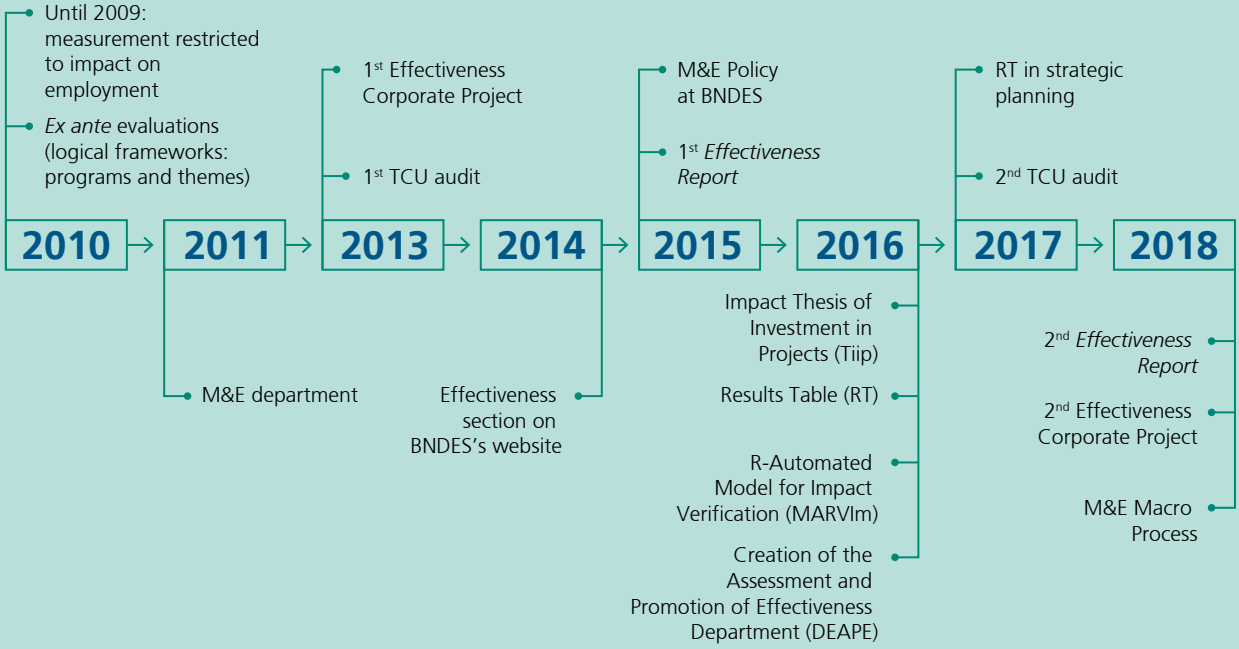
We want to be less bank and more development, transforming the lives of generations of Brazilians.

Gustavo Henrique Moreira Montezano
President of BNDES

EXECUTIVE SUMMARY

BNDES has made great efforts regarding the monitoring and evaluation (M&E) agenda, always with the aim of increasing its impact on national development and strengthening accountability to society. In January 2018, the formalization of an Effectiveness Promotion System represented an important step towards the culture of effectiveness at BNDES. This process is the result of a series of internal and external measures taken over the last decade and accelerated from 2016.

HISTORY OF MONITORING AND EVALUATION AT BNDES



Source: Elaborated by the authors.

The 2017-2018 biennium, covered in this report, was marked by the stabilization of BNDES's disbursements to a new level (close to R$ 70 billion), adoption of the Long-Term Rate (TLP), and finalization and execution of a new strategic planning of the Bank. While in 2015-2016 there was a sharp drop in BNDES's disbursements, 2017-2018 presented relative stability. In 2018, the disbursement-gross domestic product (GDP) ratio was 1.02%, while in 2017 it reached 1.08%.

The participation of BNDES's disbursements in the financing of gross fixed capital formation (GFCF) fell from 11.9% in 2015 to 5.6% in 2018. The high support percentages in previous periods represent the Bank's countercyclical performance. With the end of this cycle, the contraction in the metrics presented was already expected.

The reduction in disbursements was reflected in the drop in the number of companies supported: from 277,000 in 2014 to 65,400 in 2018, and, in the last year, 97% of which were micro, small and medium-sized enterprises (MSME). The participation of MSMEs in the amount disbursed by the Bank continued to grow, reaching 45% in 2018, in comparison with 27% in 2015. In 2017, BNDES's support reached 2.8% of the existing firms in the country. In the same year, 13.2% of large Brazilian companies were supported by the Bank, while the percentage was 11% for medium-sized companies, 6.2% for small-sized companies, and 1.8% for microenterprises.

When analyzing BNDES's contribution to the energy sector, it is worth highlighting an increase in electric power generation capacity of 11,099 MW between 2017 and 2018, which represented about 76% of all capacity added in the period in the country. The capacity added by supported hydro and small hydro power plants represented 63% of the total delivered, with 6,955 MW, while the wind power segment contributed with 3,305 MW. In turn, solar power projects totaled 439 MW, and thermal power projects, 400 MW. In the same period, there was an expansion of 7,678 km of power transmission network as a result of investments made possible with BNDES's resources, about 72% of all advance of lines observed in the country in the period. In the power distribution segment, the supported investment plans foresee implementation or replacement of almost 40,000 km of networks.

BNDES also performed evaluation studies and the sale of six federalized power distributors under Eletrobras management: Amazonas Energia, Boa Vista Energia, Eletroacre, Ceron, Cepisa and Ceal. Currently, these distributors are responsible for serving 13 million inhabitants, or 4.2 million consumer units. Among the main results achieved, it is possible to highlight: (i) end of needs of funds from the Eletrobras System, which had contributed with approximately R$ 25 billion since the incorporation of the distributors into the group, compromising their capacity of investing in generation

and transmission activities; (ii) Eletrobras' balance sheet relief, which transferred R$ 9.3 billion in debt to the new controlling shareholders; (iii) exclusion of R$ 1 billion in debt that would be borne by consumers through tariffs and assumed by new power distribution concessionaires; and (iv) initial investment of R$ 2.4 billion by the new controlling shareholders.

In 2017 and 2018, BNDES approved financial support for eight railway projects expected to replace almost 2,000 railway sleepers. There is also expectation of acquisition of 40 locomotives and renovation or modernization of about 9,000 others, acquisition of more than 2,200 wagons, and renovation or modernization of 25,687 wagons. The number of locomotives to be purchased is equivalent to about a quarter of the total built in 2017-2018, and the number of wagons corresponds to 40% of the total built in the same period.

In the road segment, support was approved for three projects providing for the duplication of 306 km of roads, paving of 18 km of new stretches and restoration or reconstruction of 434 km. In the case of airports, the four concessionaires supported in the period recorded a movement of about 36.8 million departures and arrivals in 2018, a number that represents 17.5% of all the movement of Brazilian airports. The investment plans will enable construction or renovation of 21 km of landing strips, expansion or renovation of approximately 533,000 m^2 of aircraft patio area and installation of 56 new boarding bridges, which will contribute to the expansion in traffic capacity. There are also plans to expand departure lounges by 30,410 m^2, construction or modernization of 152 check-in positions, just over 7,000 new parking spaces, and expansion of airport shopping areas by 46,758 m^2.

In 2017 and 2018, BNDES supported a significant cycle of investments in sanitation, totaling 17 projects. There is expectation of increase in water harvesting capacity of 145 liters per second, increase in water reservoir capacity of 16.2 million liters, improvements to the distribution network with 550 km length planned and replacement of another 118 km. Approximately 3 million water meters are expected to be delivered, with around 315,000 new installations and replacement of 2,689 old or obsolete units. Investments will also enable nearly 95,000 new water connections to be made. About 320,700 people are estimated to benefit from these investments.

The expected advance in deliverables related to sewage is also significant, as follows: increase in sewage treatment capacity of 2,874 liters per second; expansion of network length, sewage interceptors and collectors by nearly 2,700 km, and replacement of 136 km of network. Almost 260,000 new sewage connections are also expected to take place, which corresponds to an estimated access of more than 943,000 people to the system.

In the grain production segment, the diagnosis in Brazil points to a deficit of storage capacity of these foodstuffs. Twenty-four projects were approved in 2017 and 2018 related to storage, animal food production and soybean processing, covering the renovation of 63 warehouses of agricultural products, increase of storage capacity of 943,000 tons of grains, increase of production capacity of 322,000 tons per year, and increase in soybean processing capacity of about 1.9 million tons per year.

In the planted forest segment, in 2017 and 2018 BNDES supported three investment plans of pulp and paper producers that program to plant 78,600 hectares of forests – corresponding to 1.08% of the total forests planted in Brazil at the end of 2016. In the oil and gas sector, the Companhia de Gás de Santa Catarina's project was approved, which includes expansion, saturation and technical and structural improvements in the state's natural gas distribution network. Investments financed by BNDES aim to expand the network length by 156 km and then, by 2020, increase the volume distributed by 269,000 m3 per day to industries, businesses, vehicular natural gas (VNG) stations, and homes. In the case of housing-only services, the project increased distribution would be enough to supply about 727,000 homes.

In 2017 and 2018, in the naval segment, four projects were supported to repair 28 oil rig support vessels. BNDES is also financing three projects for the construction of 18 port support vessels and one repair project for 12 cabotage vessels. Finally, in 2017, BNDES supported the construction of a shipyard in the state of Rio de Janeiro, which will be used to repair and maintain vessels, with a repair capacity of 24 vessels per year.

In the audiovisual segment, 11 projects were approved in the period, which foresee the implementation of 25 movie theaters (eight

in Pernambuco, four in Mato Grosso, and 13 in Santa Catarina), the development and production of seven films, and plans of distribution of 36 films and 56-hour animation content for TV and other platforms.

In public education, it is important to highlight the performance of BNDES in partnership with the Ministry of Education, the Lemann Foundation and the Itaú Social Foundation, with regard to the public call Educação Conectada (Connected Education). Under this initiative, projects aimed at the adoption of technology as a pedagogical tool in public elementary schools will be supported. In 2018, four states (Tocantins, Rio Grande do Sul, Sergipe, and Paraíba) contracted projects under the call – and it is expected that more states will be considered in 2019. As some of their main deliverables expected, the projects include feasibility of connecting 435 schools to the broadband Internet network, acquisition of 3,629 electronic devices for pedagogical use, training of 7,837 people in pedagogical and technological activities, and review of 393 pedagogical political projects.

In projects supported in the health sector, an increase in drug production capacity by 130.5 million units per year ready for sale is expected. The investments supported will allow 16 new certifications or renewals of certifications for the producing companies. In addition to supporting the industrial companies that manufacture and develop medicines and medical and dental materials, BNDES has the promotion of investments in the provision of health services as an important performance guideline. In 2017-2018, five hospital expansion and modernization investment projects were approved, which seek, in relation to the structure, to provide 742 new hospital beds that are not part of the Unified Health System (SUS) – corresponding to 31% of the total number added in Brazil – and build 28 new surgery centers. With the investments, it is expected that the capacity of outpatient care will be increased by about 553,000 consultations per year, the hospitalization capacity will be increased by almost 68,000 patients per year, and that additional 24,400 surgeries will be performed per year.

With regard to the total set of innovative projects supported by BNDES in 2017 and 2018, seven new laboratories and research and development (R&D) centers are expected, totaling a constructed area of almost 189,000 m^2. Most of this planned area is due to the

construction of a 175,000 m² automotive test track. R&D infrastructure renovations are also supported, and five laboratories and research centers are expected to be renovated, totaling around 3,000 m². As a result of the innovative effort process of the supported companies, the expectation is that 165 new products will be launched in the market and 48 new production processes will be developed or implemented. With the innovative projects approved by BNDES in the period, 20 invention patent filings and seven utility model patents and industrial design registrations are expected to be generated.

BNDES also provides complementary guarantees to expand MSMEs access to credit, and it is responsible for managing the Investment Guarantee Fund (BNDES FGI), which currently has 27 partner financial institutions and supports operations in various financing lines and programs. In 2017-2018, the fund leveraged a total of R$ 1.6 billion in credit, with R$ 984.3 million in 2017 and R$ 628.5 million in 2018. In the biennium, there were 2,477 onlending operations guaranteed by BNDES FGI whose beneficiaries were new participants in the BNDES System (clients that had not been previously supported by the Bank) – 1,932 operations in 2017 and 545 in 2018. Since the fund was constituted, 62% of clients in onlending operations that were supported by the BNDES FGI had not contracted credit with BNDES previously, data that demonstrate the high potential of financial inclusion enabled by the guarantee.

In 2017 and 2018, the forest restoration projects supported by BNDES enabled the restoration of 2,466 hectares of vegetation distributed through the various techniques. Supported restorations are estimated to have captured about 247.5 thousand tons of carbon dioxide equivalent from the atmosphere, which corresponds to the 34-day emission of automobiles in the city of São Paulo, the largest in the country.

In addition to making deliverables via disbursements tangible, the BNDES Effectiveness Promotion System is committed to understanding whether and how these deliverables are capable of promoting economic, social and environmental development of Brazilians.

To this end, the M&E team maintains constant effort to map the impact assessments produced about BNDES, always with the intention of identifying best practices, internalizing the main findings,

and promoting effectiveness gains. In this edition, the *Effectiveness Report* presents a consolidated reading of 50 evaluations, 15 more than those available in the previous edition. Nevertheless, the overall conclusions regarding the impacts of BNDES have not changed. They point out that: (i) BNDES Exim financing positively affects companies' exports performance; (ii) financing for MSMEs presents robust evidence of positive impact on employment, exports and investment; and (iii) in general, BNDES is more effective in relation to measures related to firm growth (employment, investment and revenue) than to productivity measures.

It is worth mentioning that these conclusions are based on the work of 17 different institutions, and BNDES, Getulio Vargas Foundation (FGV) and the Institute for Applied Economic Research (Ipea) are the main ones. BNDES wants to work in partnership with other institutions in this effectiveness agenda. In this regard, the M&E department has directed efforts to enter into technical cooperation agreements that enable joint work and data to be provided to interested external evaluators. Examples of such efforts are the agreements signed with FGV, PUC-Rio, Inter-American Development Bank (IDB), and Ipea.

In addition to constantly mapping the body of evidence about BNDES, the M&E team also conducts and contracts a number of impact assessments, which seek primarily to address knowledge gaps and ways of doing business that are crucial to the Bank's contribution to national development. This report provides reviews for six recently produced evaluations.

In support for exports, using microdata from the Brazilian Institute of Geography and Statistics (IBGE), the BNDES's team evaluated the impacts of BNDES Exim Post-Shipment Services on the supply chain of goods and services – a segment that had not still been analyzed in any other work. The results indicate that the Bank's credit positively affected companies, with growth of revenue (around 5%), expansion of number of employees (4%) and payroll (5%).

Another assessment explores the impacts of BNDES's support on companies' innovative capacity. The results found show evidence of positive and significant effects on R&D expenditures and total innovative business expenditures.

The BNDES's M&E team also analyzed the impact of local content policy (LCP) – understood as the combination of funding with the local content rule. Although implemented since the 1970s, this policy had not yet been explored through causal inference techniques. The results estimated indicate a positive effect on manufacturers' industrial operations revenue (about 8%), accompanied by personnel cost expansion (12%). However, no effects on the purchase of inputs from manufacturers subject to local content policy could be found. These results are compatible with an LCP operating in an economy that already has an installed industrial park and therefore an established domestic supply chain.

The BNDES Card was also subject to a new impact assessment. In partnership with Ipea, the M&E team analyzed the local effects of product expansion. By analyzing impacts on micro-regions, the study differed from past assessments of the BNDES Card, which aimed at estimating effects on supported MSMEs. Aggregate analysis allowed the study of impacts that were difficult to measure when the analysis was made at the firm level. The results show that financing through the BNDES Card helps warm up the micro-regions labor market. It has been estimated that an increase of 1% in card credit, explained by the expansion of supply, causes an average increase of 0.1% in total micro-region employment.

The local effect of the wind farm installation was also the subject of an impact assessment, implemented using synthetic control. The analysis of 37 benefited municipalities between 2007 and 2014 showed a positive impact on the GDP *per capita* of the localities. However, the effects are more closely linked to the mobilization of resources for civil works and, therefore, to factors that are mostly observed in the short term.

The impact of the Program for Modernizing Tax Administration and Managing Basic Social Sectors (BNDES Pmat) on the financial health of Brazilian municipalities was also evaluated. Preliminary results found significant effects on the collection of municipalities in the Northeast – a median impact of up to 25.5% three years after financing.

At each biennial effectiveness promotion cycle, the M&E team commits to a set of impact assessments. In 2019-2020, the team will focus on four assessments: (i) promotion of the use of technology

in Brazilian education; (ii) MSMEs access to credit; (iii) BNDES contribution to sanitation challenges; and (iv) impacts of recent urban mobility works in the Rio de Janeiro Metropolitan Region.

All this effort on the M&E agenda makes BNDES's vision clear: to be recognized as Brazil's development bank for its relevance and effectiveness. Advancing in the dissemination of output and outcome indicators and in the integration between the learning produced by the Effectiveness Promotion System and the design of programs and products is expected. At the same time, the M&E agenda should also continue to contribute to the transparency agenda. Certainly, the maturation of the process of monitoring and evaluation in BNDES's culture will reinforce organizational learning, resulting in more efficient public policies to improve Brazilian citizens' lives.

CONTENTS

INTRODUCTION

In Brazil, the last decade has been characterized by a healthy increase in society's demand for more transparency and effectiveness in the use of public resources. Sharing these aspirations, BNDES intensified its monitoring and evaluation efforts. Throughout this process, the goal has always been to increase accountability to society and strengthen the Bank's organizational learning culture as a way of promoting systematic effectiveness gains.

To this end, the Bank has systematized its internal monitoring and evaluation processes, strengthened technical teams related to the theme, and significantly improved transparency actions – such as the active dissemination, through its website, of the data on each contracted operation. The results of this movement are palpable. Currently, all BNDES's activities rely on the *ex ante* definition of explicit output and outcome indicators, contributing to a performance that is increasingly based on the logic of effectiveness. Another aspect to be highlighted is the growth of external studies made to measure the impacts of BNDES on national development. In 2018 alone, 13 reviews were published – for comparison purposes, this number is higher than anything produced between 2007 and 2013. There has been great progress in the understanding of BNDES's impacts on the Brazilian economy. However, it should always be remembered that the effectiveness of an institution such as BNDES is a complex issue, especially due to the broad mandate determined by its statute:

> BNDES is the main instrument of execution of the Federal Government's investment policy, and its primary objective is to support programs, projects, works and services that relate to Brazil's economic and social development.

This document is BNDES's third *Effectiveness Report*. The first report covered the 2007-2014 period, while the second covered the 2015-2016 period. They provide detailed information about the results of operations supported by the Bank and their relative importance in the Brazilian economy. In this long period, the economic cycle is characterized by an initial phase of improvement, with the concomitant growth of BNDES's disbursements, followed by the largest economic crisis ever seen in the country. In current figures, the R$ 190 billion peak disbursed in 2013, against R$ 88 billion in 2016, is noteworthy. This represented a 53% drop in nominal values. These figures correspond to 3.6% and 1.4% of the gross domestic product

(GDP). Regardless of the analysis variable, BNDES's performance in 2016 was already quite different from that observed in 2013.

In this third report, the 2017-2018 period will be covered, marked by: (i) the stabilization of BNDES's disbursements around R$ 70 billion; (ii) the adoption of the Long Term Rate (TLP), replacing the Long Term Interest Rate (TJLP); and (iii) the finalization and execution of the Bank's new strategic planning.

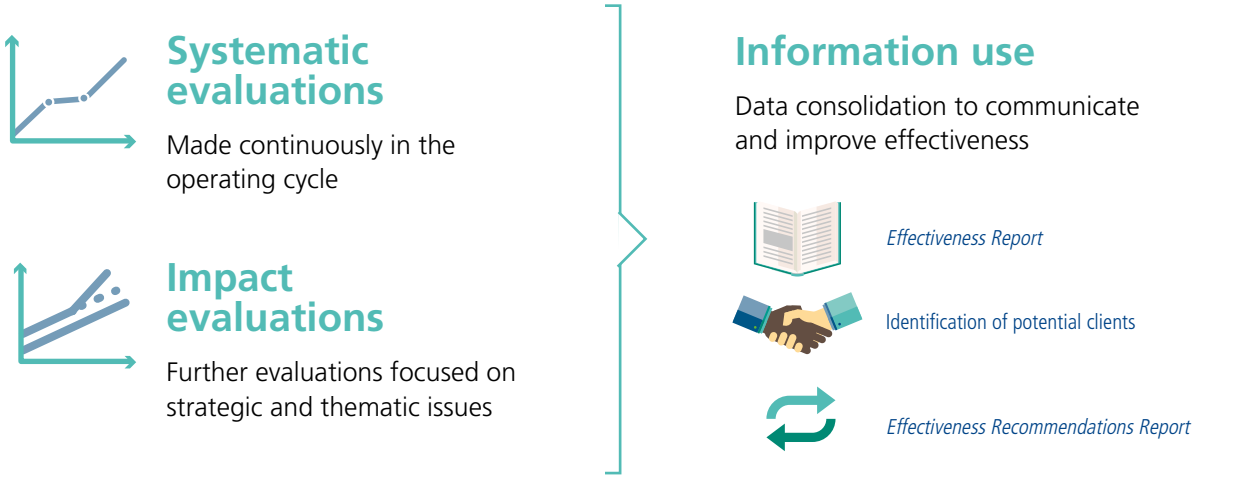
Within this transformation scenario, internally, in January 2018, BNDES formalized its Effectiveness Promotion System (SPE) (Figure 1), divided into three major layers. The first layer (systematic evaluations) consists in monitoring the output and outcome indicators of each operation or program, and in periodic evaluations. The second layer (impact evaluations) corresponds to the process of developing more throughout assessments of certain types of support. The third layer (use of information), in turn, deals with the dissemination of data and knowledge generated over the process.[1] It is in this last layer that this report is inserted.

The formalization of this system represents the maturation of BNDES's monitoring and evaluation (M&E) practices, as a result of a series of internal and external measures adopted over the last decade (Figure 2), including two operational audits of the Federal Court of Accounts (TCU), two corporate projects, the creation of a unit dedicated to M&E, and several others that contributed to increase the transparency of the Bank's performance.

In addition to this introduction, this report consists of four more chapters. In the second chapter, an overview of the Brazilian economy in the 2017-2018 period is presented. The third chapter shows the results of the projects approved in the same period, in most segments. The fourth chapter makes a brief analysis of the thematic impact assessments of BNDES's performance in 2018 and 2019. Finally, the last chapter concludes the report with a perspective of future advances in the effectiveness agenda.

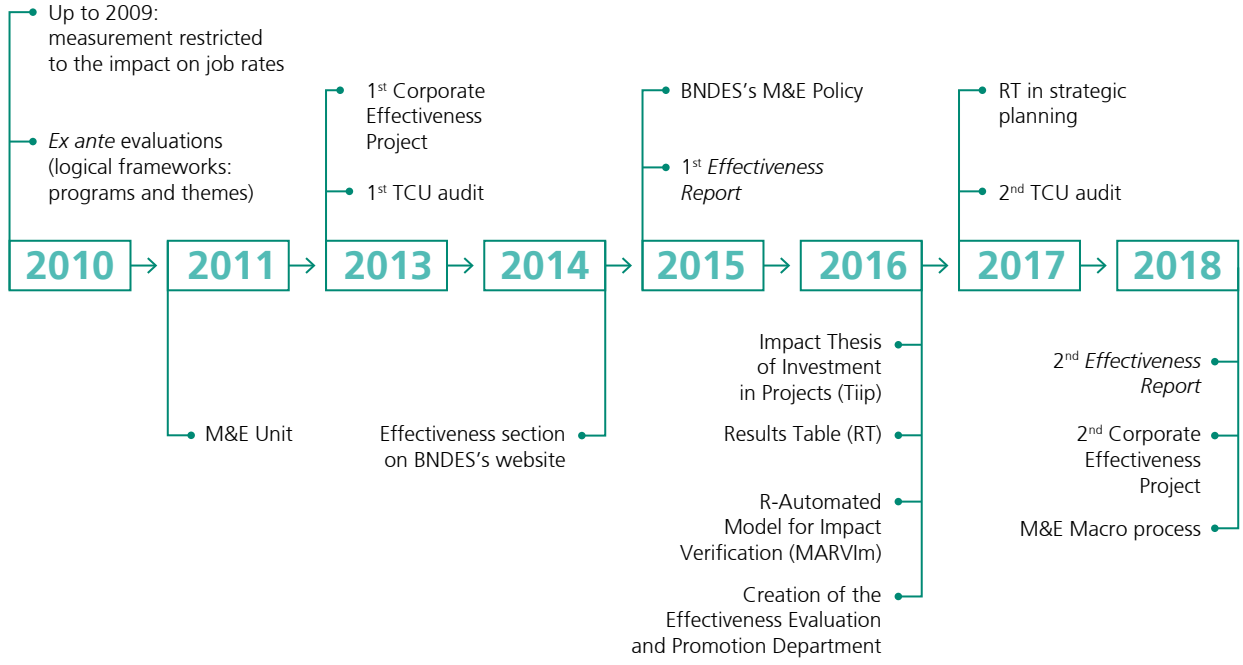
1 This system was presented in more detail in the *Effectiveness Report 2017* (BNDES, 2018).

FIGURE 1: EFFECTIVENESS PROMOTION SYSTEM



Source: Elaborated by the authors.

FIGURE 2: BNDES'S MONITORING AND EVALUATION HISTORY



Source: Elaborated by the authors.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THE **BRAZILIAN ECONOMY** IN 2017-2018

The Brazilian economy continues to recover from the severe recession observed in 2015-2016, which caused the country's gross domestic product (GDP) to decline by almost 7% over the two-year period. In 2018, GDP grew by 1.1%, the same as in 2017, again frustrating expectations.[2] The year begins with positive prospects, with adoption of an expansionary monetary policy, in addition to a significant negative output gap, as well as the expectation of fiscal reforms.

It was expected that resuming the reform agenda would reduce uncertainty and the risk premium, improving the country's financial conditions (currency appreciation and decline of long-term interest rates, for example). However, throughout the year, these expectations gradually decreased. The disclosure of GDP for the fourth quarter of 2017 in early March of 2018, below expectations, was the first indication that economic activity could be weaker than previously assumed. Similarly, labor market data also seemed to point to a slowdown in the pace of improvement, with the unemployment rate rising more than expected in the first months of the year.

In addition, the global scenario worsened, strongly pressuring the currencies of emerging countries, such as Argentina (April 2018) and Turkey (August 2018). Brazil did not suffer as much as these countries, but also saw a significant depreciation in its currency.

The truck drivers' strike, which took place at the end of May, also had very negative effects on the year's growth, not only affecting the economic activity of that specific period, but also keeping the agents' uncertainty high.

Thus, it can be said that several factors contributed to retain the Brazilian economy's growth potential. From a macroeconomic point of view, some examples may be listed:

- high uncertainty level – both due to the worsening of the fiscal reform prospects and to the electoral scenario, which remained undecipherable for a long time;

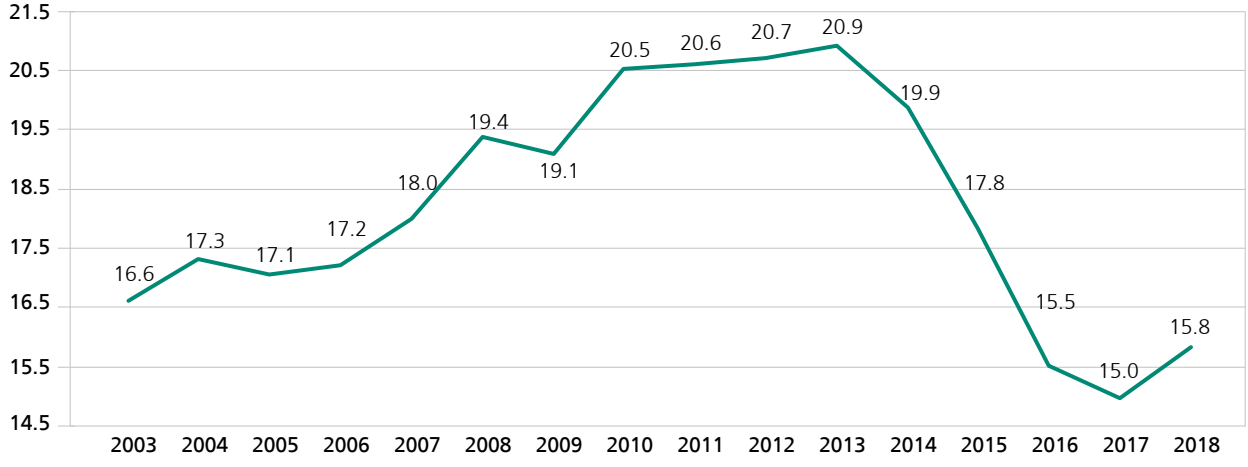
2 At the end of 2017, *Focus – Frequency Distribution Report* (BCB, 2017) projections indicated around 2.7% growth for 2018.

- maintenance of future interest rates at a high level, even with the rate of the Special System for Settlement and Custody (Selic) at its historical minimum levels;
- slowness in the fall of bank spreads; and
- lethargy of the construction industry.

Despite the repetition of the previous year's figure, the growth of the Brazilian economy in 2018 showed acceleration in the growth of domestic demand components, particularly consumption (1.4% to 1.9%) and investment (-2.5% to 4.1%).

Regarding investment, it is worth noting that 2018 represented the end of four consecutive years of retraction. Between 2014-2017, the gross fixed capital formation (GFCF) fell by around 30%. With the 4.1% increase observed last year, the investment rate, at current prices, stopped falling, reaching 15.8% at the end of 2018 (Graph 1), although it is still quite low.

GRAPH 1: GFCF/GDP INVESTMENT RATE AT CURRENT PRICES (%)



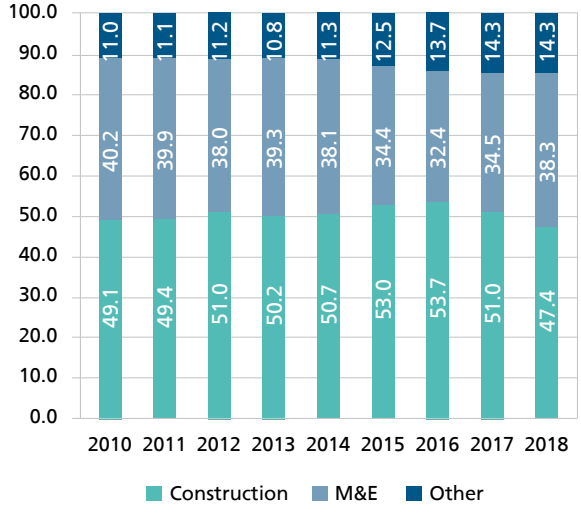
Source: Elaborated by the authors, based on data from Brazilian Institute of Geography and Statistics – IBGE (2019).

However, it is important to analyze the dynamics of GFCF components between 2017 and 2018. The share of the machinery and equipment (M&E) segment, which stood at 38.3% of the GFCF at the end of 2018 (Graph 2), had already started recovering in 2017, with 4.0% growth. In 2018, this performance was even better, with 15.4% growth (Graph 3). Part of the explanation relates to the significant

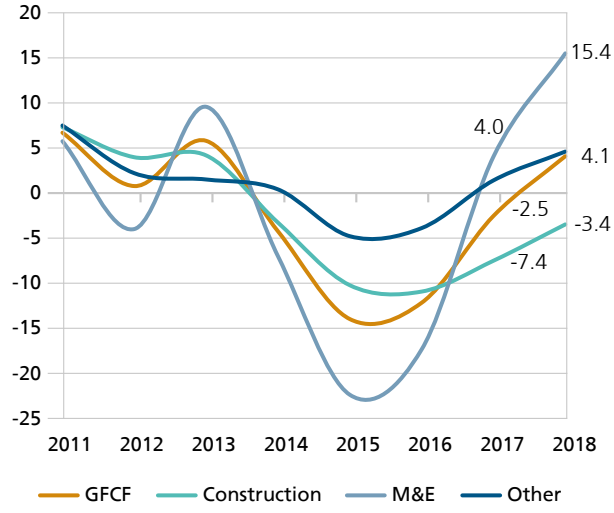
30.0% increase in the production of transport equipment, notably buses and trucks, in 2017 and 2018.[3]

The construction segment, corresponding to 47.4% of GFCF (Graph 2), still shows low dynamism, with 3.4% retraction in 2018 (Graph 3). Although the share of residential construction has been shyly showing signs of improvement since the end of 2017, heavy construction still suffers from the effects of the sharp reduction in public investment, and the legal situation of construction companies within the scope of leniency agreements under Operation Car Wash.

GRAPH 2: COMPOSITION OF GFCF (%)



GRAPH 3: PERFORMANCE OF GFCF AND ITS COMPONENTS (% VAR. PER YEAR)



Source: Elaborated by the authors, based on data from IBGE (2019).

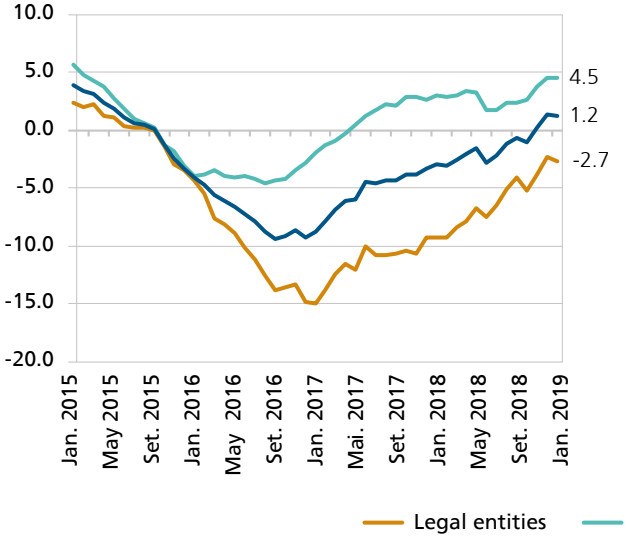
Throughout 2018, the credit market began recovering, and ended the year with 1.2% expansion in real terms, after three years of contraction. The duality shown since mid-2017 between the performance of the portfolio of legal entities and individuals has remained unchanged: while financing operations targeting individuals had already been showing real growth since mid-2017, the stock of

3 The other part relates to the reversal of the oil and gas sector's tax treatment policy (Repetro), promoting the internalization of oil exploration and production platforms. Platforms are accounted for considering the apparent consumption of machinery and equipment, therefore affecting both GFCF and imports. It is estimated that the platforms' internalization corresponded to about 2.0 percentage points of the 4.1% growth of GFCF in 2018.

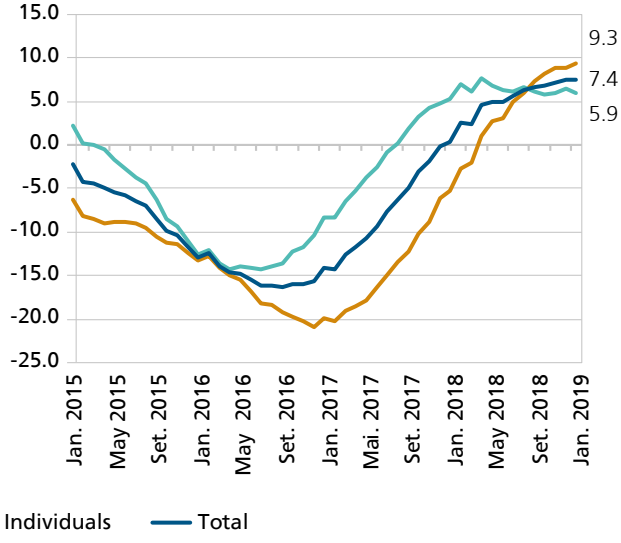
credit operations fell again. Graph 4 shows that in January 2019 the real growth of the portfolio of individuals was 4.5% over the 12-month period. On the other hand, the balance of financing to companies still shows a real 2.7% fall.

Regarding the behavior of new contracted operations (concessions), the scenario is reversed, as can be seen in Graph 5. In the last 12 months, up to January 2019, new credit flow directed to companies increased 9.3% in real bases, surpassing the one directed to families, which increased 5.9%.

GRAPH 4: CREDIT PORTFOLIO: INDIVIDUALS *VS.* LEGAL ENTITIES (% VAR. PER YEAR)



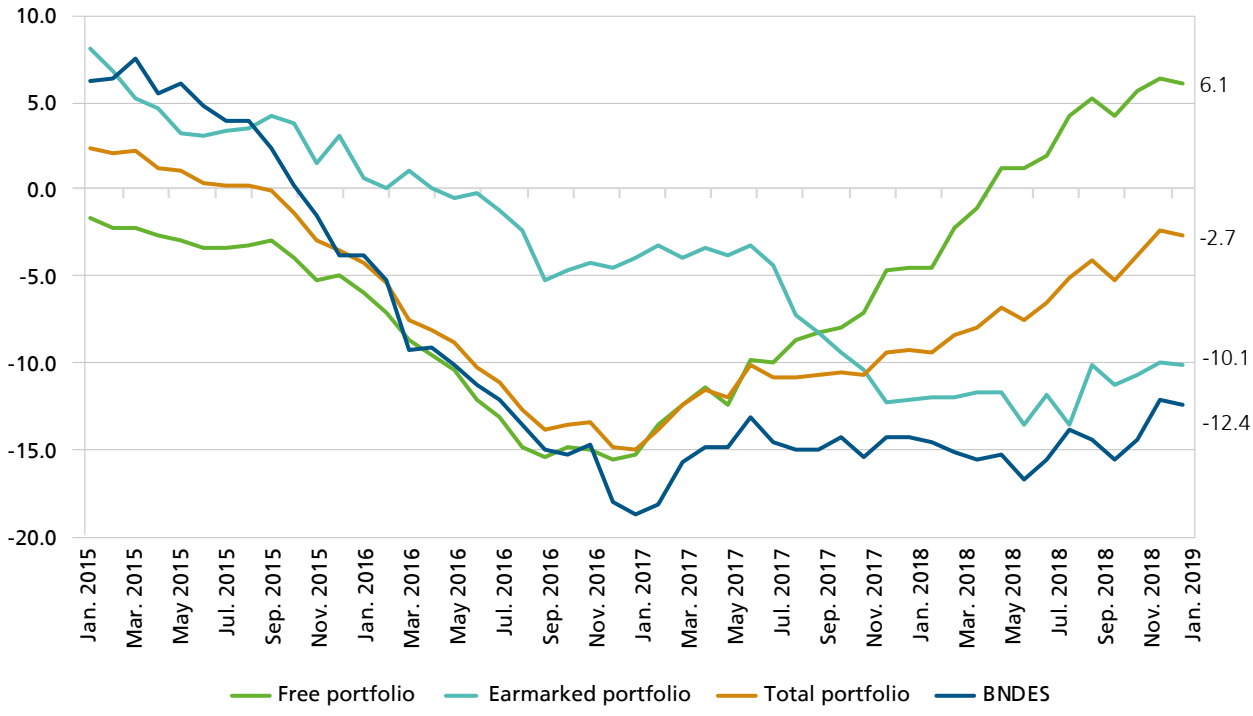
GRAPH 5: CREDIT CONCESSIONS: INDIVIDUALS *VS.* LEGAL ENTITIES (% VAR. PER YEAR)*



Source: Elaborated by the authors, based on data from BCB (2019).
Note: * Real percentage change deflated by the Extended National Consumer Price Index (IPCA).

It can also be noted that the portfolio of legal entities has also shown strong divergence between its components. While the portfolio of operations with free resources shows a 6.1% expansion in real bases, the behavior of the earmarked portfolio, particularly influenced by BNDES's performance (which represents 31% of the balance of credit operations for companies in Brazil and shows a 12.4% decline), is still quite negative, with a real 10.1% contraction (Graph 6).

GRAPH 6: TOTAL, FREE AND EARMARKED PORTFOLIO OF LEGAL ENTITIES (% VAR. PER YEAR)



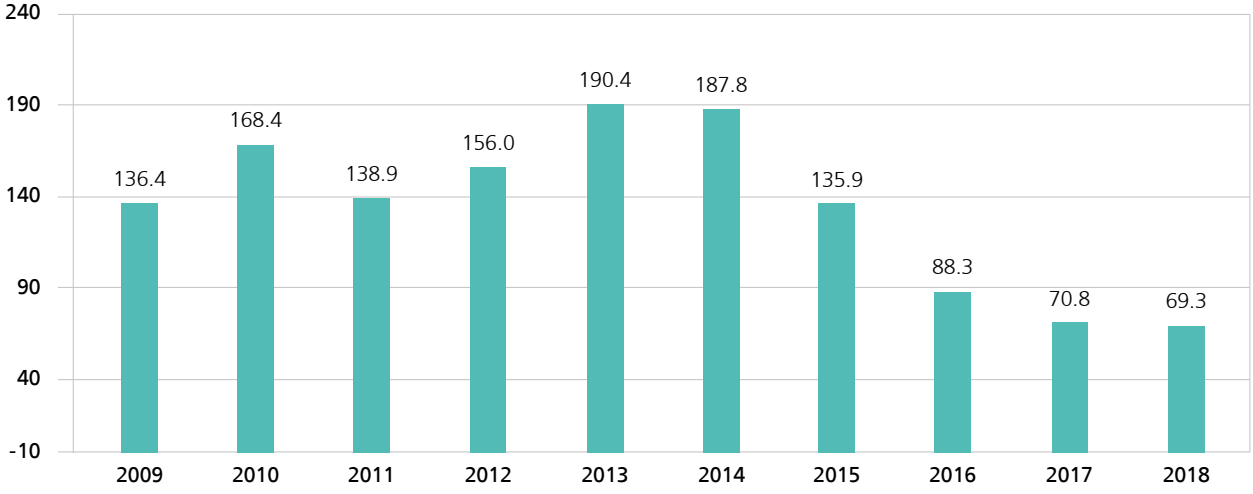
Source: Elaborated by the authors, based on data from BCB ([2019]).
Note: Real percentage change deflated by IPCA over 12 months until Jan. 2019.

The recovery of free credit to companies has been focusing on external lines (foreign exchange contract advances – ACC, international trade financing and external transfers) and specific domestic modalities, such as factoring, prepayment of credit card receivables, and purchase of vehicles. The strong exchange rate depreciation in 2018 had a strong influence on the balance of foreign lines, which grew on real bases – 12.8% in 2018 – and contributed to about 50% of the real 6.4% growth of the free credit portfolio of legal entities in the year.

In relation to BNDES's performance in this period, which is further explored in the following chapter, it is obviously possible to notice a great influence of the macroeconomic scenario, in both circumstantial and structural terms. In the first case, the recovery of the economy, although quite slow, caused disbursements in 2018, totaling R$ 69.3 billion, to become practically stable in relation to the previous year, in current values, interrupting a sequence of three years of strong declines (Graph 7).

Regarding structural aspects, it is important to highlight that the Bank, as an integral part of the Federal Government, is always influenced by its general economic policy guidelines. In recent years, with the fiscal policy focused on the adjustment of public accounts, the Bank has had to change its credit conditions, either by increasing TJLP or by adjusting its share in and the cost of financing for companies (BNDES's operating policies). In addition, at the end of 2017, TLP was created, replacing TJLP for most of the Bank's disbursements from 2018 on.

GRAPH 7: BNDES'S DISBURSEMENTS (CURRENT BILLION R$)



Source: Elaborated by the authors.

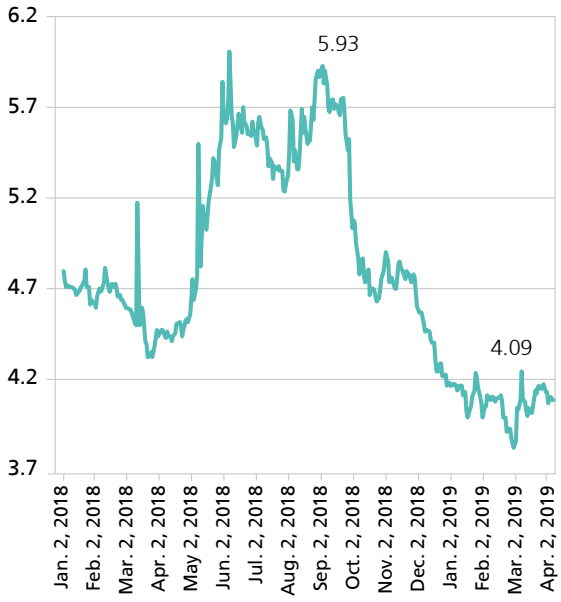
Lowering interest rates in the economy pose an additional challenge to BNDES. A benign inflationary scenario has enabled the basic interest rate to reach its historical lows, also affecting five-year interest rates (BNDES's new cost benchmarking standard), as well as the full range of the term structure of interest rates in Brazil.

Overall, therefore, the Brazilian economy has been recovering, albeit modestly, after experiencing a very acute economic crisis in 2015 and 2016, with negative consequences for GDP, investment, and other macroeconomic variables.

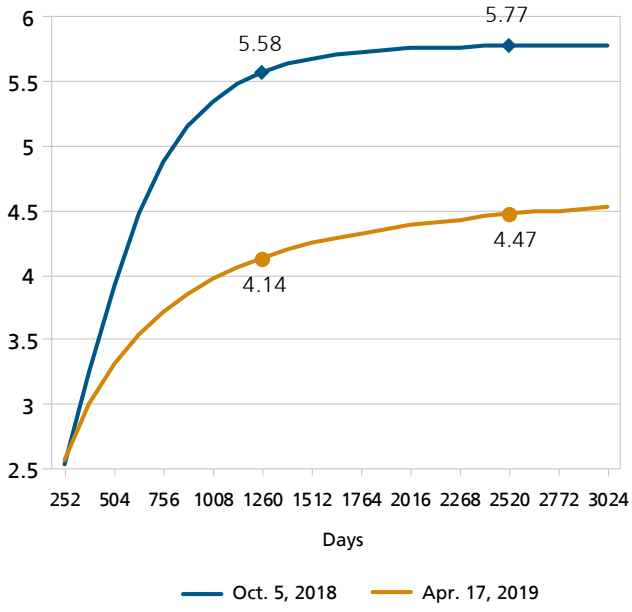
BNDES was, of course, also affected by this process. In this sense, the Bank has been undergoing changes in supply, while the situation

also affects demand, which is beginning to recover. During this time, it is worth noting that the Bank sought to take advantage of the negative economic scenario to improve its products and processes, adapting its operational policies to the challenges of the coming years.

GRAPH 8: FIVE-YEAR NTN-B (% PER YEAR)



GRAPH 9: NTN-B TERM STRUCTURE (% PER YEAR)



Source: Elaborated by the authors, based on data from Anbima, available at: www.anbima.com.br.
Note: NTN-B – Brazil Treasury Securities, B Series.


CAUTION
HIGH
TRAILER

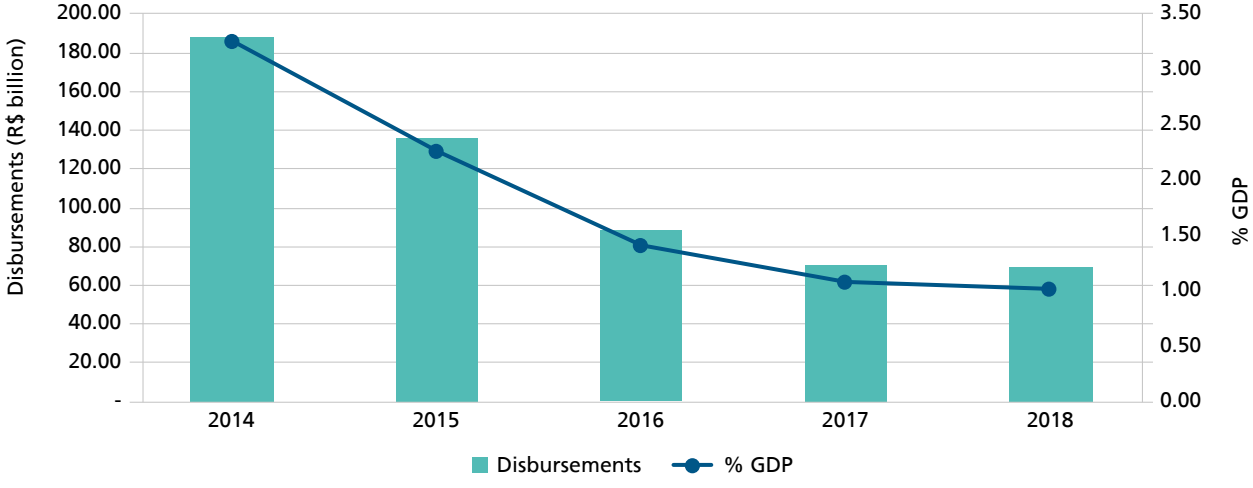
BNDES'S EFFORT AND RESULTS ON **JOB CREATION** AND PRESERVATION

The year of 2016 represented a change in the orientation of BNDES's performance, due to substantial changes in the formulation of economic policies. The economic crisis, which would only be eased in subsequent years, drastically reduced the demand for investment resources. The cost of the Bank's financing lines changed with the introduction of the Long Term Rate (TLP), approved in September 2017. This context shaped the results that will be presented in this section.

SHARE IN GDP AND INVESTMENT

While the 2015-2016 period was characterized by a sharp fall in BNDES's disbursements, the 2017-2018 period shows relative stability. Looking at current values (Graph 10), R$ 88 billion were disbursed in 2016, which represents a 35% drop compared to 2015. In 2017, disbursements totaled R$ 70 billion, representing a 19.8% decrease over the previous year. In 2018, disbursements totaled R$ 69 billion, a very similar figure to that of 2017.

GRAPH 10: EVOLUTION OF DISBURSEMENTS AND COMPARISON WITH GDP – 2014-2018

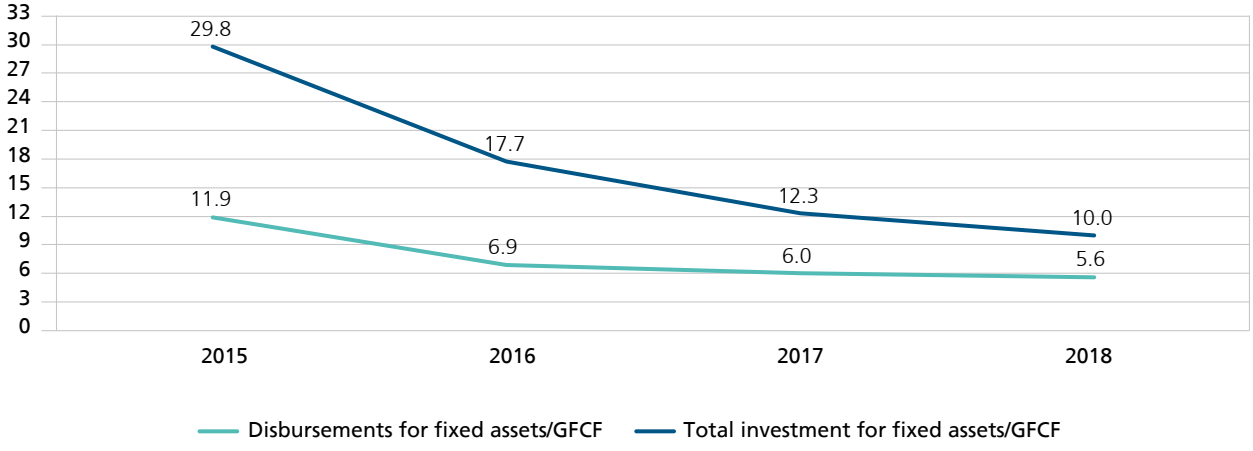


Source: Elaborated by the authors.

The reduction in BNDES's disbursements changed the Bank's relative size. In 2018, the disbursement-GDP ratio was 1.02%, while in 2017, it reached 1.08%. Compared to 2014, when the ratio was 3.25%, there was a 68% drop in the Bank's size, based on this metric.

The share of BNDES's disbursements in the financing of the gross fixed capital formation (GFCF), as shown in Graph 11, fell from 11.9%, in 2015, to 5.6%, in 2018. It should be reiterated that, as discussed in the previous section, this period represented a dramatic cycle for investment in Brazil, with four consecutive years of retraction. In 2018 alone, GFCF grew by 4.1%.

GRAPH 11: DISBURSEMENTS AND TOTAL INVESTMENT FOR FIXED ASSETS COMPARED TO GFCF – 2015-2018 (%)



Source: Elaborated by the authors, based on internal data and IBGE (2019).
Note: Total investment corresponds to BNDES's disbursements plus investments made with other fund sources (contributions).
The value of GFCF, excluding residential construction in 2016, was estimated based on the total GFCF for 2016 and the average between 2013 and 2015 of the share of residential construction in the total investment.

It should be noted that the Disbursement/GFCF metric also points to stability at a new level in 2016-2018. In the case of the values of the total investment supported by BNDES in relation to GFCF, the Bank's disbursements are added to the other fund sources that financed the investment. Although the drop in this indicator was sharp over the analyzed period, the Bank continues to contribute to at least 10% of the country's GFCF. The figure of almost 30% in 2015 marks the end of BNDES's countercyclical policy execution.

THE COMPOSITION OF DISBURSEMENT

When observing the share of each sector in the total disbursed by BNDES (Table 1), it is not possible to notice any major changes in 2017-2018. The infrastructure sector remains the main target of disbursements, with a share of 44% in 2018.

TABLE 1: EVOLUTION OF DISBURSEMENTS BY SECTOR – 2014-2018 (%)

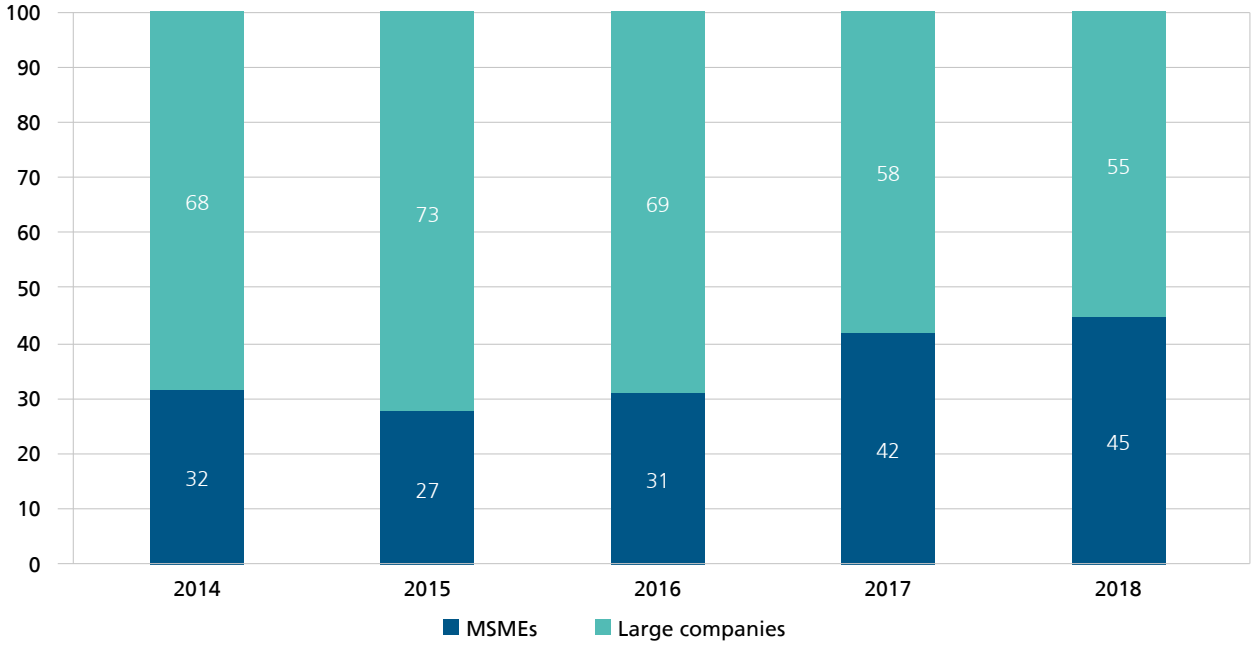
SECTOR	2014	2015	2016	2017	2018
Farming	9	10	16	20	21
Trade/services	28	22	21	20	17
Industry	27	27	34	21	18
Infrastructure	37	40	29	38	44

Source: Elaborated by the authors.

The share of the agricultural sector stands out due to its significant growth: from 9% in 2014 to 21% in 2018. When considering the support for the agricultural sector, it should be noted that this trajectory is mainly the result of the Bank's performance through BNDES Finame, i.e., the acquisition of machinery and equipment was responsible for positioning BNDES as a relevant source of funds for the sector. BNDES Finame's disbursements jump from just over R$ 250 million in 2014 to R$ 8 billion in 2018.

The share of micro, small and medium enterprises (MSME) (Graph 12) continued to advance in the period analyzed, from 42% to 45%. Just as an example, in 2015, this percentage was 27%. It is also noteworthy that the total volume disbursed to large companies fell in nominal values between 2017 and 2018 (6.5% decrease).

GRAPH 12: COMPOSITION OF DISBURSEMENTS BY COMPANY SIZE – 2014-2018 (%)



Source: Elaborated by the authors.

The regional distribution of disbursed values (Table 2) was also stable over the period analyzed. The South and Southeast regions received 64% of resources, while the other 36% were allocated to the Central-West, North and Northeast. The Northeast region jumped from 13% in 2014 to 20% in 2017, and received 17% of disbursements in 2018.

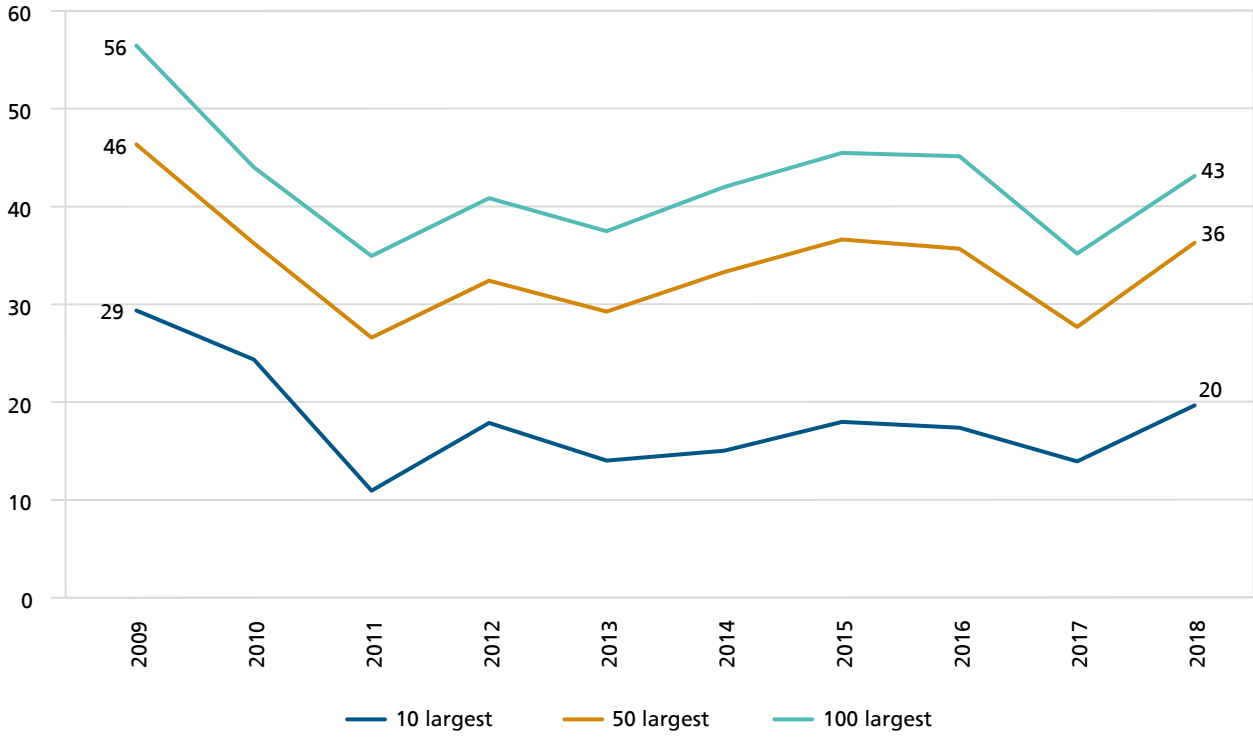
TABLE 2: EVOLUTION OF DISBURSEMENTS BY REGION – 2014-2018 (%)

REGION	2014	2015	2016	2017	2018
Central-West	12	9	12	12	14
Northwest	13	17	13	20	17
North	7	9	5	5	5
Southeast	48	44	45	38	38
South	20	21	25	25	26

Source: Elaborated by the authors.

Graph 13 shows the concentration of BNDES's disbursements in its 10, 50 and 100 largest clients in disbursement volume in recent years. In the comparison between 2009 and 2018, it is possible to notice that BNDES's credit became more diluted, with a drop in the three indicators. In 2009, the 100 largest clients concentrated 56% of disbursements, compared to 43% in 2018. In the comparison between those same years, there is a fall from 29% to 20% in relation to the ten largest clients. This trajectory reflects the greater dispersion of the Bank's resources, and suggests increased access of smaller companies to credit.

GRAPH 13: SHARE OF CLIENTS WHO RECEIVED MORE FUNDS FROM BNDES (%)

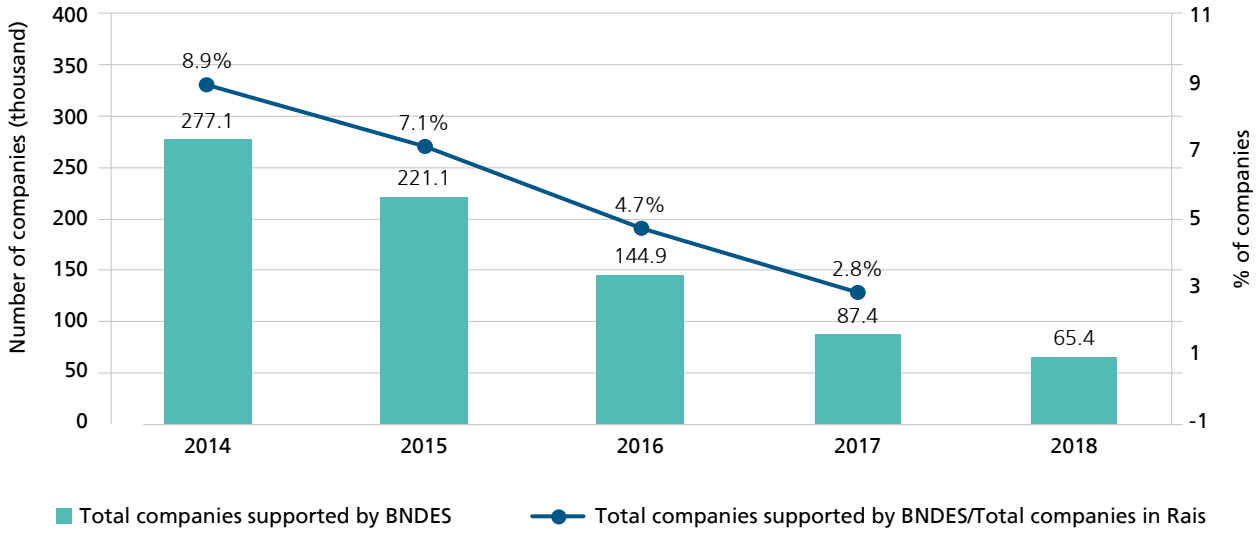


Source: Elaborated by the authors.

NUMBER OF SUPPORTED COMPANIES

The reduction in disbursements was also reflected in the decrease in the number of companies supported (Graph 14): from 277,000 in 2014, to 65,400 in 2018.

GRAPH 14: NUMBER OF COMPANIES SUPPORTED BY BNDES (THOUSAND) AND COMPARISON WITH THE TOTAL NUMBER OF EXISTING COMPANIES IN BRAZIL (%) – 2014-2016



Source: Elaborated by the authors, based on internal data and Rais (Annual List of Social Information – Ministry of Economy).
Note: For each year, the number of companies supported by any of BNDES's support instruments was considered. If a company received more than one support in a given year, it is only counted once in that year, but may be counted in different years. Companies that had no formal employees during the year were excluded from Rais (they declared negative Rais).

Considering the universe of companies in the Annual List of Social Information (Rais), BNDES's support reached, in 2017 (last year for which Rais data are available), 2.8% of existing firms. About 97% of the supported companies are MSMEs (Table 3). There is relative stability in the distribution of the share of each company size in the total of supported companies.

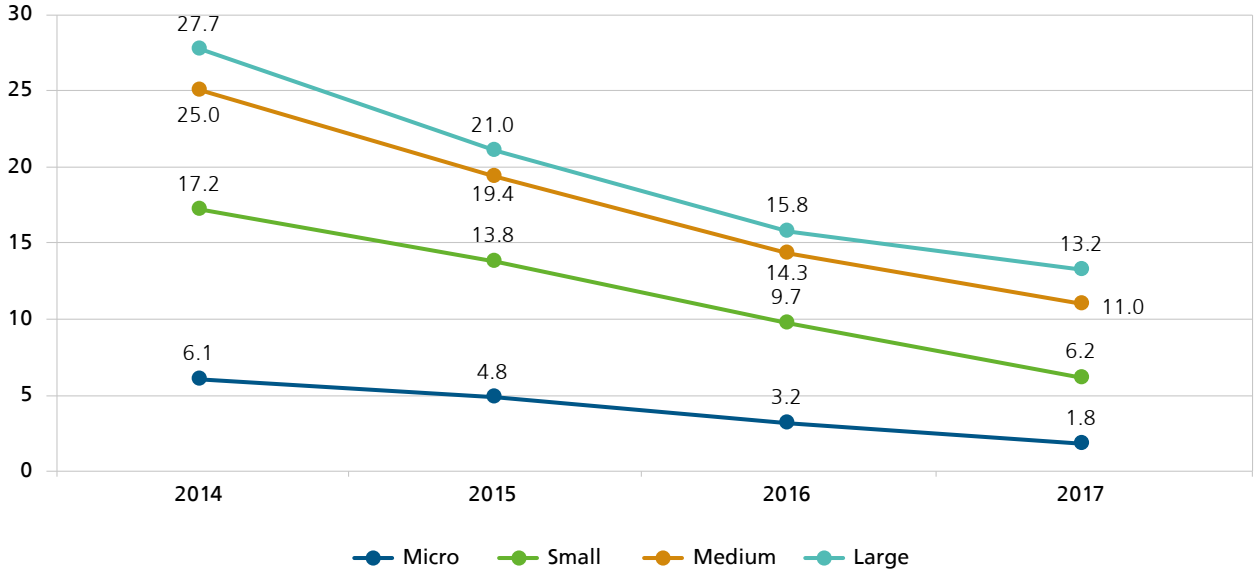
While the previous analysis shows the scope of BNDES's support in the universe of Brazilian companies, Graph 15 shows how this coverage is distributed among company sizes. In 2017, 13.2% of large Brazilian companies were supported by the Bank, while this percentage is 11% for medium companies, 6.2% for small companies, and 1.8% for microenterprises. In 2017, therefore, one in nine medium-sized companies was supported by BNDES.

TABLE 3: COMPOSITION OF TOTAL NUMBER OF COMPANIES SUPPORTED BY BNDES BY SIZE (%) – 2014-2017

SIZE	2014	2015	2016	2017
Microenterprises	59.0	58.7	57.5	54.3
Small	31.5	32.7	33.3	33.7
MSEs	**90.5**	**91.3**	**90.8**	**88.0**
Medium	7.2	6.6	7.0	8.8
MSMEs	**97.7**	**97.9**	**97.8**	**96.8**
Large	2.3	2.1	2.2	3.2
TOTAL	**100**	**100**	**100**	**100**

Source: Elaborated by the authors, based on internal data and Rais.

GRAPH 15: COMPARISON OF THE NUMBER OF COMPANIES SUPPORTED BY SIZE WITH RAIS (%) – 2014-2017



Source: Elaborated by the authors, based on internal data and Rais.
Note: Companies that had no formal employees during the year were excluded from Rais (they declared negative Rais).

The high percentages in 2014 represent the Bank's countercyclical performance. Contraction in all support levels was expected. The end of this performance cycle, the change in the cost of the Bank's lines, and the general fall in the demand for resources determined the scenario in Graph 15.

Table 4 shows the behavior of the degree of coverage of companies supported by BNDES Finame, a product for financing the purchase of machinery and equipment, in 2014-2017. This indicator compares the number of companies financed by BNDES Finame with the population of formal companies in the country. The years of 2016 and 2017 show a new level of coverage of this product, 0.5%, compared to 2.8%, observed in 2014. The largest coverage is achieved in farming, with support for 3.2% of the formal companies in this sector.

TABLE 4: EVOLUTION OF THE SHARE OF COMPANIES FINANCED BY BNDES FINAME IN THE TOTAL OF COMPANIES IN BRASIL BY SECTOR – 2014-2017 (%)

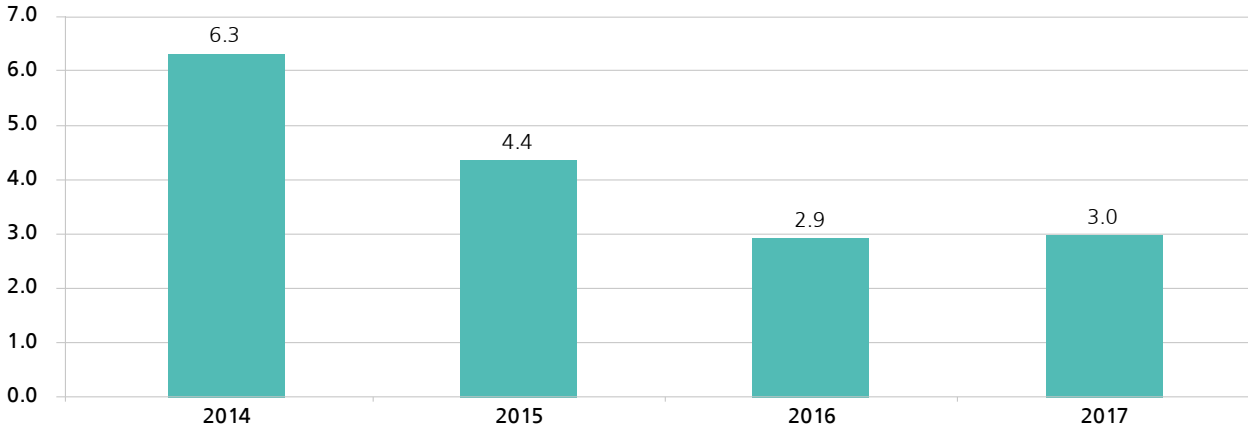
MAJOR SECTOR	2014	2015	2016	2017
Farming	8.0	4.1	3.0	3.2
Industry	4.2	1.5	0.8	0.8
Trade	1.8	0.6	0.3	0.3
Services	3.5	1.3	0.7	0.7
Total BNDES Finame	**2.8**	**1.0**	**0.5**	**0.5**

Source: Elaborated by the authors, based on internal data and Rais.
Note: For each year and major sector, the number of companies supported by BNDES Finame products was considered. This figure was divided by the number of companies by sector and year obtained in Rais. Companies that had no formal employees during the year were excluded from Rais (they declared negative Rais).

BNDES Finame's intervention logic is based on the support for the sale of nationally manufactured machinery and equipment. From a technical standpoint, BNDES accredits manufacturers with a minimum percentage of local content. Thus, it is important to observe the degree of coverage of capital goods manufacturers selling their products through BNDES Finame.

Graph 16 shows that the 2016-2017 period was characterized by 3% coverage of national capital goods manufacturers. This value is about half of that observed in 2014.

GRAPH 16: EVOLUTION OF THE SHARE OF CAPITAL GOODS MANUFACTURERS FINANCED BY BNDES FINAME IN THE TOTAL OF CAPITAL GOODS MANUFACTURERS IN BRAZIL – 2014-2017 (%)



Source: Elaborated by the authors, based on internal and Rais data.
Note: For each year, the number of companies supported by BNDES Finame was considered. This figure was divided by the number of capital goods manufacturers obtained in Rais. Companies that had no formal employees during the year were excluded from Rais (they declared negative Rais).

The BNDES Card is a product with great capillarity, in addition to being exclusive to MSMEs. In 2014-2015, this product maintained over 6% coverage in the universe of Brazilian companies. In the last year for which there is Rais data available (2017), this coverage reached 2% (see Table 5). This downward trend was observed in all supported sectors, but support for the farming sector was the one with smallest contraction.

TABLE 5: EVOLUTION OF THE SHARE OF COMPANIES FINANCED BY BNDES CARD IN THE TOTAL OF COMPANIES IN BRAZIL BY SECTOR – 2014-2017 (%)

MAJOR SECTOR	2014	2015	2016	2017
Farming	2.0	1.8	1.4	0.7
Industry	9.6	8.7	6.2	3.2
Trade	7.3	6.6	4.4	2.1
Services	5.2	4.6	3.0	1.5
Total BNDES Card	**6.8**	**6.1**	**4.1**	**2.0**

Source: Elaborated by the authors, based on internal and Rais data.
Note: For each year and major sector, the number of companies supported by the BNDES Card was considered. This figure was divided by the number of companies by sector and year obtained in Rais. Companies that had no formal employees during the year were excluded from Rais (they declared negative Rais).

JOB CREATION OR PRESERVATION

To estimate the number of jobs created or preserved during the implementation of the investments supported, BNDES uses an input--output model for the Brazilian economy, named the Job Generation Model, based on data from the System of National Accounts and the Input-Output Matrix, compiled by the Brazilian Institute of Geography and Statistics (IBGE).

The Job Generation Model's results should be interpreted as the average number of jobs required to enable the implementation of investments supported by BNDES. This average number of jobs, in turn, does not correspond to the net job creation, because the model is not able to estimate which jobs would have been taken by previously employed individuals who were allocated in the implementation of the investments supported by BNDES, and which would have been taken by previously unemployed individuals. Thus, the concept of created or preserved jobs is used.

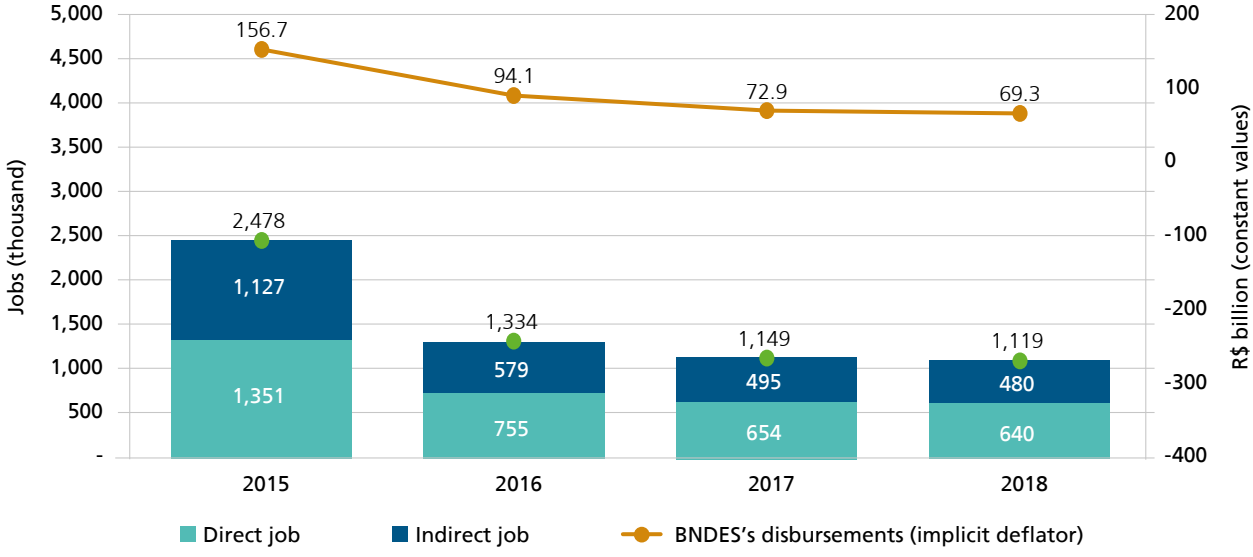
In this way, the Job Generation Model's results for the phase of implementation of investments can be broken down into two types of job:

- direct jobs – occur in sectors that provide GFCF products to projects supported by the Bank, i.e., mainly in construction, trade, and in the services provided to the companies; and
- indirect jobs – correspond to jobs in the production chains that supply the sectors directly affected by the investments supported.

The amounts intended for fixed investments were estimated from BNDES's total disbursements, such as expenses related to the implantation and modernization of industrial units, construction of infrastructure, and purchase and installation of machinery and equipment. Disbursements for the purchase of imported equipment (supported by BNDES under specific conditions) and capital market operations without associated fixed investment, for instance, were disregarded. Working capital in association with investment projects was considered, while operations with working capital only were disregarded.

Graph 17 shows the results of the estimates of job creation or preservation associated with BNDES's disbursements. These estimates were obtained based on MGE simulations made for each year of the 2015-2018 period.

GRAPH 17: ESTIMATES OF FORMAL EMPLOYMENT CREATED OR PRESERVED, BY TYPE OF EMPLOYMENT, ASSOCIATED WITH BNDES'S DISBURSEMENTS – 2015-2018



Source: Elaborated by the authors.

In 2017 and 2018, the results of jobs created or preserved by BNDES were very close, and fell compared to the previous two years, following the downward trend in total disbursements. The annual average number of jobs associated with projects implemented in 2017 and 2018 supported by BNDES was 1,134 thousand, a 15% decrease compared to the result obtained in 2016. This decrease was proportionally smaller than the fall in disbursements (26%), as the share of funds intended for fixed investments in the total disbursed by BNDES increased in 2017 and 2018 to 84% from the 76% observed in 2016.

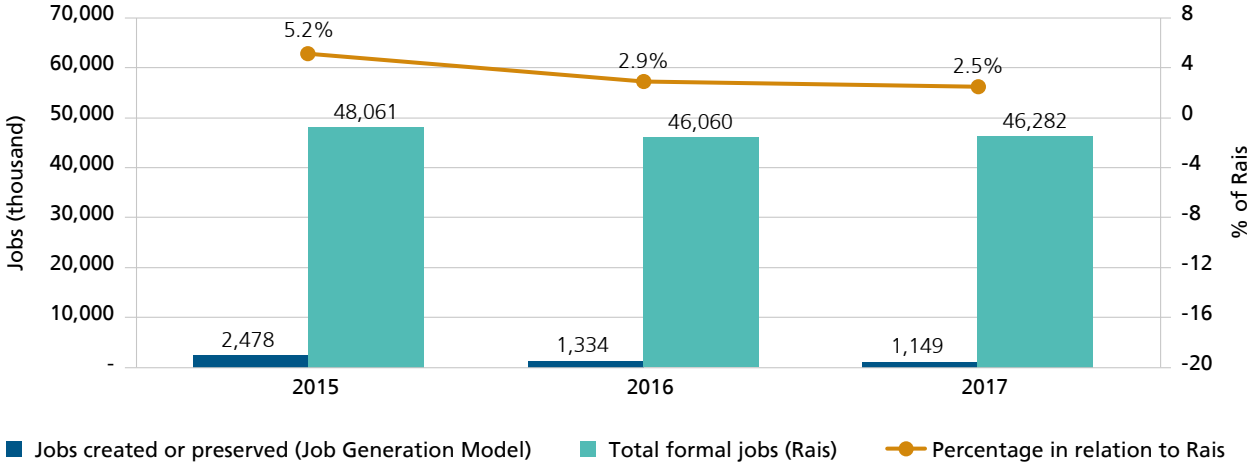
Regarding the type of job estimated, the results of 2017-2018 did not change significantly compared to previous years. About 57% of the total refers to direct jobs, and 43% to indirect jobs. Thus, the annual average of direct creation or preservation was 647,000 jobs, and the indirect average, 487,000 jobs.

In 2017 and 2018, for each R$ 1 million invested in activities that influence employment, the estimate of jobs associated with the

implementation was 19.4. The same ratio had been, on average, 20.2 in the previous two years, which means that the composition of sectors that have their demand heated up with the execution of fixed investments had a slightly less labor-intensive profile in the most recent period.

The labor market has been showing unimpressive results, with high unemployment rates and low number of jobs created. As can be seen in Graph 18, between 2015 and 2017, about 1.7 million jobs were eliminated according to Rais (from 48 million formally employed people in 2015 to 46.3 million in 2017), reflecting the economic recession in the country.

GRAPH 18: EVOLUTION OF THE SHARE OF JOBS ASSOCIATED WITH BNDES'S DISBURSEMENTS IN THE TOTAL OF FORMAL JOBS IN BRAZIL – 2015-2017



Source: Elaborated by the authors, based on internal data and Rais.

Investment financing heats up the economy and creates jobs and income, helping to mitigate this recession. However, the drop in BNDES's disbursements in recent years has also generated a lower result of estimated jobs, as previously shown, which in 2017 represented 2.5% of total jobs at the end of the year. In 2016, this share had been about 3%.

MONITORING OF THE **RESULTS OF BNDES'S SUPPORT**

Up until this moment, data on the effort of BNDES's performance have been shown, such as its share in investments, disbursements from various perspectives, and the number of companies supported. In this chapter, information on the results of interventions or sets of supported interventions is analyzed. Initially, the data structuring process used should be described.

In 2017, BNDES adopted, as an *ex ante* assessment tool in the analysis of nonautomatic support,[4] the Results Table (RT), inspired by logical models such as the Logical Framework or the Theory of Change,[5] which presents the development objectives pursued by BNDES when investing, and output and outcome indicators that allow estimating the expected benefits. These are the essential elements for the construction of an intervention logic, i.e., the expectation of how these effects are to be achieved, through the delivery of products and services.

In 2018, BNDES approved the Macro Process of Effectiveness Promotion, which allowed further progress in the structuring of the institution's Monitoring and Evaluation System. The first layer of this system consists of monitoring and self-assessment activities (i.e., carried out by the Bank's own operational teams) for nonautomatic support, and the RT is the tool around which they are structured. Based on the indicators and values predicted in the RT, the values realized during the implementation of the investments supported should be estimated and, after this monitoring period, a balance of achievements in relation to the initial estimates should be performed.

4 Nonautomatic support is that in which the postulant operation must be subjected to a credit and merit analysis by BNDES's teams, generally comprising support for investment projects. Automatic support, in turn, consists of a system in which the proponent's compliance with requirements of the support instrument, such as type of asset, whether the sector is supportable, etc., is verified via information systems.

5 Logical framework is a project and policy planning instrument used to systematize the causal hypothesis associated with the intervention. It explains how carrying out the activities should generate the project's products and services, which in turn may be able to bring about the changes expected by the beneficiaries, and ultimately contribute to the intended end goal. For each objective established, the indicators and respective goals should be defined, in order to monitor the project's performance; in addition, factors beyond the project's control that may influence the achievement of goals are specified.

As the projects approved in 2017 and 2018 reach maturity in relation to the expected effects on the RT's indicators, these self-assessments will be carried out, making it possible to generate performance statistics based on this material.

The RT's application to all nonautomatic supports has allowed the definition of a richer set of result indicators compared to the one previously used. As BNDES's performance is broad in terms of the scope of sectors, business segments and financial instruments, the indicators used seek to portray more tangible aspects, such as number of locomotives purchased in railroad projects, as well as intangible phenomena, such as intellectual capital employed in the technological development of innovation projects, measured in man-hours.

BNDES's M&E management unit, currently the Assessment and Promotion of Effectiveness Department of the Strategic Planning Division, advises the Bank's operational teams on the application of the RT's methodology. The lists of goals and indicators are constantly updated, according to the needs of support operations.

For nonautomatic support from BNDES, this chapter presents the expected outputs by projects approved in 2017-2018, according to the expected values of their RTs' indicators.[6] As the profile of BNDES-supported investments is long-term and the use of the RT is relatively recent, data on the outputs actually delivered are not yet available in the Bank's information systems for most supports, and thus, the available information pertains to the output effectiveness expected.[7]

The RT with all its elements is being filled out in BNDES's information systems (which were modernized and adapted to these M&E activities), and the construction of a reference framework on which to base the analysis of these indicators' values will allow all outputs delivered in a given period to be reported in the future.

6 Although this section focuses on output indicators, some outcome indicators may be sometimes included, with no damage to the presentation of the results.

7 Although approved in 2017 and 2018, supports that were registered as cancelled or withdrawn up to the end of the first quarter of 2019, were disregarded.

To present the data, the values of the indicators used were added to at least three projects supported by the Bank; thus, the information presented in this section is only a subset of all outputs planned by the institution.[8] The indicators are divided by sector or theme, and it is possible for a same project to be considered in different tables or infographics, if it has indicators related to different themes. A certain table or infographic can also consist of support for different economic sectors (innovation, for example).

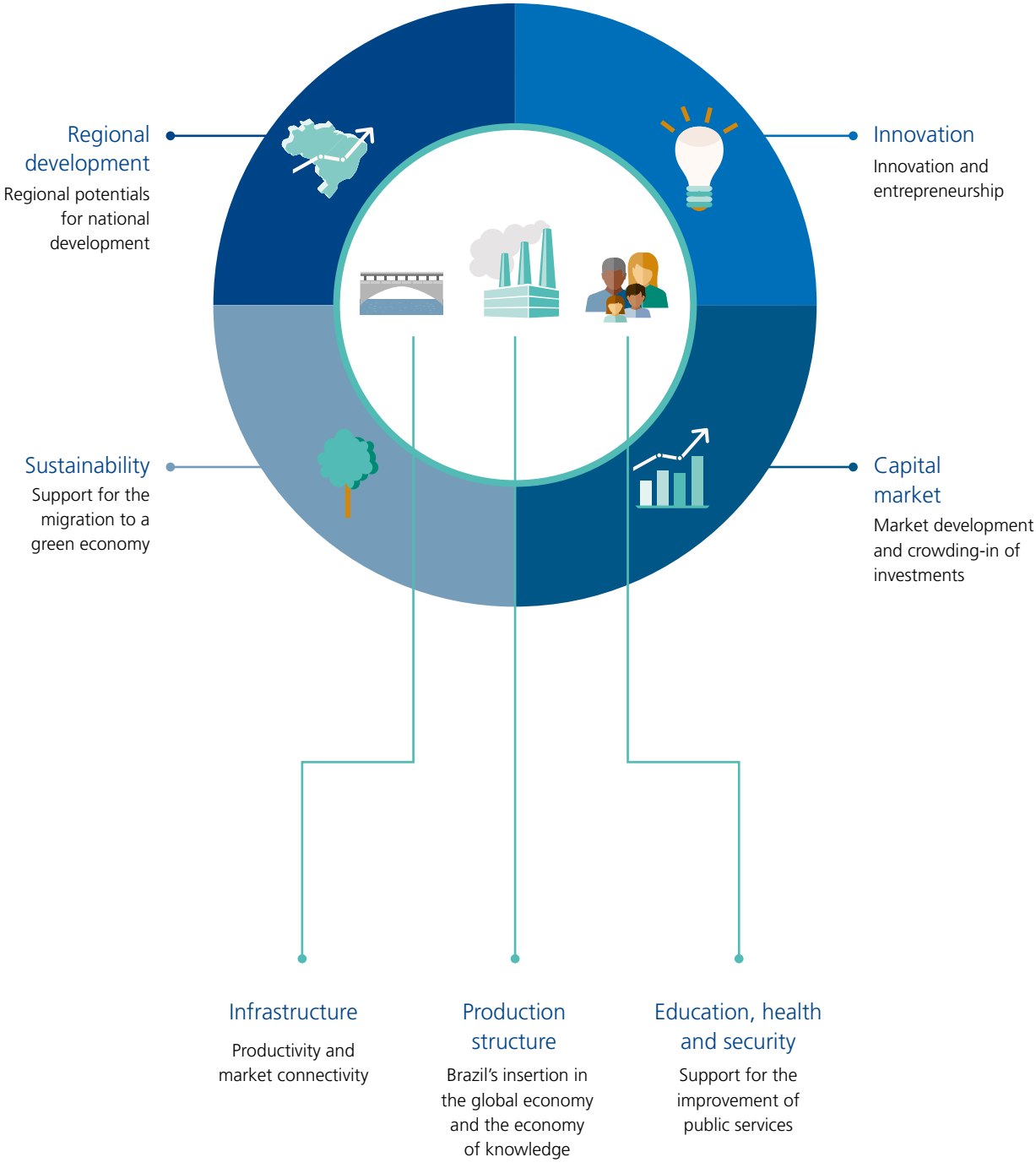
In almost all cases, BNDES's resources are used to finance a portion of the projected investments' total value, which is complemented by the borrowers' own resources and other funding sources. Although some output indicators may only be associated with monetary support from BNDES, the output effectiveness figures expected are always related to investments in general, regardless of the share of the Bank's financing. This is because BNDES contributes significantly to the viability of investments made.

In this chapter, some output indicators related to automatic support are also shown, such as the number of equipment items sold via BNDES Finame, or the value of capital goods exports supported through BNDES Exim. In these cases, the information presented reveals the criteria used in the indicators' analysis.

The sections dividing the indicators into major themes correspond to BNDES's missions to achieve its final goals, included in the Bank's corporate strategy for 2018-2023 (approved in March 2018), as shown in Figure 3.

8 In a few cases, it was decided to inform the values of indicators with less than three projects, as the outputs' value and/or BNDES's support were considered relevant to the segment or theme.

FIGURE 3 – STRATEGIC GUIDELINES – 2018-2023 PLANNING



Source: Elaborated by the authors.

INFRASTRUCTURE

Electricity generation, transmission and distribution

BNDES supports productive investments in all stages of production and supply of electricity in the country, including generation (focusing on renewable sources), transmission to locations that are closer to consumer centers, and distribution to end consumers, such as businesses and households.

At the generation stage, the main goal pursued by the supported projects is the expansion of the energy supply. To estimate this stage's indicators, data on the generation capacities that began operating in 2017-2018 were obtained from the Ministry of Mines and Energy (MME). The power of the energy-generating units that received support from BNDES were identified and subsequently added up. Despite the availability of the same capacity indicators on which to base output estimates in the RTs of operations approved in 2017 and 2018, the systematic monitoring of investments by MME and Aneel (Brazilian Electricity Regulatory Agency) allows the presentation of data on outputs delivered. Thus, the indicators compiled by generation segment are shown in Table 6.

TABLE 6: ELECTRICITY GENERATION CAPACITY DELIVERED IN 2017-2018 BY THE PROJECTS SUPPORTED

SEGMENT	Output	Unit
Hydroelectric power station*	6,955	MW
Thermal power station**	400	MW
Wind farms	3,305	MW
Photovoltaic power station	439	MW
Total generated	**11,099**	**MW**

Source: Elaborated by the authors, based on data from Brasil (2019a).
Notes: * Regular and small-sized plants. Does not include generation distributed. ** Does not include nuclear energy.

BNDES contributed to the viability of the 11,099 MW increase in power generation capacity between 2017 and 2018, which represented about 76% of all added capacity in the period. The capacity added by regular and small-sized hydroelectric plants represented 63% of the total supported, with 6,955 MW. The second most relevant segment was wind energy, which has shown a significant increase in the Brazilian energy matrix, with 3,305 MW of added capacity supported. Solar energy projects, in turn, totaled 439 MW of installed capacity, as the share of this segment in the matrix is still timid. Thermal stations added only 400 MW (low capacity in relation to the power already installed in the country in this segment), as it is not a renewable energy source and, therefore, not a priority for the Bank.

The renewable energy generation capacity added by the projects supported in 2017-2018 is equivalent to the average monthly consumption of all households in the North and Northeast regions.

Estimated at 10,699 MW, the total renewable energy generation capacity supported by BNDES is expected to be sufficient to supply the average monthly consumption of 22,781 thousand households, roughly the number of households in the North and Northeast of Brazil.[9]

Moving on to the transmission stage, BNDES's support aims to ensure the supply of energy to the electrical system. In this segment, among the outputs delivered in the country in 2017-2018, it was also possible to identify the investments supported by the Bank.

TABLE 7: EXTENSION OF TRANSMISSION LINES DELIVERED IN 2017-2018 BY THE PROJECTS SUPPORTED

SEGMENT	Output	Unit
230 kV	1,117	km
550 kV	2,388	km
800 kV*	4,174	km
Total	**7,678**	**km**

Source: Elaborated by the authors, based on data from Brasil (2019a).
Note: * Direct current.

9 According to the National Household Sample Survey (Pnad) (IBGE, 2016), the two regions together totaled 22,932 thousand households in 2015.

In 2017 and 2018, the power transmission grid was expanded by 7,678 km as a result of investments made possible with resources from BNDES, about 72% of all expansion of lines observed in the period. This distance is equivalent to riding a car from Florianópolis (SC) to Fortaleza (CE) and back. About 54% of the expansion (4,174 km) was due to the 800 kV voltage class in direct current, referring to the line that will allow transferring the energy generated by the Belo Monte Dam (PA) to the Southeast/Central-West submarket.

BNDES supported 72% of the Brazilian power grid's expansion in 2017-2018.

Power voltage needs to be high to minimize transmission losses. Thus, investments in equipment with which to perform this task are supported, and the energy transformation capacity expanded in 2017-2018 by the projects financed was 17,487 MVA.

Finally, in the power distribution segment, the essential objective is to ensure the universalization of energy, focusing on quality. In contrast to previous segments, the output estimates presented in the RTs of projects approved in 2017 and 2018 were used as information source.

TABLE 8: EXTENSION OF POWER DISTRIBUTION GRIDS PLANNED BY PROJECTS APPROVED IN 2017-2018

VOLTAGE CLASS	Output	Unit
Less than 2.3 kV	10,137	Km
2.3 kV to 25 kV	22,050	Km
30 kV to 44 kV	2,798	Km
69 kV	1,341	Km
88 kV to 138 kV	3,340	Km
Underground network	192	Km
Total	**39,857**	**Km**

Source: Elaborated by the authors.

The investment plans of energy distributors supported in 2017 and 2018 foresee the implementation or replacement of almost 40,000 km of grid, 80% of this total being in voltage classes up to 25 kV. This extension is equivalent to more than 80% of the total grid of the largest distributor in Brazil.

TABLE 9: OTHER ELECTRICITY DISTRIBUTION OUTPUTS EXPECTED BY PROJECTS APPROVED IN 2017-2018

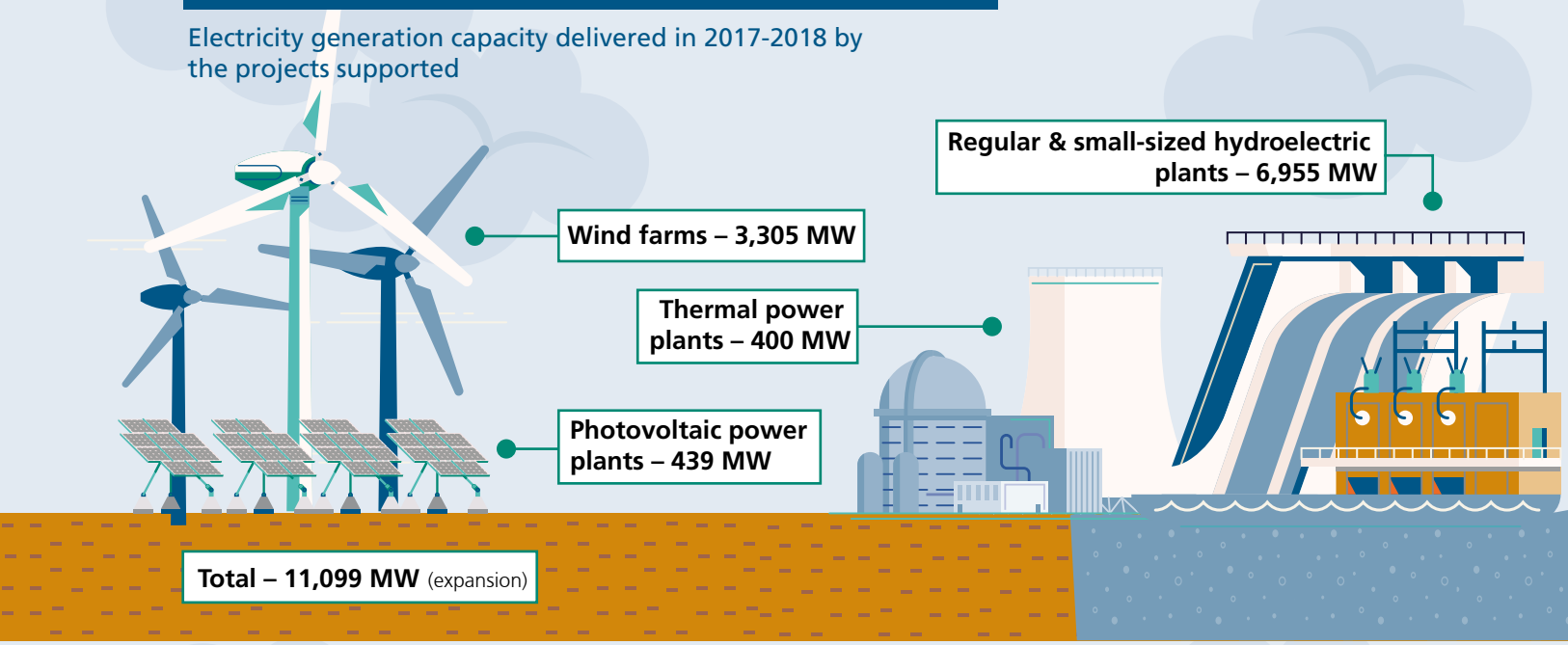
INDICATOR	Output	Unit
Installation of energy meters	3,494,636	Units
Construction of power distribution substations	72	Units
Modernization/expansion of power distribution substations	424	Units
Implementation/expansion of the transformation capacity of distributed power	5,920	MVA
Replacement of the transformation capacity of distributed power	1,258	MVA

Source: Elaborated by the authors.

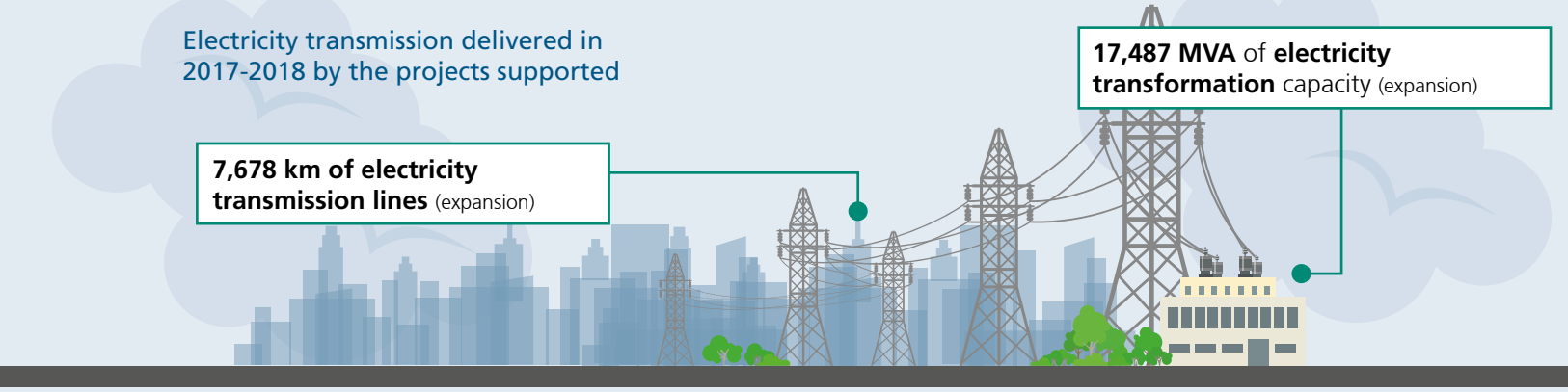
Measures taken to improve the energy supply's quality include the installation of nearly 3.5 million energy meters, the construction of 72 new distribution substations and the modernization or expansion of 424 substations. As for the energy transformation capacity at the distribution stage, 5,920 MVA will be implemented or expanded, and 1,258 MVA will be replaced.

ELECTRICITY – OUTPUTS DELIVERED OR PLANNED BY PROJECTS SUPPORTED – 2017-2018

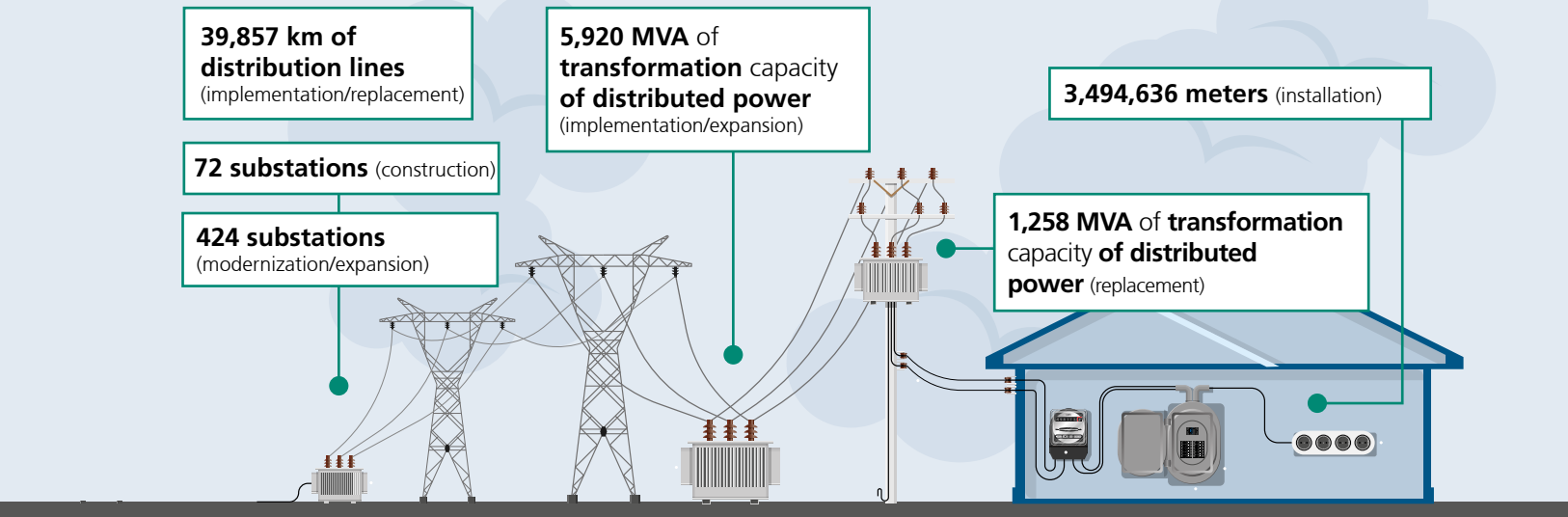
Electricity generation capacity delivered in 2017-2018 by the projects supported



Electricity transmission delivered in 2017-2018 by the projects supported



Electricity distribution outputs planned by projects approved in 2017-2018



Source: Elaborated by the authors.

PRIVATIZATION

In 2017 and 2018, BNDES once again started focusing on a type of direct action that had been a relevant component of its toolkit in the 1990s: the support for privatization processes. In this type of support, in general terms, the Bank provides technical knowledge and promotes the communication between the process' actors in the private and public sectors.

In 2016, the Federal Government created the Investment Partnership Program (PPI) to expand and strengthen the interaction between State and private sector, through the signing of partnership agreements and other privatization measures. BNDES was in charge of executing and monitoring privatization processes, and contributed to the necessary studies for structuring projects, relying on an independent external audit to certify their smoothness and transparency; on the indication of regulatory alternatives to increase the value of companies; on the communication with the granting authority, regulatory agencies, investors, control bodies and other actors in the public sector; and on the performance, in partnership with B3, of bids and events.

PPI's objectives are to increase investment and employment opportunities and promote technological and industrial development, in line with the country's social and economic development goals, ensuring the expansion and quality of public infrastructure, with tariffs adapted to users.

In the late 1990s, several energy distributors were federalized in an attempt to reorganize the states' tax situation and refinance their debts. Over the last 20 years, the federalized distributors have accumulated billionaire losses (about R$ 29 billion), management problems, lack of investments and drop in the level of services provided.

In 2017 and 2018, after performing several evaluation studies, BNDES sold six federated energy distributors under Eletrobras' management, namely: Amazonas Distribuidora de Energia S.A. (Amazonas Energia), Boa

Vista Energia S.A., Companhia de Eletricidade do Acre (Eletroacre), Centrais Elétricas de Rondônia S.A. (Ceron), Companhia de Energia do Piauí (Cepisa), and Companhia Energética de Alagoas (Ceal).

Currently, these distributors are responsible for serving 13.6 million inhabitants or 4.2 million consumer units, as follows:

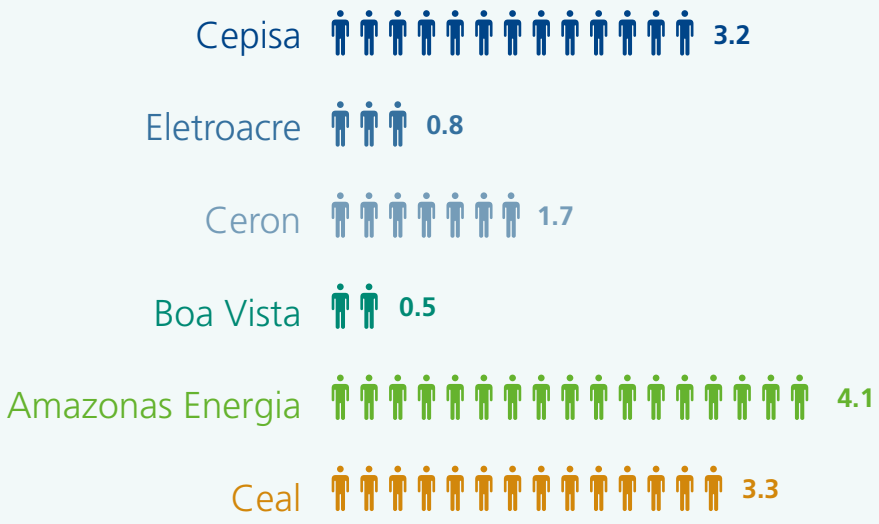
FIGURE 4 – POPULATION SERVED BY THE ENERGY DISTRIBUTORS PRIVATIZED – 2017-2018

13.6
million
inhabitants

or

4.2
million
consumer units

By distributor (million inhabitants)



Source: Elaborated by the authors.

The results achieved by the support were:

- end to the need for funds from the Eletrobras System, which had disbursed about R$ 25 billion since the distributors' incorporation in the group, compromising its capacity of investment in generation and transmission activities;
- financial relief in the balance sheet of Eletrobras, which transferred R$ 9.3 billion in debts to the new controlling shareholders;
- exclusion of R$ 1 billion in debts assumed by the new concessionaires that would be otherwise paid off with tax money; and
- initial investment of R$ 2.4 billion by the new controlling shareholders.

It is also estimated that investments of around R$ 6.7 billion will be made over the next five years, with expectations of improvement in the quality of services. The targets for improving the distributors' operational performance in relation to the reduction in service interruptions are shown in Table 10.

TABLE 10: TARGETS FOR REDUCING SERVICE INTERRUPTIONS BY 2022 OF ENERGY DISTRIBUTION COMPANIES PRIVATIZED BY BNDES – 2017-2018 (%)

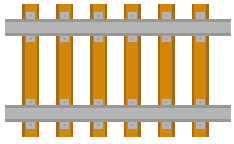
DISTRIBUTOR	Duration	Frequency
Amazonas Energia	18	36
Boa Vista Energia	33	41
Ceal	39	40
Cepisa	39	37
Ceron	39	29
Eletroacre	20	11

Source: Elaborated by the authors.

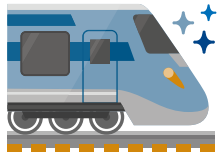
Logistics

BNDES's support for investments in logistics from 2017 to 2018 emphasized in this report may be segmented into railroad, port and highway concession projects. The support for railways is aimed at expanding the capacity of freight train flows, restoring rail quality and improving rail safety.

RAILWAYS – OUTPUTS PLANNED BY PROJECTS APPROVED IN 2017-2018

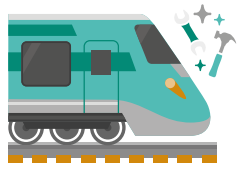


1,990
railroad ties
(replacement)

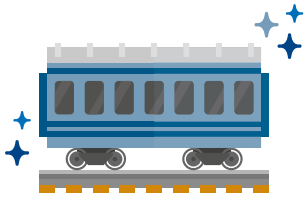


40
locomotives
(purchase)

25% of total locomotives built in Brazil during this period

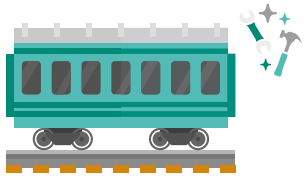


917
locomotives
(restoration)

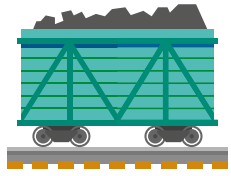


2,272
railcars
(purchase)

40% of total railcars built in Brazil in the same period



25,687
railcars
(restoration)



24.3
billion TKM*/year of
load capacity

Source: Elaborated by the authors.
Note: * TKM – ton-kilometer.

In 2017 and 2018, BNDES directly approved the financial support for eight rail projects that were expected to replace almost 2,000 railroad ties. With regard to rolling stock, the purchase of 40 locomotives, the restoration or modernization of just over 900 locomotives, the purchase of over 2,200 railcars, and the restoration or modernization of a whopping 25,687 railcars are planned.[10] In Brazil, between 2017 and 2018, 145 locomotives and 5,444 railcars were built, according to production statistics of Brazil's Railway Industry Association (ABIFER, 2019). The Bank's planned support for the purchase of locomotives is equivalent to about 25% of the total of locomotives built in these two years, and for the manufacture of railcars, it corresponds to 40% of the total built in the same period.

Regarding load capacity, the projected expansion is 24.3 billion ton-kilometers (TKM) per year, enough to transport, approximately, the total volume of sugar, soybeans and soybean meal transported by Brazilian railways in 2016 (just over 37.0 million tons of products). For further comparison, in the period in question, the total load volume transported in Brazil was 782.5 billion TKM, according to data from ANTT's Statistical Yearbook ([2019]).

In relation to highways, BNDES supports concessionaire investments aimed at increasing vehicle flow capacity, restoring pavement quality, improving the quality of the service delivered to users, and promoting the safety of infrastructure.

In 2017 and 2018, support for three projects was approved aimed at the duplication of 306 km of roads, paving of 18.0 km of new stretches, and restoration or reconstruction of 434 km, as shown in Table 11. As a basis for comparison, in 2016, Brazil registered 8,679 km of highways duplicated under private management and, in 2017, 6,318 km of restored/rebuilt highways, according to the Brazilian Association of Highway Concessionaires (ABCR, 2019a; 2019b).

10 These numbers are underestimated in relation to BNDES's full support in railway equipment, as they do not consider capital goods financed automatically by BNDES Finame.

TABLE 11: OUTPUTS PLANNED BY HIGHWAY CONCESSION PROJECTS APROVED IN 2017-2018

INDICATOR	Output	Unit
Duplication of highways	306	km
Paving of highways (new stretches)	18	km
Reconstruction/restoration of highways	434	km

Source: Elaborated by the authors.

The expected length of duplication and restoration/reconstruction of highways is 739 km, slightly more than the driving distance between Brasília (DF) and Belo Horizonte (MG), 716 km.

Ports are also a target of BNDES's support, aiming to expand the storage and handling of cargo at terminals, and to increase berth occupancy.

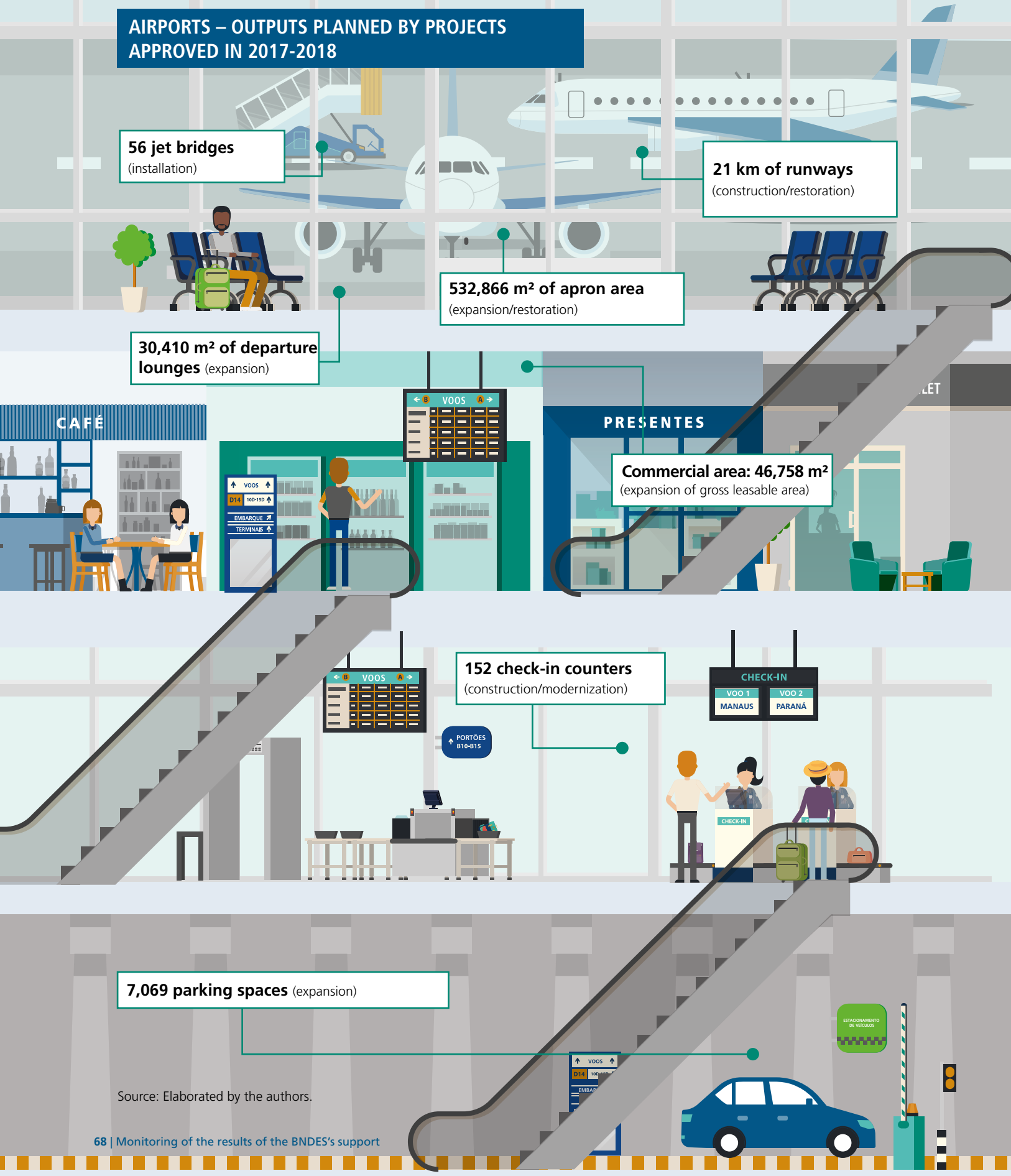
As a common indicator for three interventions related to two projects approved in 2017 and 2018, it was possible to verify the construction or renovation of storage area. Investments are expected to allow the expansion or improvement of just over 104,000 m², which is equivalent to approximately 14.5 soccer fields.

BNDES's support for the airport segment will contribute to the expansion of traffic capacity, with construction or renovation of 21 km of runways and 533,000 m² of apron area.

The airport segment stood out in 2017 and 2018 regarding BNDES's support in direct investments, aimed at promoting urban mobility in the country. The support for this type of project seeks to increase traffic capacity and improve the quality of the services offered. The four airport concessionaires supported in the period registered about 36.8 million departures and arrivals in 2018, a number that represents 17.5% of the total for all Brazilian airports according to Anac.

The investment plans supported will allow the construction or renovation of 21 km of runways, the expansion or renovation of approximately 533,000 m² of apron area, and the installation of 56 new jet bridges, which will contribute to the expansion in traffic capacity. Departure lounges will be expanded by 30,410 m², 152 check-in counters will be built or modernized, 7,000 new spaces

AIRPORTS – OUTPUTS PLANNED BY PROJECTS APPROVED IN 2017-2018



Source: Elaborated by the authors.

will be added to parking lots, and the commercial areas of airports are being expanded by 46,758 m^2. Considering 2.5 m^2 per person as the parameter adopted by international departure lounges to optimize the quality of services offered, the expansion planned by the projects supported will allow lounges to accommodate at least 121,000 people.

Environmental sanitation

Another relevant activity of BNDES in infrastructure concerns the support for investments in environmental sanitation, a segment for which economic theory points to a high level of positive externalities. In relation to water and sewage, the objectives pursued by BNDES are related to the expansion of water supply as essential to well-being, expansion of the sewage disposal and treatment system, and promotion of operational improvements of service providers, such as quality of supply.

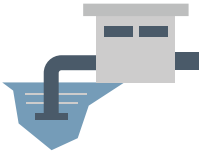
In 2017 and 2018, BNDES approved a significant cycle of investments in sanitation, totaling 17 projects, the planned output indicators of which are presented below.

The projects approved in 2017-2018 are estimated to provide access to sewage drainage to more than 943,000 people, with 260,000 new sewer connections.

From the start of the rainwater harvesting process to the delivery of the asset to households after it has been properly treated, BNDES has indicators on which to base the planned outputs. Projections include an increase in catchment capacity of 145 liters per second, an increase in water reservoir capacity of 16.2 million liters, and improvements in the distribution network, with expectation of 550 km of expansion and replacement of another 118 km. About three million water meters are expected to be delivered, with about 315,000 new installations and replacement of 2,689 thousand old or obsolete units.

Investments will also allow nearly 95,000 new water connections. Considering that, according to data from the National Information System on Sanitation (SNIS, 2019), the average in 2017 was 3.38 users with direct supply, it is estimated that about 320,700 people will benefit from the investments supported by BNDES.

SOLID WASTE TREATMENT AND DISPOSAL – OUTPUTS PLANNED BY PROJECTS APPROVED IN 2017-2018



2,450
t/day
of **solid waste treatment and disposal** capacity
(expansion)

Equivalent to the **daily waste production of 2.37 million people**

Source: Elaborated by the authors, based on data from Abrelpe ([2018?]).

The expected advance in sewage-related outputs is also significant. Projections include an increase in sewage treatment capacity of 2,874 liters per second, an increase in the extension of sewage networks, interceptors and collectors of nearly 2,700 km, and the replacement of 136 km of network. Almost 260,000 new sewer connections are also planned, which corresponds, according to the national parameter of 3.63 people per sewer connection, to a prediction of access of more than 943,000 people to the system upon the supported projects' implementation. By way of comparison, the city of Fortaleza (CE) in 2017, had about 2,531 km of network, and 1.33 million inhabitants with access to sewage.

To conclude the environmental sanitation segment, in 2017 and 2018, BNDES approved the direct support for two projects aimed at increasing the proper disposal and treatment capacity of 2,450 tons of municipal solid waste per day, the equivalent to the daily waste production of 2.37 million people.[11] BNDES's activities in this segment are aimed at increasing the capacity of MSW treatment, remediating contaminated areas (which have negative impacts on the environment), and recovering waste, for instance, by generating energy from organic material.

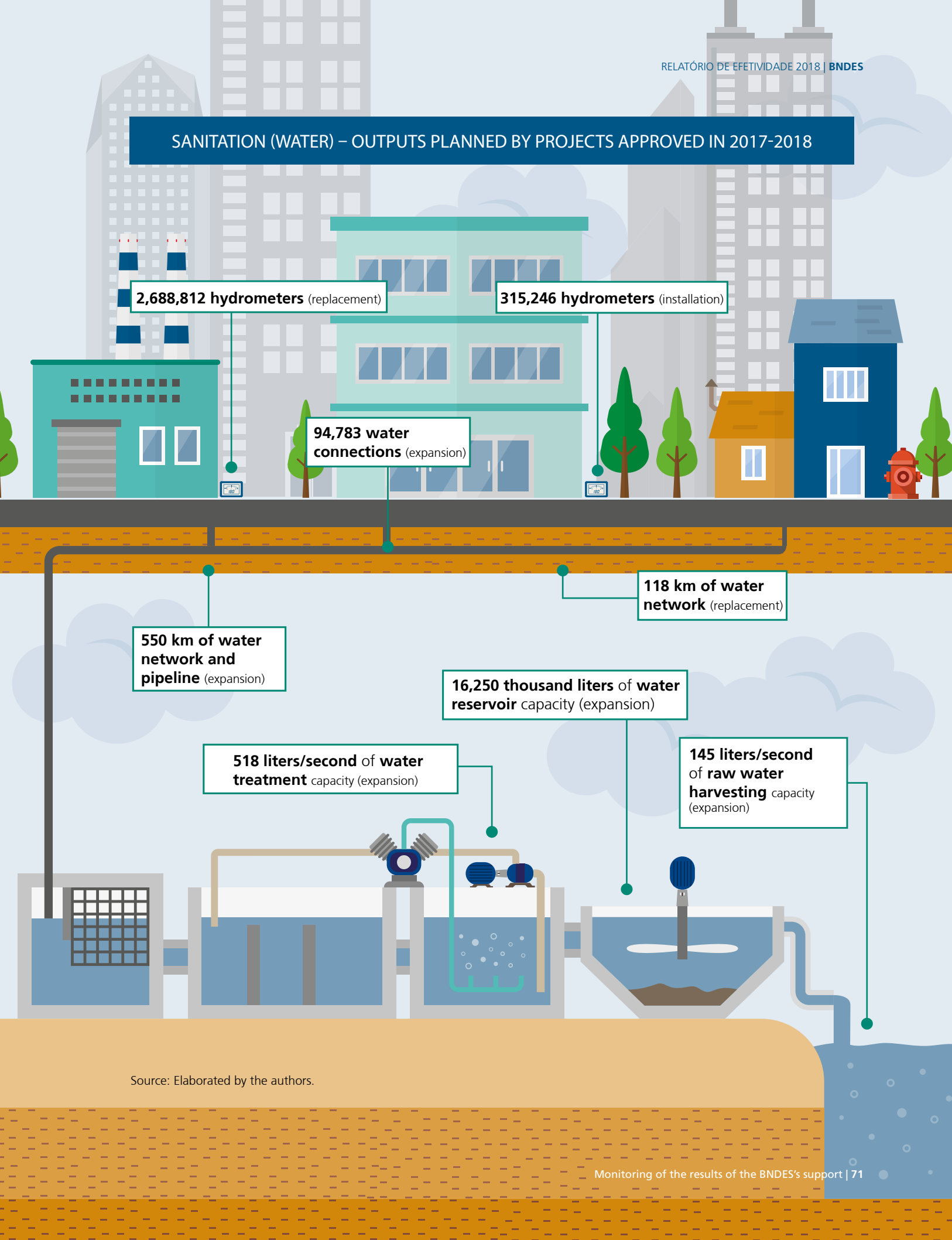
TABLE 12: OUTPUTS PLANNED BY SANITATION PROJECTS (SEWAGE) APPROVED IN 2017-2018

INDICATOR	Output	Unit
Sewage treatment capacity	2,874	liters/second
Extension of sewage networks, interceptors and collectors	2,699	km
Replacement of sewage networks, interceptors, collectors and pumping systems	136	km
New sewer connections	259,877	nº of connections

Source: Elaborated by the authors.

11 According to Abrelpe ([2018?]), Brazil produced, on average, 1,035 kg of waste per day in 2017.

SANITATION (WATER) – OUTPUTS PLANNED BY PROJECTS APPROVED IN 2017-2018



Source: Elaborated by the authors.

PRODUCTION STRUCTURE

Agroindustries and biofuels complex

The RT's adoption in direct industrial operations from 2017 onwards has allowed a significant advance in the compilation of outputs planned by agroindustry projects, compared to previous effectiveness reports. In the slaughterhouse and meatpacking segments, BNDES's support has the specific goals of promoting investments that translate into increased production, promoting productivity gains and/or added value in production, enabling and diversifying exports, and reducing and mitigating environmental risks and impacts. As will be shown in the presentation of each industrial segment, these goals are also present in the logic of support for other segments.

TABLE 13: OUTPUTS PLANNED BY SLAUGHTERHOUSE AND MEATPACKING PROJECTS APPROVED IN 2017-2018

PRODUCTIVE CAPACITY	Output	Unit
Poultry slaughtering	15,100	thousand heads/year
Pig farming	2,062	thousand heads/year
Pork sausages	34,729	tons/year

Source: Elaborated by the authors.

In 2017 and 2018, seven agroindustrial projects planning the outputs shown in Table 13, i.e., increase in poultry slaughtering capacity of 15.1 million heads per year, just over two million pig heads per year, and production of 34,800 tons of pork sausages, were approved. The poultry slaughtering capacity to be added corresponds to 0.26% of the total slaughtered in 2016 in Brazil. In the case of pig farming, the comparison with the actual production in 2016 is 4.87%. The survey did not consider operations for financing purchases of previously existing productive assets, for which there are also indicators of expected outputs.

In the sugar and alcohol production segment, the results expected are related to the increase in production capacity, the achievement of productivity gains or added value, the expansion of energy cogeneration capacity, and the reduction in environmental impacts.

In the period, a whopping 29 projects in the segment were nonautomatically approved.

The lower the average age of sugarcane fields, the higher their productivity is. Thus, 28,400 hectares of new planting areas and the renewal of 91,400 hectares are expected. The expansion and renewal of sugarcane plantations supported by the Bank correspond to 1.17% of the sugarcane area harvested in 2016 in Brazil. Projections include an increase of 6.5 million tons per year in sugarcane crushing capacity; of 470,000 tons in sugarcane storage capacity; and of 364,000 tons per year in sugar production. Regarding alcohol production, storage capacity is expected to increase by 240,000 m^3, and production capacity is expected to increase by 264,000 m^3 of ethanol per year. Considering the full utilization of this biofuel production capacity and an average fuel tank capacity of 58.6 liters, the anticipated annual expansion is capable of supplying about 4.5 million cars.

Organic material resulting from the processing of agricultural products such as sugar cane and corn has energy generation potential that can be used for the industrial activity's own production, or supplied to the National Interconnected System. In 2017 and 2018, BNDES nonautomatically approved 12 projects aiming at an increase of 228.1 MW in biomass power generation capacity. Some projects that foresee an increase in biomass generation have also been included in the estimation of sugar and alcohol indicators previously presented, as it is very common for plant investments to include investments in cogeneration as a strategy for obtaining efficiency gains.

BIOMASS POWER GENERATION – OUTPUTS PLANNED BY PROJECTS APPROVED IN 2017-2018

228.1
MW
of installed power
(expansion)

Source: Elaborated by the authors.

Projects approved in 2017-2018 expect an annual increase of 264,000 m^3 in ethanol production capacity, enough to supply 4.5 million cars.

DAIRY PRODUCTION – OUTPUTS PLANNED BY PROJECTS APPROVED IN 2017-2018

173,000
liters/year
of production capacity of **sterile, UHT and long-life milk** (expansion)

65,030
tons/year
of production capacity of **powdered milk and other dairy products** (expansion)

Source: Elaborated by the authors.

With regard to the grain production segment, the diagnosis in Brazil points to a deficit in the storage capacity of these foodstuffs, and BNDES supports investments that translate into reduced logistics costs, promoting productivity gains or added value, improving the quality, safety and control of industrial production, and reducing environmental impacts.

In this sense, 24 projects related to soybean storage, feed production and processing were approved in 2017 and 2018. The investments supported include the renovation of 63 warehouses for storage of agricultural products (mainly cereals), an increase in storage capacity of 943,000 tons of grain, an increase in feed production capacity of 322,000 tons per year, and an increase in soybean processing of about 1.9 million tons per year. The expected grain storage capacity corresponds to 0.56% of Brazil's total capacity, registered by IBGE in early 2017.

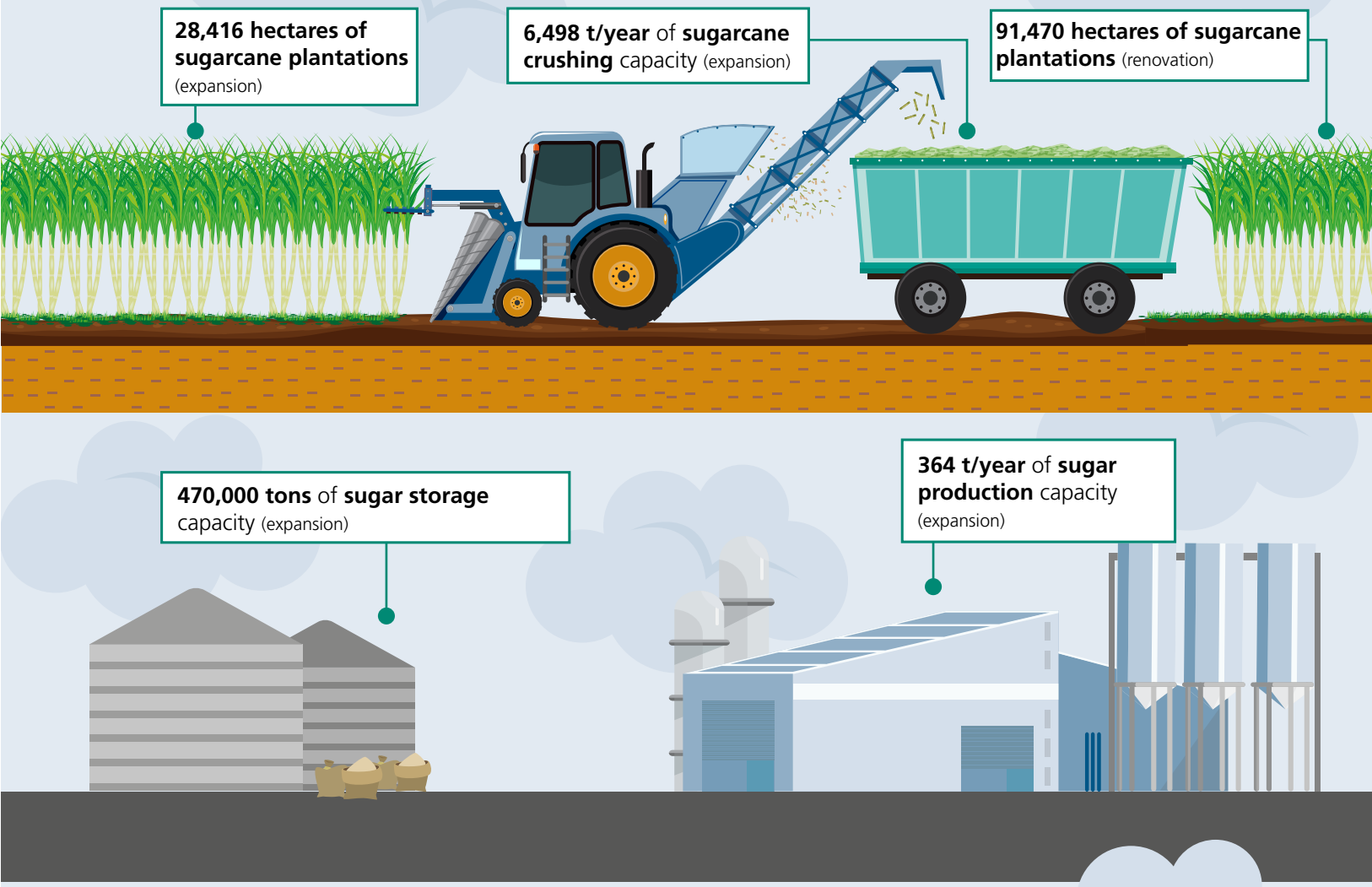
To complete the presentation of the outputs planned by agroindustrial projects, it was possible to consolidate indicators of direct support for dairy production. Three investment projects in this segment aim to expand the production capacity of sterilized, long-life and ultra-high temperature (UHT) milk by 173,000 liters per year, and the production capacity of powdered milk and other dairy products by just over 65,000 tons per year.

TABLE 14: OUTPUTS PLANNED BY GRAIN STORAGE AND FEED PRODUCTION PROJECTS APPROVED IN 2017-2018

INDICATOR	Output	Unit
Warehouse renovation	63	nº of warehouses
Grain storage capacity	943	thousand tons
Feed production capacity	322	thousand tons/year
Soybean processing capacity	1,897	thousand tons/year

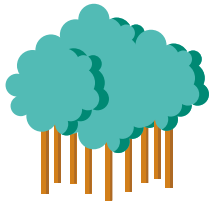
Source: Elaborated by the authors.

SUGAR AND ALCOHOL – OUTPUTS PLANNED BY PROJECTS APPROVED IN 2017-2018

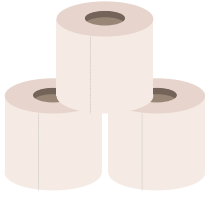


Source: Elaborated by the authors.

PLANTED FORESTS AND PAPER – OUTPUTS PLANNED BY PROJECTS APPROVED IN 2017-2018



78,606
hectares
of **planted forest area**
(expansion)



14,020
t/year
of **toilet paper production**
capacity (expansion)

Source: Elaborated by the authors.

Planted forests and paper

Basic industries are supported by BNDES to increase production or maintain installed capacity (avoiding depreciation and loss of productivity, for example), increase operational efficiency, promote productivity gains and/or added value in production, develop human capital and skills, enable and diversify exports, reduce and mitigate environmental risks and impacts, and increase energy and cogeneration efficiency.

In the segment of planted forests, in 2017 and 2018 BNDES approved three investment plans of pulp and paper producers aimed at planting 78,600 hectares of forests. This number corresponds to 1.08% of total planted forests in Brazil at the end of 2016, according to data from the Brazilian Forest Service (SFB, 2019).

In addition, two projects for increasing the production capacity of toilet paper were approved, totaling around 14,000 tons per year, enough to supply the annual consumption of 2.6 million Brazilians according to the *per capita* consumption of 2016, 5.4 kilograms (PÖYRY, 2017).

Oil, gas and shipbuilding

In the oil and gas sector, BNDES-supported investments have the same set of results previously presented for basic industries as development objectives, from increases in installed capacity and production to productivity gains and operational efficiency.

In 2018, a project of the Santa Catarina Gas Company was approved, aiming at the expansion and saturation of the state's natural gas distribution network, as well as technical and structural improvements. By 2020, BNDES-financed investments aim to increase the network by 156 km and, in this way, increase the

volume distributed to industries, businesses, CNG stations and households by 269,000 m^3 per day. Considering the provision to households only and an average daily household consumption of 0.37 m^3, the project's distribution increase would be sufficient to supply about 727,000 households.

In the shipbuilding segment, four projects were approved in 2017 and 2018, aiming at the repair of 28 oil rig support vessels, such as anchor, handling, tug and supply vessels (AHTS), platform supply vessels (PSV) (mainly dedicated to the transport of people and supplies between platforms and bases), and oil spill response vessels (ORSV). Also in 2018, the conversion of a PSV into a OSRVE-type vessel was supported.

TABLE 15: OUTPUTS PLANNED BY SHIPBUILDING PROJECTS APPROVED IN 2017-2018

INDICATOR	Output	Unit
Repair of oil rig support vessels	28	nº of vessels
Building of platform supply vessels	18	nº of vessels
Repair of coastal trading vessels	12	nº of vessels

Source: Elaborated by the authors.

In order to strengthen the national inland waterway transport, BNDES has been financing three projects of support to the building of 18 platform supply vessels (azimuthal tugboats, which offer more maneuverability and agility), and one aimed at the repair of 12 coastal trading vessels.

Finally, in 2017, BNDES supported the construction of a shipyard in the state of Rio de Janeiro, which will be used to repair and maintain vessels, with a repair capacity of 24 vessels per year.

RETAIL – OUTPUTS PLANNED BY PROJECTS APPROVED IN 2017-2018

523

stores (opening), totaling

2,260 m²

356

stores (modernization), totaling

14,240 m²

373

micro, small and medium enterprises supported via anchor company operations

Source: Elaborated by the authors.

Consumer goods, trade and services

In addition to the common goals shared with the industrial segments, such as increasing the production or provision of services and promoting productivity and competitiveness gains, the support for retail seeks to foster the creation or preservation of jobs, develop human capital and competence in firms and promote inter-firm cooperation networks.

The indicators available for consolidating the outputs of the four trade projects approved in 2017 and 2018 total 523 new stores – corresponding to an area of 2,260 m² – and modernization of 356 existing stores – corresponding to an area of 14,200 m².[12] The indirect support for 373 MSMEs occurs via operations in which BNDES's client acts as an anchor company that transfers resources to, for example, its franchisees. This client's relationship with its franchisees allows it to perform more detailed credit analyses with these smaller companies, and to assume credit risk with BNDES. This is a way to speed up the access to BNDES's financial resources, with more attractive terms and costs, promoting the continued growth of MSMEs.

The logistics associated with the distribution of goods is a topic of increasing importance for the segment's efficiency, considering the growth of digital trade. In 2017 and 2018, BNDES approved four projects for the expansion/modernization of distribution centers, totaling an area of about 490,000 m², which corresponds to more than 117 soccer fields.

Investments are expected to increase service delivery, promote logistical efficiency in the supported companies (reducing stocking costs, improving customer service etc.), and foster job creation or preservation.

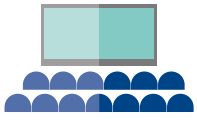
12 The relationship between the area of open stores and the number of new stores should not be made since not every project evaluated foresees the value of these two indicators. Regarding modernization, the relationship between area and number of stores is applicable, resulting in 40 m² on average per store.

Information and communication technologies (ICT) and creative economy

BNDES's support for information and knowledge-intensive segments is naturally focused on financing intangible assets, which is reflected in the types of output indicators associated with these projects. The support for the audiovisual production segment, for example, aims to promote the sustainability of national audiovisual content, stimulate the recognition of Brazilian audiovisual production, promote the national animation industry's competitiveness, facilitate national audiovisual content exports, and promote a modern and decentralized movie theater market.

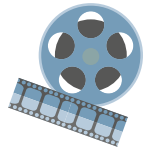
The infographic on the audiovisual segment presents the output indicators of 11 projects approved in the period, which foresee the implementation of 25 movie theaters (eight in state of Pernambuco, four in state of Mato Grosso and 13 in state of Santa Catarina), the development and production of seven films and the plans to distribute 36 films, and 56 hours of animation content for TV and

AUDIOVISUAL SEGMENT – OUTPUTS PLANNED BY PROJECTS APPROVED IN 2017-2018

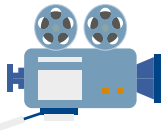


25
movie theaters
(implantation)

56
hours of animation content
for TV and other platforms



36
films
(distribution)



7
films
(development and production)

299,052
working hours of creation hub employees

R$ 2.74 million
in **wage bill** of creation hub employees

Source: Elaborated by the authors.

other platforms. The 25 new movie theaters supported by the Bank in 2017-2018 will be added to the 3,160 existing in 2016, which had already reached 3,223 in 2017. The variation between 2017 and 2016 was, therefore, 63 theaters. Assuming that the same number of theaters will be added to the country by 2018, the Bank will have contributed to nearly 20% of the expansion.

To develop audiovisual content, almost 300,000 working hours of people allocated to creative hubs are expected, corresponding to a wage bill, i.e., the sum of these professionals' salaries, of about R$ 2.7 million. Considering a 40-hour weekly work contract, the total work in creative hubs estimated would be enough to keep approximately 155 people working exclusively on the projects supported for one year.

Projects approved in 2017-2018 foresee the development of four digital games, of which three are serious games, aimed at the transmission of knowledge.

In the games development segment, the objectives pursued by BNDES with its support to investments are promoting the national games industry's competitiveness and fostering its exports.

In 2017 and 2018, BNDES approved two projects for development of four digital games, three of which are serious game, i.e., games aimed not at the promotion of entertainment, but at the transmission of knowledge or performance of some kind training.

BNDES is a major supporter of software development projects as vectors of business competitiveness gains, innovation efforts and results, development of human capital and skills, and facilitation and diversification of exports. In 2017 and 2018, 19 projects seeking to locally develop 178 new software programs and upgrade another 46 were directly supported. It is estimated that the manpower needed to carry out the supported companies' development plans will amount to over 7.5 million hours, an effort equivalent to 3,916 people working forty hours a week for a full year. Of the funds approved to support investments, it is estimated that around R$ 730 million will be used to pay employees allocated to the development of software programs.

TABLE 16: OUTPUTS PLANNED BY PROJECTS IN THE SOFTWARE SEGMENT APPROVED IN 2017-2018

INDICATOR	Output	Unit
Local development of new software programs	178	nº of software
Updating of locally developed software programs	46	nº of software
Working hours for software development supported	7,519,236	man-hour
Wage bill for software development supported	729,703	R$ thousand

Source: Elaborated by the authors.

Sale of capital goods

Capital goods are equipment, facilities or goods used in the production of other goods and services that survive the production process. BNDES supports the investments of companies in capital goods nonautomatically when the purchase and installation of these assets are part of a larger set of productive investments, and automatically when financing isolated purchases of machinery and equipment.

Due to the low level of fixed investments of Brazilian companies and the low average efficiency of capital goods in use in the country, BNDES promotes access to credit for the purchase of machinery and equipment. Achieving higher levels of investment in the companies supported can in turn increase employment and turnover rates.

Considering only capital goods indirectly supported through BNDES Finame, Table 17 shows the amount of machinery and equipment of trading operations approved in 2017 and 2018 for some equipment types. BNDES Finame supports accredited equipment of various types or purposes; therefore, some types of equipment for which there is expected to be relative homogeneity in the items included in each category were selected. For example, despite the large amount of computer and telecommunication equipment supported, not all have been presented, as the category ranges from computer peripherals to telecommunication centers with greater individual value.

TABLE 17: PURCHASE OF MACHINERY AND EQUIPMENT SUPPORTED BY BNDES FINAME IN 2015-2018

TYPE OF MACHINERY OR EQUIPMENT	2015	2016	2015-2016 total	2017	2018	2017-2018 total
Trucks	66,157	33,366	**99,523**	43,693	41,195	**84,888**
Buses	13,573	9,262	**22,835**	10,943	8,005	**18,948**
Harvesters	6,448	6,101	**12,549**	6,820	7,221	**14,041**
Farm tractors	16,540	15,644	**32,184**	17,231	15,913	**33,144**
Sprayers and sprinklers	3,901	3,677	**7,578**	3,658	3,356	**7,014**
Industrial ovens and kilns	16,579	24,793	**41,372**	157,302	4,208	**161,510**
Power generators, transformers and electric motors	195,137	2,360	**197,497**	8,897	815	**9,712**
Refrigeration and air conditioning	67,930	67,191	**135,121**	120,782	9,930	**130,712**
Medical and hospital equipment	2,609	519	**3,128**	233	377	**610**
Machine tools	3,065	642	**3,707**	831	1,009	**1,840**
Industrial robots	23	2	**25**	8	5	**13**

Source: Elaborated by the authors.

Following the fall in BNDES Finame disbursements in 2017 and 2018 compared to 2015 and 2016, the number of capital goods financed dropped in most of the selected types. Industrial ovens and kilns had significant growth in the period, and it is noted that the main goods for the agricultural sector (harvesters and tractors) also showed growth, reaching a total of 47,200 in the last two years of the series. The number of buses and trucks supported is significant, with an average of 52,000 units per year in 2017 and 2018, but it decreased in 2017 and 2018 by 17% and 15%, respectively, compared to the 2015-2016 period. This average volume of support is equivalent to six and a half months of purchases of buses and trucks performed in the country in 2018.

The volume of refrigeration and air conditioning items is also relevant, with an average support of 65,300 units per year in 2017 and 2018.

It can be seen that BNDES Finame's support is used to purchase goods with different levels of technological intensity, including industrial ovens and kilns, hospital equipment, power generators and electric motors, and industrial robots.

Support to exports

BNDES's support to Brazilian exports has, as main objectives, promoting the insertion and competitiveness of national companies in the foreign market, increasing the national production scale by expanding the consumer markets, generating income and direct and indirect jobs (exports supplier chain), and strengthening the balance of payments by diversifying exports and generating long-term foreign currency inflows.

BNDES Exim's support for capital goods exports decreased in 2017-2018, as can be seen in Table 18.

TABLE 18: CAPITAL GOODS EXPORTS SUPPORTED BY BNDES EXIM IN 2015-2018 BY SELECTED SEGMENTS (CURRENT US$ MILLION)

SEGMENT	2015	2016	2015-2016 total	2017	2018	2017-2018 total
Industrial or power generation machinery	234	935	**1,169**	56	40	**96**
Road-building or agricultural machinery	235	143	**378**	32	25	**57**
Buses, trucks, parts and accessories	129	3,286	**3,415**	37	75	**112**
Other transport equipment	1,143	1,611	**2,753**	651	1,136	**1,787**
Other capital goods	16	62	**78**	17	2	**19**
Total	**1,758**	**6,037**	**7,794**	**793**	**1,278**	**2,071**

Source: Elaborated by the authors.

In 2017 and 2018, US$ 2,071 million in exports (value of exported goods) were supported, compared to a performance of US$ 7,794 million in the 2015-2016 period. All capital goods segments registered a reduction in performance, but the segment of other transport equipment declined proportionately (35% against 73% in total), as it largely consists of aircraft support.

The support for the commercialization of aircraft produced by Embraer decreased in 2017 and 2018 compared to the two previous years, totaling 71 units. Considering the average aircraft volume financed by BNDES from 2008 to 2016 of around 38 units per

year, the average annual support of 35 units in 2017 and 2018 was slightly lower.

TABLE 19: AIRCRAFT EXPORTS BY EMBRAER SUPPORTED IN 2015-2018

SEGMENT	2015	2016	2015-2016 total	2017	2018	2017-2018 total
Aircraft supported through BNDES credit	43	62	**105**	25	46	**71**

Source: Elaborated by the authors.

Regarding the dynamization of the supply chain of goods and services for engineering works carried out abroad by national companies, there is also a decrease in performance in 2017, and no outputs in 2018.

This results from the suspension of new hiring of post-shipment operations to support exports of engineering services, since 2016. The result for 2018 was nil.

TABLE 20: OUTPUTS OF ENGINEERING WORKS SUPPORTED IN 2015-2017

SEGMENT	2015	2016	2017
Shipped goods (US$ current million)	273.9	100.2	1.6
Third-party services hired (US$ current million)	94.3	37.8	2.2
N° of suppliers of goods	508	301	37
N° of suppliers of services	356	246	25

Source: Elaborated by the authors.

EDUCATION, HEALTH AND SECURITY

Education

A form of singular support from BNDES, structured around projects for adoption of technology in educational processes, stood out in 2018. The BNDES – Connected Education – Implementation and Use of Digital Technologies in Education public call is an initiative carried out in partnership with the Ministry of Education (MEC), which has great potential to generate learning for the Federal Government's Connected Education Innovation Program (Piec) and for BNDES's performance within this theme.

Through the public call, projects aimed at the adoption of technology as a pedagogical and management tool in public basic education schools will be supported. In the actions to be supported, there must be balance among four dimensions: (i) vision; (ii) training; (iii) digital educational resources; and (iv) infrastructure. According to Piec, the potential of technology is realized only if these four dimensions are in balance.

Projects supported under the public call are expected to promote greater use of technology as a pedagogical and management tool. Teachers are expected to intensify the use of technology in the classroom, managers are expected to apply technology to administrative systems, and students are expected to rely on technological resources to study. This may increase the interest and motivation of students and promote changes in their study habits, improving attendance and dropout rates. The consequence of this whole process would be the promotion of meaningful learning.

In 2018, six projects of support to state and municipal education networks in the states of Goiás, Tocantins, Minas Gerais, Rio Grande do Sul, Sergipe and Paraíba were approved under the call. Some of the main outputs foreseen in the RTs of these projects include: provision of broadband internet access to 435 schools, purchase of 3,629 electronic devices for pedagogical use, training of 7,837 people in pedagogical and technological activities, and revision of 393 pedagogical political projects.

HEALTH INDUSTRY – OUTPUTS PLANNED BY PROJECTS APPROVED IN 2017-2018

130,504

thousands of ready-to-sell **units/year of drugs** for human health

16

certifications or recertifications (Inmetro, Anvisa, Mapa and ISO)

22

records of medical and dental products in Anvisa

Source: Elaborated by the authors.

As will be presented in the chapter *Evaluation of BNDES's impacts*, this support will feature a specific evaluation design strategy to isolate the impacts achieved.

Health

BNDES's support to the health sector is performed on two fronts: by fostering investments of industrial companies in the research and manufacture of drugs, and enabling improvements in the provision of care by hospitals, clinics etc.

Within the scope of support to the industrial health segment, BNDES's logic of promotion of development lies in expanding the supply of health products, promoting productivity gains and increasing business competitiveness; expanding the local supply of strategic products for Brazil's health needs; expanding the supply of biotechnological products for human health; enabling and diversifying exports; and improving the quality, traceability and safety of products, meeting regulatory changes, improving environmental and safety controls, and controlling the manufacture processes of healthcare industries.

Seven projects approved in 2017 and 2018 had their output indicators computed. An increase in drug production capacity of 130.5 million ready-for-sale units per year (in the form of vials, pills, ointments, among others) is foreseen. The supported investments will allow manufacturing companies to obtain 16 new certifications or renewals of certifications from agencies such as the National Institute of Metrology, Quality and Technology (Inmetro), the Brazilian Health Regulatory Agency (Anvisa), the Ministry of Agriculture, Livestock and Supply (Mapa), and the International Organization for Standardization (ISO).

The health industrial complex is also made up of companies that manufacture medical and dental products. BNDES's support in 2017 and 2018 is expected to enable the registration of 22 new products, such as orthopedic prostheses and digital radiology systems.

In addition to supporting the industrial companies that manufacture and develop drugs and medical and dental materials, BNDES bases its performance on the promotion of investments in the provision of health services. This action's goals are improving the management quality of health service providers, maintaining the provision of services to the Brazilian Unified Health Service (SUS) in institutions facing financial difficulties, and expanding and improving the supply of health services in the country, especially in regions with fewer beds than that recommended by the World Health Organization (WHO).

The support for the provision of health services aims to improve the management quality of providers, maintain the provision of services to SUS in institutions facing financial difficulties, and expand the supply of health services in the country.

TABLE 21: OUTPUTS PLANNED BY HEALTH SERVICE PROJECTS APPROVED IN 2017-2018

INDICATOR	Output	Unit
New beds outside SUS	742	nº of beds
Construction of operating rooms outside SUS	28	nº of rooms
Outpatient care capacity	552,981	consultations/year
Inpatient care capacity	67,868	patients-day/year
Surgical care capacity	24,440	surgeries/year

Source: Elaborated by the authors.

In 2017-2018, five hospital expansion and modernization investment projects were approved, which, in relation to infrastructure, seek to provide 742 new beds outside SUS, and build 28 new operating rooms. With these investments, it is expected that the outpatient care capacity will be increased by about 553,000 consultations per year,

With the projects approved in 2017-2018, it is expected that the outpatient care capacity will be increased by about 500,000 consultations and surgical care capacity will be increased by 24,000 surgeries per year.

that the hospitalization capacity will be increased by almost 68,000 patients per year, and that the surgical care capacity will be increased by 24,400 surgeries per year.

To estimate the size of the Bank's operations, between 2017 and 2018, 2,364 new beds outside SUS were made available in Brazil (Cadastro Nacional de Estabelecimentos de Saúde do Ministério da Saúde – BRASIL, 2019b). During this period, BNDES approved projects that foresaw the delivery of 742 new beds outside SUS, which would correspond to 31% of the total number added in Brazil.

Security

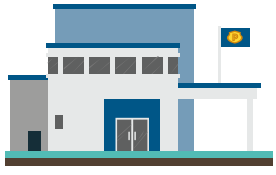
BNDES's support for investments in public security has two main objectives regarding the expected results. One is focused on promoting the improvement of prisons by expanding prison capacity (seeking to reduce overcrowding and the prison deficit in state prison systems), and also by contributing to the resocialization and/or improvement of the living conditions of inmates (increase in the number of elementary, middle and technical school placements for inmates, increase in medical, dental, psychological and legal capacity, among others). The other objective is to expand and/or modernize the infrastructure of police stations and control centers, as well as the intelligence of public security, in order to improve the services provided to the population and increase operational efficiency (investment in buildings, vehicles, security cameras, professional training and acquisition of security software, among others).

In 2017 and 2018, BNDES approved a set of investments aimed at the organizational modernization and upgrading of the equipment of public security agencies in the state of Espírito Santo. These investments are anchored in the 2016-2019 Multiannual Plan (PPA), which intends to develop integrated and diversified actions to combat crime and prevent violence. The project's main outputs are the construction of five new public security buildings, purchase of 837

police cars and 2,300 personal protective equipment items (such as bullet proof vests) by December 2021.

It is important to highlight that the list of security objectives and indicators will be improved with the deepening of BNDES's performance in the segment, including as options for the RT's development, issues related to the prevention of violence, with investments in public lighting, social policies focused on marginalized groups, and the strengthening of the integration between federative entities as a strategy to confront the issue.

PUBLIC SECURITY (STATE OF ESPÍRITO SANTO) – OUTPUTS PLANNED BY PROJECT APPROVED IN 2017-2018



5
public security **buildings** (construction)

837
police **cars** (purchase)

2,300
personal **protective equipment** (purchase)

Source: Elaborated by the authors.

CULTURAL HERITAGE

Education, health and security strategic mission encompasses BNDES's support for cultural infrastructures and historical heritage. Supporting this segment is aimed at preserving the Brazilian cultural heritage as a vector of economic, social and territorial development, promoting the maintenance of its sustainability beyond occasional restoration, and developing human capital and skills.

BNDES's performance is more than recovering heritage sites and their collections. It also aims at stimulating and facilitating the enjoyment of the asset restored (material, intangible and memorial collections) and promoting its better use by society so that it can be an instrument for economic, tourist and urban development at the location where it is.

Regarding the first specific objective, related to preserving heritage and the structuring of cultural facilities, a total of 14 projects were approved in 2017 and 2018 with outputs shown in Table 22.

TABLE 22: OUTPUTS PLANNED BY CULTURAL HERITAGE PROJECTS (PRESERVATION) APPROVED IN 2017-2018

INDICATOR	Output	Measure
Preservation of material heritage	17	nº heritage sites
Preservation and/or digitization of collections	60,000	nº of items
Collections of institutions supported or hosting made available for partners	65,472	nº of items
Establishment or revitalization of cultural facilities	9	nº of facilities
Area for institution or revitalization of cultural facilities	16,871	m^2
Creation of visitation circuits	5	nº of circuits

Source: Elaborated by the authors.

Seventeen material heritage sites such as cinemas, hotels, museums, churches, cultural centers and historic buildings will be preserved. Regarding collections that are supported by BNDES's resources, it is estimated that 60,000 items will be preserved and/or digitized, such as photos, videos, texts, paintings, and sculptures. Projects approved in 2017 and 2018 also foresee the availability of about 65,500 items of collection on the internet, institution or revitalization of nine cultural facilities and an area of 16,900 m^2 of cultural facilities. Finally, five visitation circuits are expected to be implemented by the projects supported.

TABLE 23: OUTPUTS PLANNED BY CULTURAL HERITAGE PROJECTS (SUSTAINABILITY) APPROVED IN 2017-2018

INDICATOR	Output	Measure
Structuration of endowment funds	6	nº of funds
Elaboration of financial sustainability plans	3	nº of funds

Source: Elaborated by the authors.

BNDES is concerned with sustaining preservation activities and with access to the cultural heritage it supports, therefore it encourages structuring of endowment funds as a new way of supporting cultural institutions. Endowment funds have their own resources and are managed as the funds available in the financial market. In its bylaws, the fund's own income is used to help maintain the cultural institution and develop projects. The instrument ensures the predictability and continuity of resources for the cultural institution, giving the entity operational stability and allowing it to focus on its mission. In 2017 and 2018, BNDES approved six projects providing for the structuring of six funds of this nature. Moreover, elaboration of three financial sustainability plans is foreseen.

TABLE 24: OUTPUTS PLANNED BY CULTURAL HERITAGE PROJECTS (HUMAN CAPITAL) APPROVED IN 2017-2018

INDICATOR	Output	Measure
Qualification in technical or managerial activities	972	nº of people
Qualification in technical or managerial activities	11,614	class hours

Source: Elaborated by the authors.

Concluding the cultural heritage segment, four projects were approved in 2017 and 2018 involving training in intangible heritage or activities related to the management of cultural facilities. Some 970 people are expected to be trained, with 11,600 class hours. This training includes a project for the preservation and enhancement of intangible heritage in the region of Minas Gerais based on local "knowing and doing" of traditional constructive activities. Preservation will be achieved through the implementation of a vocational training program for about 600 young people from 18 to 25 years old, in five traditional construction activities: construction site, painter and plasterer, blacksmith, plasterworker, and carpenter. The target audience is composed of residents of low-schooling and from low-occupied localities of the municipality of Mariana, who suffered negative economic and social impacts from the environmental disaster that occurred in 2015.

INNOVATION

Support for innovation is a cross-cutting theme that encompasses investment support for various segments of industry, trade and services. The projects supported by BNDES's innovation instruments have the increase of the companies' ability to innovate as expected objectives, that is, the promotion of greater private innovative effort; value creation for the company through innovation, which, in turn, consists of transforming the continuous business innovation strategy into positive economic results (such as productivity gains), and promotion of innovation based on applied academic knowledge, an objective associated with the approximation between academic research and business innovation plans aimed at boosting the development of technologies that are more likely to be brought to the market.

Output indicators foreseen by projects supported by this theme were divided into three blocks: research and development (R&D) infrastructure, innovation development, and intellectual property registration.

INNOVATION (INFRASTRUCTURE) – OUTPUTS PLANNED BY PROJECTS APPROVED IN 2017-2018

7 **laboratories** or development research centers totaling

188,892 m²

(construction)

5 **laboratories** or development research centers totaling

3,068 m²

(renovation)

Source: Elaborated by the authors.

Regarding the set of innovative projects approved by BNDES in 2017 and 2018, nine provided for investments in infrastructure for R&D.

With the implementation of these projects, seven new laboratories and R&D centers made possible by BNDES's resources are expected to be delivered, totaling a built area of almost 189,000 m^2. Most of this planned area is due to the construction of a 175,000 m^2 of automotive test track. Disregarding the constructed area of this project, the area has a total of 13,800 m^2 for R&D, approximately two soccer fields. There are also plans to renovate five laboratories and research centers, totaling around 3,000 m^2.

By analyzing indicators related to intangibles supported by innovation projects, the outputs for R&D development and innovative results are presented in Table 25, which considers 39 projects in total.

TABLE 25: OUTPUTS PLANNED BY INNOVATION PROJECTS (DEVELOPMENT) APPROVED IN 2017-2018

INDICATOR	Output	Measure
Man-hour supported (R&D)	2,006,398	man-hours
Man-hour supported (engineering)	3,494,096	man-hours
Wage bill supported (R&D)	80,152	R$ thousand
Wage bill supported (engineering)	85,950	R$ thousand
Hiring of technological services	47,485	hours
New processes developed/implemented	48	processes
New products/services launched in the market	165	products/services

Source: Elaborated by the authors.

Engineers and researchers teams' development effort is presented as indicators of man-hours devoted to development and the salaries that are paid to these professionals. More than two million hours of R&D are planned, and about 3.5 million hours specifically in engineering (mostly automotive engineering). Altogether, these hours

of development are equivalent to 2,865 employed professionals working 40 hours a week for a year. As compensation for this effort, approximately R$ 80 million will be allocated to R&D and R$ 86 million to engineering.

For the execution of innovation plans, the companies supported also hire specialized technological services, such as laboratory tests, which will total 47,500 hours of service. As a result of all this process of innovative effort, 165 new products or services are expected to be launched in the market, and 48 new production processes will be developed or implemented.

Twenty invention patents and seven utility patent filings or industrial design registrations are expected as a result of projects approved in 2017-2018.

Finally, investments in innovation can be protected through developed intellectual property registration, but not every R&D process generates such rights. Innovative projects approved by BNDES in 2017 and 2018 are expected to generate 20 invention patent filings and seven utility model patents and industrial design registrations.

CAPITAL MARKET

In December 2017, the Capital Market Acting Policy (PAMC) was approved, which aims to establish BNDES System's operating guidelines through capital market operations involving securities, which should comply with at least one of the following objectives:

- increased use of capital markets by fundraising companies and investors to invest funds;
- diversification of the use of capital market instruments and market development;
- improvement of management, governance, sustainability and transparency practices by companies and investors;
- incentive to investments that have positive impacts on society;
- development of the venture capital culture, entrepreneurship, and innovative companies in the country; and/or

- creation of value and improvement of the risk/return ratio for the BNDES System's capital market portfolio.

BNDES System's performance in capital market operations occurs by means of the following instruments:

- debt assets;
- debt equity; and
- participation in investment funds.

Debt assets

BNDES supports the issuance of corporate debt securities through the subscription of simple debentures and other publicly offered securities issued by Brazilian companies.

In 2017-2018, BNDES's main activity in the debt assets capital market segment was through the subscription of simple debentures, object of public offerings. As can be seen in Table 26, eight debenture operations were carried out in the period considered, five in 2017 (all for infrastructure projects) and three in 2018 (two infrastructure projects and one corporate project).

TABLE 26: DEBENTURE OPERATIONS – 2017-2018

NUMBER OF OPERATIONS	2017	2018	Total
Infrastructure	5	2	**7**
Corporative	-	1	**1**

Source: Elaborated by the authors.

Equity assets

Through a public or private issuance, BNDESPAR subscribes shares or other securities convertible or exchangeable for shares or in any way convertible, redeemable or backed by shares.

The operations of equity assets, which may be actively promoted, should be intended to support business plans that are in accordance

with the BNDES System's strategic planning and which fall into at least one of the following guidelines:

- economy competitive development;
- capital market development;
- sustainable development; and/or
- social development.

Equity participation

During the monitoring period, shares in the BNDES System's debt equity portfolio will be considered subject to disinvestment when, cumulatively, the following factors are verified:

- maturity of the investment in terms of future profitability prospects;
- absence of role to be played by the BNDES System in the company invested;
- existence of opportunity and liquidity;
- possibility of divestment of the asset at a price higher than the fair value; and
- absence of impediments (legal, contractual, regulatory and/or of any type) to the divestment of such asset.

Divestments in recent years totaled R$ 16.6 million, of which R$ 6.7 million were incurred in 2017 and R$ 9.9 million in 2018, as shown in Table 27.

TABLE 27: DIVESTMENTS OF BNDESPAR IN EQUITY ASSETS – 2017-2018

INDICATORS	2017	2018	Total
Volume disbursed (R$ million)	**6,656**	**9,976**	**16,632**
Number of companies disbursed	**22**	**16**	**38**
Total	13	8	**21**
Partial	9	8	**17**
Number of companies that migrated to Novo Mercado	**4**	**0**	**4**

Source: Elaborated by the authors.

During this period, divestments (partial and total) involved 38 companies from the industrial productive, trade and services sectors, and infrastructure, such as energy and telecommunications.

In accordance with the Capital Market Performance Policy (PAMC) implemented in 2017, BNDES encourages governance improvements by enhancing management, sustainability and transparency practices by companies and investors. In 2017, four companies with BNDESPAR participation migrated to B3's Novo Mercado. By migrating to the Novo Mercado, the company is committed to adopting best corporate governance practices.

Equity funds (FIP)

BNDESPAR supports equity funds (FIP) aiming at:

- fostering the venture capital industry;
- supporting companies and projects that may result in development for the country;
- inducing best management practices and corporate governance; and
- acting in partnership with other investors.

In this way, startups, developing companies or mature companies can be supported with BNDESPAR resources through investment funds managed by market managers.

As a shareholder of these funds, BNDESPAR may participate in the investment committees, analyzing the investment proposals brought by the managers, contemplating in this analysis several aspects such as: economic and financial evaluation of the company and its projects; company's market, governance and management; risks and their mitigating factors and structure of the proposed operation, among others. In some cases, BNDESPAR may also be shareholder of funds in which investors do not participate in the investment committee, that is, in which investment decisions are fully made by the fund manager. In this case, BNDESPAR's interest is limited to 25% of the total subscribed capital of the fund.

Equity funds by BNDESPAR invested in 55 MSMEs in 2017-2018, enabling total investments of over R$ 400 million.

Credit funds

The BNDES System supports corporate credit funds aiming at expanding BNDESPAR's performance in the financial disintermediation process in the country by investing in funds primarily focused on long-term corporate credit operations.

In 2018, BNDESPAR approved the subscription and payment of quotas of the Vinci Energia Sustentável FIDC (Credit Rights Investment Fund), in the amount of up to R$ 217 million, representing a 43.4% interest in the fund capital committed. This fund was selected through a public call and its objective is to invest R$ 500 million in energy sector infrastructure debentures, focusing on sustainable projects. The fund is a Climate Bonds Partner Fund as defined by the Climate Bonds Initiative.

Investment Guarantee Fund (BNDES FGI)

BNDES has been providing complementary guarantees to expand access to credit by MSMEs for over 20 years, and it is currently responsible for managing BNDES FGI.

BNDES FGI increases the chances of approval of MSMEs' credit applications by supplementing the guarantees offered by smaller companies and entrepreneurs, who have historically had difficulty in providing collaterals required by financial institutions. BNDES FGI guarantee can also generate better conditions for operations, such as longer terms.

Currently, BNDES FGI has 27 partner financial institutions and supports operations in various financing lines and programs, both in BNDES's onlendings and in the FGI Free Credit modality (referring to lines of accredited financial agents or other sources). In 2017-2018, the fund leveraged a total of R$ 1.6 billion in credit, with R$ 984.3 million in 2017 and R$ 628.5 million in 2018. In the biennium, there were 2,477 onlending operations guaranteed by BNDES FGI whose beneficiaries were entering the BNDES System (clients that had not been previously supported by the Bank) – 1,932 operations in 2017 and 545 in 2018.

TABLE 28: BNDES FGI PERFORMANCE – 2017-2018

INDICATOR	2017	2018	Total
Total credit leveraged (R$ thousand)	984,336	628,519	**1,612,855**
Number of operations with new clients	1,932	545	**2,477**

Source: Elaborated by the authors.

In 2018, there was a significant growth in the FGI Free Credit line, which closed the year with R$ 120 million in guaranteed financing, a value 156.8% higher than the previous year. It is also worth mentioning operations aimed at innovation, which totaled R$ 65 million, growing 173.6%.

Since the fund was constituted, 62% of clients in onlending operations that had the BNDES FGI guarantee had not contracted credit with BNDES before, as it demonstrates the high potential of financial inclusion enabled by the guarantee.

SUSTAINABILITY

Amazon Fund

BNDES's main support instrument for biome conservation in Brazil and deforestation reduction is the Amazon Fund, which is structured into four support components:

- sustainable production, whose purpose is that the activities that maintain the forest standing have economic attractiveness;
- monitoring and control, which, in turn, aims at governmental actions to ensure the adequacy of anthropic activities to environmental legislation;
- territorial planning, which seeks to make the Brazilian Amazon region ordered by public forest management, ecological and economic zoning and land regularization; and

- science, technology and economic instruments, in the sense that these instruments and activities should contribute to the recovery, conservation and sustainable use of biodiversity.

The advanced level of monitoring and evaluation activities performed for Amazon Fund support allows presentation of the results obtained by the projects in 2017-2018. For the first three fund's operation components, information was gathered from all projects supported in several years but delivered in 2017-2018.

In the component "sustainable production," the specific objectives of the projects are related to identifying and developing economic activities of forest and biodiversity sustainable use; increasing added value of agroforestry and biodiversity chains; expanding managerial and technical capacity of the actors involved for implementation of sustainable forest and biodiversity economic activities, and recovering deforested and degraded areas for economic and ecological conservation purposes.

In 2017 and 2018, approximately 5,300 individuals were trained in sustainable economic activities and 1,850 rural properties benefited from technical management and production assistance. A total of 269 family farming and extractive products processing units were set up, and more than 56,000 people were directly benefited from activities supported by sustainable production projects. Approximately 12.5 million hectares of forests started being managed as a result of the projects supported, an extension corresponding almost to the total area of England, which has about 130,000 km^2. Finally, about 5,000 hectares were recovered for economic activities.

AMAZON FUND (COMPONENT "SUSTAINABLE PRODUCTION") – OUTPUTS DELIVERED IN 2017-2018
BY SUPPORTED PROJECTS

5,353

individuals capable of practicing sustainable economic activities

1,850

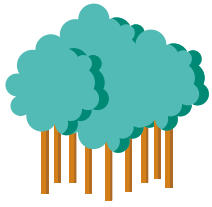
rural properties benefited from technical assistance

269

family farming and **extractive** products **processing units**

56,545

individuals directly benefited from activities supported



12,503,150

hectares of forests directly handed as a result of projects supported

5,026

hectares recovered used for economic purposes

Source: Elaborated by the authors.

In the component "monitoring and control," the specific objectives of the projects refer to structuring and modernization of monitoring institutions, environmental control and accountability, and promotion of expanded access for rural producers to the environmental regularization of their properties.

TABLE 29: OUTPUTS DELIVERED IN 2017-2018 BY PROJECTS SUPPORTED BY THE AMAZON FUND (COMPONENT "MONITORING AND CONTROL")

INDICATOR	Output	Measure
Services qualified	1,669	nº of people
Environmental inspection missions performed	687	nº of missions
Properties registered with the Rural Environmental Registry (CAR) – record	699,548	nº of properties
Area of properties registered with the Rural Environmental Registry (CAR) – record	27,019,275	hectares
Area reforested for land regularization purposes (regeneration in progress)	4,162	hectares

Source: Elaborated by the authors.

In 2017 and 2018, 1,669 civil servants were trained to structure and improve environmental monitoring and control activities, and 687 environmental inspection missions were carried out. Regarding the Rural Environmental Registry (CAR), the values of the indicators are even more expressive. Almost 700,000 rural properties joined the first phase of the CAR (record), totaling 27 million hectares, an area equivalent, for example, to the state of Tocantins. Another output was an area of 4,200 hectares reforested for land regularization purposes, which has been regenerated.

The component "territorial planning," is aimed at expanding public forests and protected areas; consolidating infrastructure, territorial protection and management of protected areas; expanding areas of land with regular land tenure, and defining areas with territory organization by the ecological-economic zoning (EEZ).

AMAZON FUND (COMPONENT "TERRITORIAL PLANNING") – OUTPUTS DELIVERED IN 2017-2018
BY PROJECTS SUPPORTED

85
protected areas supported

15
indigenous lands supported

22,074
indigenous ethnicity individuals directly benefited

2,494
Individuals capable
of performing activities related to management of public forests protected areas

56,530 km²
of protected areas
with infrastructure, environmental management and/or strengthened control of its territory

Source: Elaborated by the authors.

The projects supported by the Amazon Fund in the component "territorial planning" reached 85 protected areas and 15 indigenous lands in 2017 and 2018. Approximately 22,000 indigenous people benefited directly from the project actions, and nearly 2,500 people were trained in activities related to the management of public forests and protected areas. The extension of protected areas that had infrastructure, environmental management and/or strengthened control of the territory totaled 56,500 km², equivalent to the area of the state of Paraíba.

Forest restoration

In addition to acting through the Amazon Fund, BNDES supports the restoration of biomes by means of recovering native vegetation with refundable and nonrefundable resources. Restoration has the main

benefits of maintaining biodiversity, contributing to water resources, reducing erosion, improving the landscape, sequestering carbon dioxide from the atmosphere, and improving the microclimate.

As in the Amazon Fund, a follow-up of the outputs delivered made by the projects supported is maintained, and indicators of restored area and tons of CO_2 equivalent are presented in Table 30.

TABLE 30: OUTPUTS DELIVERED IN 2017-2018 BY FOREST RESTORATION SUPPORTED PROJECTS

	Total 2011 to 2018	Only 2017 and 2018
Restoration (hectares)	17,220	2,466
Carbon sequestration in tons of CO_2 equivalent*	651,449	247,476

Source: Elaborated by the authors.
Note: * Calculated based on the reforestation in hectares carried out each year throughout the subsequent years up to 2018. That is, the carbon sequestration in 2017 and 2018, for example, is derived from the reforestation done from 2011 to 2018. It considers linear increase of carbon stored over a twenty-year cycle for forest maturation.

In 2017 and 2018, the reforestation projects supported by BNDES enabled the restoration of 2,466 hectares of vegetation distributed through the various techniques. Restorations supported are estimated to have captured about 247,500 tons of carbon dioxide equivalent from the atmosphere.

According to the Inventory of Atmospheric Emissions from the Passenger Road Transport of the Municipality of São Paulo, of the Institute of Energy and Environment, on a typical day of 2015, the entire fleet of automobiles in the city emitted 7,253 tons of carbon dioxide equivalent in emissions of greenhouse gas. Therefore, the carbon sequestration delivered by forest restoration projects in 2017 and 2018 was equivalent to the 34-day emission of automobiles in the country's largest city.

REGIONAL DEVELOPMENT

Regional development is one of BNDES's strategic guidelines. The objective is to develop the various regions of the country, with support for companies and public agencies. The Bank's strategic planning highlights as focal points for this transversal guideline: (i) adjustment of the priorities defined in the new BNDES's strategy to the different realities of the country; (ii) articulation, with states and municipalities, of regional development strategies; and (iii) study of regional potentialities and key development gaps at the local level.

The North and Northeast regions concentrated 89% of the installed electricity capacity supported by BNDES in 2017-2018.

This section shows diverse indicators on outputs delivered and/or planned by projects approved in 2017-2018. This is a portion of the data already presented on the most relevant projects located in the North, Northeast and Central-West regions.

Energy support stands out in the infrastructure sector. Regarding the 11,099 MW of electricity generation that came into operation in 2017 and 2018, 9,897 MW were in the North and Northeast states. This number represents 89% of the total power generation supported by BNDES. These regions were configured as the great Brazilian frontier of clean energy generation.

Due to its great potential, the Northeast is the main region benefiting from BNDES's support for wind power generation. Considering the total of projects supported by this form of generation, 94% of the installed capacity was in this region, totaling 3,111 MW. This energy is enough to supply 6,205 thousand households.

In the environmental sanitation segment, BNDES supported the implementation of a solid waste treatment plant (CTRS) in the municipality of Guapó, in the state of Goiás. The operation has as objective the construction of two types of landfill at CTRS, contemplating three phases of its implementation and expansion, which corresponds to the construction of a disposal capacity of 100,000 tons of hazardous waste and 1,519,000 tons of nonhazardous waste. Project completion is scheduled for December 2020. The project is directed at meeting the demand of the municipalities of

Goiânia, Guapó, Aparecida de Goiânia and other smaller municipalities, benefiting a population of approximately 2.1 million.

Also in this segment, the highlight was a project supported in the city of Guarantã do Norte, in the state of Mato Grosso. Its objective is to expand and improve existing water supply and sewage systems in the city. With regard to water supply, the interventions proposed aim to ensure the improvement of existing operational units, as well as increasing the supply capacity of the system to maintain 100% of service for the urban population. The interventions related to sanitary sewage aim to increase the coverage rate from 9% to 100%. The total investment provided by the applicant is R$ 32.3 million, and BNDES' participation is R$ 25.5 million (78.8%).

In the field of creative economy, regarding the 25 movie theaters to be implemented by the projects approved in the period, 12 will be in the Northeast and Central-West states.

In the area of planted forests, it is worth mentioning the support for a reforestation project in Bahia, covering the establishment, renovation and sprouting of eucalyptus forests in an area between 38,902 and 48,628 hectares. The forestry program began in 2016, and 24,047 hectares had already been planted by the end of that year. The purpose of the forestry activities is to supply Veracel's industrial unit, which operates in the pulp and paper sector, ensuring the economic viability of the project.


TERMINAL ALVORADA
BRT
BILHETERIA BRT
01
03
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06
Embarque

EVALUATION
OF BNDES'S IMPACTS

In the previous chapter, a brief overview of the main output indicators of BNDES was presented. Monitoring output indicators is crucial because it gives concreteness to BNDES's performance, demonstrating how the institution's disbursements become outputs – measurable products and services – for Brazilian society.

As seen in the Introduction, after the consolidation of the EPS, all BNDES's operations were covered by the systematic evaluation layer, which imposes monitoring and self-evaluation requirements. This allows a broad monitoring of the results achieved by the BNDES System. This chapter will address the results of impact evaluations that seek to understand whether and how these outputs are capable of promoting beneficiaries' economic, social and environmental development.

To this end, the chapter is divided into three sections. The first outlines an overall profile of BNDES's effectiveness based on a set of 50 impact evaluations published by March 2019. It is, in fact, a review of the *Effectiveness Report* 2017 (BNDES, 2018). The intention of the BNDES's M&E team is to continue monitoring all impact evaluations produced on the Bank, always seeking to identify best practices, internalize key findings, and promote effectiveness gains.

The second section summarizes the main findings of the most recent EPS-related impact evaluations. Strategically, BNDES has directed this causal identification effort at knowledge gaps and ways of acting that are crucial for BNDES's contribution to national development. This report provides reviews for six evaluations, namely:

- BNDES Exim Post-shipment Services evaluation, carried out by the operational area in partnership with the impact evaluation team and the Inter-American Development Bank (IDB);
- evaluation of BNDES's innovation credit impact on R&D expenditures and new product revenues of the companies financed, carried out by the operational area in partnership with the impact evaluation team;
- evaluation of BNDES's local content policy effects on the national capital goods sector, carried out by the impact

evaluation team based on data from the manufacturer's register implemented by the Bank;

- evaluation of BNDES Card impact on local economies, conducted by the Institute of Applied Economic Research (Ipea) in partnership with the impact evaluation team of BNDES;
- impact evaluation of local wind farm installation by BNDES's impact evaluation team using the MARVIm synthetic control module;
- evaluation of the direct modality of the Tax Modernization Program and the Management of the Basic Social Sectors (BNDES Pmat Finem) impact on the fiscal health of the municipalities financed, also carried out by the BNDES's impact evaluation team using MARVIm synthetic control module.

Finally, the last section of this chapter brings the progress of the evaluations that have been performed under the EPS. As a good practice of transparency, the M&E team now proposes to disclose in advance the topics to be investigated. With this, it is expected that interlocutors interested will be able to get in touch to monitor and, eventually, contribute to the evaluations during the execution phase.[13]

REVIEWING BNDES'S IMPACT EVALUATIONS

In this current edition, the survey achieved 50 impact evaluations, 15 more compared to the *Effectiveness Report* 2017 (BNDES, 2018). The following box provides a complete list of these works. The year 2018 is highlighted, as it concentrated the disclosure of 13 evaluations of BNDES's impact, according to Graph 19. This number is particularly impressive compared to previous years. It is reasonable to suppose that this expansion has been occurring both by BNDES's internal effort, expressed in the evaluations linked to the institution's EPS

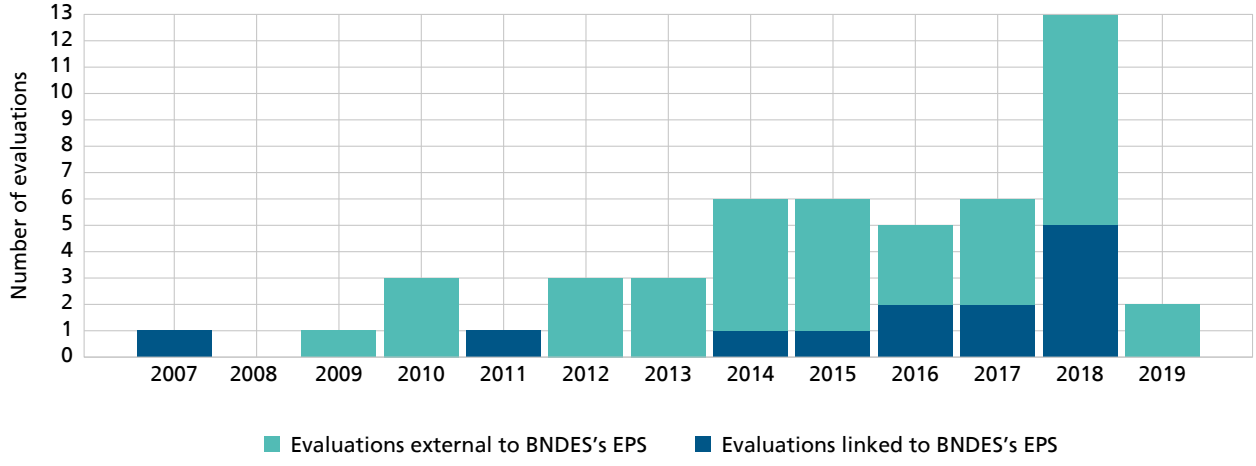
13 Interlocutors interested can contact the BNDES' M&E technical team by sending an e-mail to efetividade@bndes.gov.br.

and data made available on its website, and by external researchers' interest.[14]

The 15 impact evaluations published since 2017 investigated the impact of BNDES's actions on 19 different variables. These include investment, employment and productivity (adding labor productivity and total factor productivity – TFP) – with, respectively, five, four, and four studies each. Historically, the Bank's primary mission has been to leverage investment and employment in the Brazilian economy. In the new context, however, it is natural that BNDES should start increasingly focusing on ways of acting that deal directly with the current great challenge of the Brazilian economy: productivity growth. The subject of the M&E agenda also seems to move in that direction.

Fifteen evaluations published since 2017 investigated BNDES's impact on 19 variables, with the highest concentration in investment, employment and productivity.

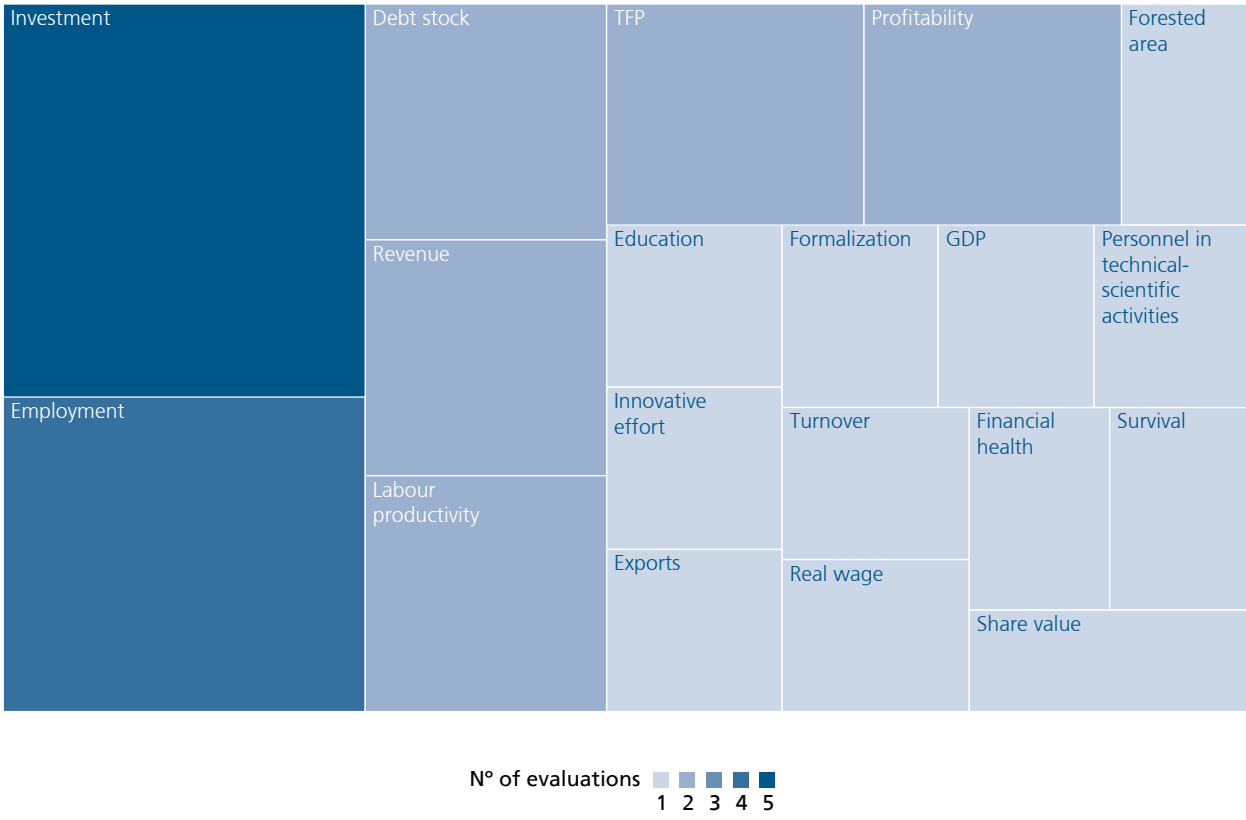
GRAPH 19: ANNUAL EVOLUTION OF THE EVALUATIONS OF BNDES'S IMPACT



Source: Elaborated by the authors.
Note: Evaluations are considered linked to the EPS when they are performed, contracted and/or promoted by the BNDES's impact evaluation team, even if there are no BNDES's employees among the authors.

14 The evolution of the visits to the Transparency section of BNDES website illustrates this fact. In 2018, this section received more than 189,000 visits in comparison with about 74,000 in 2013.

GRAPH 20. MAIN IMPACTS INVESTIGATED REGARDING BNDES'S ACTIONS (EVALUATIONS PUBLISHED AFTER 2017)



Source: Elaborated by the authors.

SURVEY OF EVALUATIONS OF BNDES'S IMPACT

Chart 1 provides details considering the type of support analyzed, the impact dimension investigated and the result found by each of the mapped evaluations of BNDES's impact. This list does not include studies that only apply mean comparisons or do not use information about control and treatment groups. Additionally, only studies that were available on the Internet in March 2019 are considered. For more details and justifications on the definition of the criteria, see BNDES (2018). Finally, it cannot be guaranteed that all available impact evaluations have been found, although an extensive search has been made. In case any have not been included, please send them to efetividade@bndes.gov.br.

CHART 1: SURVEY OF EVALUATIONS OF BNDES'S IMPACT

REFERENCE	Type of support	Impact dimension	Unity evaluated	Impact
Alves, Botelho and Fernandes (2018)	Financing for acquisition of capital goods	Education	Company	0
Pires and Russel (2017)	Financing for acquisition of capital goods	Employment	Company	Inconclusive
Alves, Botelho and Fernandes (2018)	Financing for acquisition of capital goods	Employment	Company	+
Grimaldi *et al.* (2018)	Financing for acquisition of capital goods	Employment	Large-sized company	0
Grimaldi *et al.* (2018)	Financing for acquisition of capital goods	Employment	MSME	+
Grimaldi *et al.* (2018)	Financing for acquisition of capital goods	Revenue	Large-sized company	Inconclusive

(continued)

(continuation)

REFERENCE	Type of support	Impact dimension	Unity evaluated	Impact
Grimaldi *et al*. (2018)	Financing for acquisition of capital goods	Revenue	MSME	+
Machado and Roitman (2015)	Financing for acquisition of capital goods	Investment	Company	+
Machado, Grimaldi and Albuquerque (2018)	Financing for acquisition of capital goods	Investment	Company	+
Grimaldi *et al*. (2018)	Financing for acquisition of capital goods	Investment	Large-sized company	0
Grimaldi *et al*. (2018)	Financing for acquisition of capital goods	Investment	MSME	+
Alves, Botelho and Fernandes (2018)	Financing for acquisition of capital goods	Potec	Company	Inconclusive
Pires and Russel (2017)	Financing for acquisition of capital goods	Capital productivity	Company	Inconclusive
Araújo (2014)	Financing for acquisition of capital goods	Labor productivity	Company	0
Pires and Russel (2017)	Financing for acquisition of capital goods	Labor productivity	Company	Inconclusive
Grimaldi *et al*. (2018)	Financing for acquisition of capital goods	Labor productivity	Large-sized company	Inconclusive
Grimaldi *et al*. (2018)	Financing for acquisition of capital goods	Labor productivity	MSME	Inconclusive
Pires e Russel (2017)	Financing for acquisition of capital goods	TFP	Company	0
Calice, Ribeiro and Byskov (2018)	Financing for acquisition of capital goods	TFP	Company	-
Araújo (2014)	Financing for acquisition of capital goods	Profitability	Company	0

(continued)

(continuation)

REFERENCE	Type of support	Impact dimension	Unity evaluated	Impact
Grimaldi *et al*. (2018)	Financing for acquisition of capital goods	Profitability	Large-sized company	Inconclusive
Grimaldi *et al*. (2018)	Financing for acquisition of capital goods	Profitability	MSME	Inconclusive
Alves, Botelho and Fernandes (2018)	Financing for acquisition of capital goods	Turnover	Company	Inconclusive
Pires and Russel (2017)	Financing for acquisition of capital goods	Real wage	Company	Inconclusive
Alves, Botelho and Fernandes (2018)	Financing for acquisition of capital goods	Real wage	Company	0
Goldemberg (2014)	Financing for culture economy	Culture	Company	0
Coelho and De Negri (2010)	Financing for companies – general	Employment	Company	+
Maffioli *et al*. (2017)	Financing for companies – general	Employment	Company	+
Souza, Mattos and Ribeiro (2019)	Financing for companies – general	Innovative effort	Sector	+
Maffioli *et al*. (2017)	Financing for companies – general	Exports	Company	+
Coelho and De Negri (2010)	Financing for companies – general	Revenues	Company	+
Oliveira (2014)	Financing for companies – general	Investment	Company	+
Alves, Silva and Morais (2018)	Financing for companies – general	Investment	Company	Inconclusive
Lavieri (2015)	Financing for companies – general	Investment	Sector	Inconclusive
Araújo (2014)	Financing for companies – general	Labor productivity	Company	0

(continued)

(continuation)

REFERENCE	Type of support	Impact dimension	Unity evaluated	Impact
Coelho and De Negri (2010)	Financing for companies – general	Labor productivity	Company	+
Coelho and De Negri (2010)	Financing for companies – general	TFP	Company	Inconclusive
Araújo (2014)	Financing for companies – general	Profitability	Company	0
Maffioli *et al*. (2017)	Financing for companies – general	Real wage	Company	0
Ehrl (2018)	Financing for companies – general	Survival	Company	Inconclusive
Grimaldi *et al*. (2018)	Financing for exports	Employment	Company	Inconclusive
Alvarez, Prince; Kannebley (2014)	Financing for exports	Exports	Company	+
Galleti and Hiratuka (2013)	Financing for exports	Exports	Company	+
Lobo and Silva (2012)	Financing for exports	Exports	Company	+
Schmidt (2012)	Financing for exports	Exports	Company	+
Grimaldi *et al*. (2018)	Financing for exports	Exports	Company	Inconclusive
Grimaldi *et al*. (2018)	Financing for exports	Revenues	Company	Inconclusive
Grimaldi *et al*. (2018)	Financing for exports	Investment	Company	Inconclusive
Grimaldi *et al*. (2018)	Financing for exports	Labor productivity	Company	Inconclusive
Grimaldi *et al*. (2018)	Financing for exports	Profitability	Company	Inconclusive
Grimaldi *et al*. (2018)	Financing for working capital	Employment	Company	Inconclusive
Grimaldi *et al*. (2018)	Financing for working capital	Revenues	Company	Inconclusive

(continued)

(continuation)

REFERENCE	Type of support	Impact dimension	Unity evaluated	Impact
Grimaldi *et al*. (2018)	Financing for working capital	Investment	Company	Inconclusive
Grimaldi *et al*. (2018)	Financing for working capital	Labor productivity	Company	Inconclusive
Grimaldi *et al*. (2018)	Financing for working capital	Profitability	Company	Inconclusive
Bonomo, Brito and Martins (2015)	Financing for large-sized companies	Debt stock	Large-sized company	+
Bonomo, Brito and Martins (2015)	Financing for large-sized companies	Investment	Large-sized company	0
Lazzarini *et al*. (2015)	Financing for large-sized companies	Investment	Large-sized company	0
Monteiro (2017)	Financing for large-sized companies	Investment	Large-sized company	Inconclusive
Lazzarini *et al*. (2015)	Financing for large-sized companies	Profitability	Large-sized company	0
Bonomo, Brito and Martins (2015)	Financing for large-sized companies	Financial health	Large-sized company	Inconclusive
Lazzarini *et al*. (2015)	Financing for large-sized companies	Financial health	Large-sized company	+
Bellegard (2016)	Financing for large-sized companies	Share value	Large-sized company	0
Lazzarini *et al*. (2015)	Financing for large-sized companies	Share value	Large-sized company	0
Assunção, Szerman and Costa (2016)	Financing for infrastructure	Water and sewage	Municipality	0
Assunção, Szerman and Costa (2016)	Financing for infrastructure	Forested area	Others	Inconclusive

(continued)

(continuation)

REFERENCE	Type of support	Impact dimension	Unity evaluated	Impact
Assunção, Szerman and Costa (2016)	Financing for infrastructure	Employment	Municipality	+
Assunção, Szerman and Costa (2016)	Financing for infrastructure	GDP	Municipality	Inconclusive
Martini *et al*. (2018)	Financing for infrastructure	GDP	Municipality	+
Assunção, Szerman and Costa (2016)	Financing for infrastructure	Population	Municipality	+
Assunção, Szerman and Costa (2016)	Financing for infrastructure	Health	Municipality	0
Ribeiro and De Negri (2009)	Financing for innovation	Employment	Company	+
Machado, Martini and Gama (2017)	Financing for innovation	Innovative effort	Company	+
Brigante (2016)	Financing for innovation	Innovative effort	Company	0
Ribeiro and De Negri (2009)	Financing for innovation	Revenue	Company	+
Ribeiro and De Negri (2009)	Financing for innovation	Investment	Company	+
Ribeiro and De Negri (2009)	Financing for innovation	Labor productivity	Company	0
Ribeiro and De Negri (2009)	Financing for innovation	TFP	Company	0
Pires *et al*. (2014)	Financing for MSMEs	Employment	MSME	+
Pires and Russel (2017)	Financing for MSMEs	Employment	MSME	Inconclusive
Machado, Parreiras and Peçanha (2011)	Financing for MSMEs	Employment	MSME	+
Grimaldi *et al*. (2018)	Financing for MSMEs	Employment	MSME	+

(continued)

(continuation)

REFERENCE	Type of support	Impact dimension	Unity evaluated	Impact
Goldszmidt *et al*. (2018)	Financing for MSMEs	Employment	Individuals	0
Goldszmidt *et al*. (2018)	Financing for MSMEs	Debt stock	Individuals	0
Pires *et al*. (2014)	Financing for MSMEs	Exports	MSME	+
Grimaldi *et al*. (2018)	Financing for MSMEs	Revenue	MSME	+
Goldszmidt *et al*. (2018)	Financing for MSMEs	Revenues	Individuals	Inconclusive
Goldszmidt *et al*. (2018)	Financing for MSMEs	Formalization	Individuals	0
Cavalcanti and Vaz (2017)	Financing for MSMEs	Investment	MSME	+
Grimaldi *et al*. (2018)	Financing for MSMEs	Investment	MSME	+
Pires and Russel (2017)	Financing for MSMEs	Capital productivity	MSME	+
Pires and Russel (2017)	Financing for MSMEs	Labor productivity	MSME	Inconclusive
Cavalcanti and Vaz (2017)	Financing for MSMEs	Labor productivity	MSME	+
Grimaldi *et al*. (2018)	Financing for MSMEs	Labor productivity	MSME	Inconclusive
Pires and Russel (2017)	Financing for MSMEs	TFP	MSME	0
Cavalcanti and Vaz (2017)	Financing for MSMEs	TFP	MSME	+
Grimaldi *et al*. (2018)	Financing for MSMEs	Profitability	MSME	Inconclusive
Pires *et al*. (2014)	Financing for MSMEs	Innovation result	MSME	+
Pires *et al*. (2014)	Financing for MSMEs	Real wage	MSME	+
Pires and Russel (2017)	Financing for MSMEs	Real wage	MSME	Inconclusive
Barbosa Filho (2013)	Financing for municipalities	Tax collection	Municipality	+

(continued)

(continuation)

REFERENCE	Type of support	Impact dimension	Unity evaluated	Impact
Bast (2015)	Financing for municipalities	Tax collection	Municipality	0
Gadenne (2017)	Financing for municipalities	Tax collection	Municipality	+
Oliveira, R. (2015)	Financing for municipalities	Tax collection	Municipality	0
Gadenne (2017)	Financing for municipalities	Education	Municipality	+
Pires and Russel (2017)	Financing for investment project	Employment	Company	Inconclusive
Grimaldi *et al*. (2018)	Financing for investment project	Employment	Company	0
Grimaldi *et al*. (2018)	Financing for investment project	Employment	Large-sized company	Inconclusive
Grimaldi *et al*. (2018)	Financing for investment project	Revenue	Company	0
Grimaldi *et al*. (2018)	Financing for investment project	Revenues	Large-sized company	Inconclusive
Grimaldi *et al*. (2018)	Financing for investment project	Investment	Company	+
Grimaldi *et al*. (2018)	Financing for investment project	Investment	Large-sized company	Inconclusive
Pires and Russel (2017)	Financing for investment project	Capital productivity	Company	0
Pires and Russel (2017)	Financing for investment project	Labor productivity	Company	Inconclusive
Sousa and Ottaviano (2018)	Financing for investment project	Labor productivity	Company	Inconclusive
Sousa (2013)	Financing for investment project	Labor productivity	Company	0

(continued)

(continuation)

REFERENCE	Type of support	Impact dimension	Unity evaluated	Impact
Grimaldi *et al*. (2018)	Financing for investment project	Labor productivity	Company	Inconclusive
Grimaldi *et al*. (2018)	Financing for investment project	Labor productivity	Large-sized company	Inconclusive
Pires and Russel (2017)	Financing for investment project	TFP	Company	0
Sousa and Ottaviano (2018)	Financing for investment project	TFP	Company	0
Grimaldi *et al*. (2018)	Financing for investment project	Profitability	Company	Inconclusive
Grimaldi *et al*. (2018)	Financing for investment project	Profitability	Large-sized company	Inconclusive
Pires and Russel (2017)	Financing for investment project	Real wage	Company	Inconclusive
Bouchardet, Porsse and Júnior (2016)	Nonrefundable support	Forested area	Municipality	+
Tersitsch *et al*. (2016)	Nonrefundable support	Forested area	Municipality	Inconclusive
Simonet *et al*. (2018)	Nonrefundable support	Forested area	Individuals	+
Tersitsch *et al*. (2016)	Nonrefundable support	Environmental regularization	Municipality	+
Pinto, Grimaldi and Martini (2018)	Local content policy	Employment	Company	+
Grimaldi *et al*. (2018)	Local content policy	Employment	Company	Inconclusive
Grimaldi *et al*. (2018)	Local content policy	Revenue	Company	Inconclusive
Grimaldi *et al*. (2018)	Local content policy	Investment	Company	Inconclusive
Grimaldi *et al*. (2018)	Local content policy	Labor productivity	Company	Inconclusive
Grimaldi *et al*. (2018)	Local content policy	Profitability	Company	Inconclusive

(continued)

(continuation)

REFERENCE	Type of support	Impact dimension	Unity evaluated	Impact
Matos (2018)	Equity assets	Debt stock	Large-sized company	Inconclusive
Pereira (2010)	Equity assets	Governance	Large-sized company	+
Zorman (2012)	Equity assets	Governance	Large-sized company	+
Inoue, Lazzarini and Musacchio (2013)	Equity assets	Investment	Large-sized company	Inconclusive
Lazzarini *et al*. (2015)	Equity assets	Investment	Large-sized company	0
Matos (2018)	Equity assets	Investment	Large-sized company	Inconclusive
Inoue, Lazzarini and Musacchio (2013)	Equity assets	Profitability	Large-sized company	Inconclusive
Lazzarini *et al*. (2015)	Equity assets	Profitability	Large-sized company	0
Matos (2018)	Equity assets	Profitability	Large-sized company	+
Lazzarini *et al*. (2015)	Equity assets	Financial health	Large-sized company	Inconclusive
Pereira (2010)	Equity assets	Financial health	Large-sized company	+
Matos (2018)	Equity assets	Financial health	Large-sized company	Inconclusive
Inoue, Lazzarini and Musacchio (2013)	Equity assets	Share value	Large-sized company	0
Lazzarini *et al*. (2015)	Equity assets	Share value	Large-sized company	0

(continued)

(continuation)

REFERENCE	Type of support	Impact dimension	Unity evaluated	Impact
Pereira (2010)	Equity assets	Share value	Large-sized company	+
Matos and Barbosa (2018)	Equity assets	Share value	Large-sized company	+
Reiff, Galvão and Rosati (2007)	All	Employment	Municipality	+
Wegelin (2014)	All	Employment	Municipality	0
Ellery Júnior, Nascimento Junior and Sachsida (2018)	All	Investment	Countries	0
Wegelin (2014)	All	GDP	Municipality	+

Source: Elaborated by the authors.
Notes: (1) In column 2 (Type of support) "Financing for companies – general" comprises various types of business support taken together without distinction; "Nonrefundable support" includes nonrefundable support for social, environmental, cultural or technological projects; "Equity assets " includes equity interest in companies through BNDESPAR; "All" includes all types of support taken together without distinction. (2) In column 3 (Impact dimension), "Innovative effort" denotes some measure of companies' efforts to innovate (for example, R&D expenditure); "Potec" denotes staff in technical-scientific occupations; "Turnover" denotes the turnover of the workforce; "Financial health" denotes the companies' financial health, including liquidity and financial expenses. (3) In column 4 (Unit evaluated), "Company" denotes the cases in which both large firms and MSMEs were included in the evaluation. (4) In column 5 (Impact), "+" indicates that the impact is positive, statistically significant at 10%, and remains in different specifications; "-" indicates that the estimated impact is negative, statistically significant at 10%, and remains in different specifications; "0" indicates that the estimated impact is not statistically nonzero, and remains in different specifications; "Inconclusive" indicates cases where different specifications lead to different conclusions.

In the *Effectiveness Report* 2017 (BNDES, 2018), an aggregate analysis of the results regarding the Bank's performance found so far led to identification of some relevant standards. In particular, it should be noted that:

- all evaluations already produced of BNDES Exim impact indicated a positive impact on companies' export performance;
- financing for MSMEs provided robust evidence of positive impact on employment, exports and investment; and
- generally, BNDES appeared to be more effective regarding company growth measures (employment, investment, and revenues) than in relation to productivity measures.

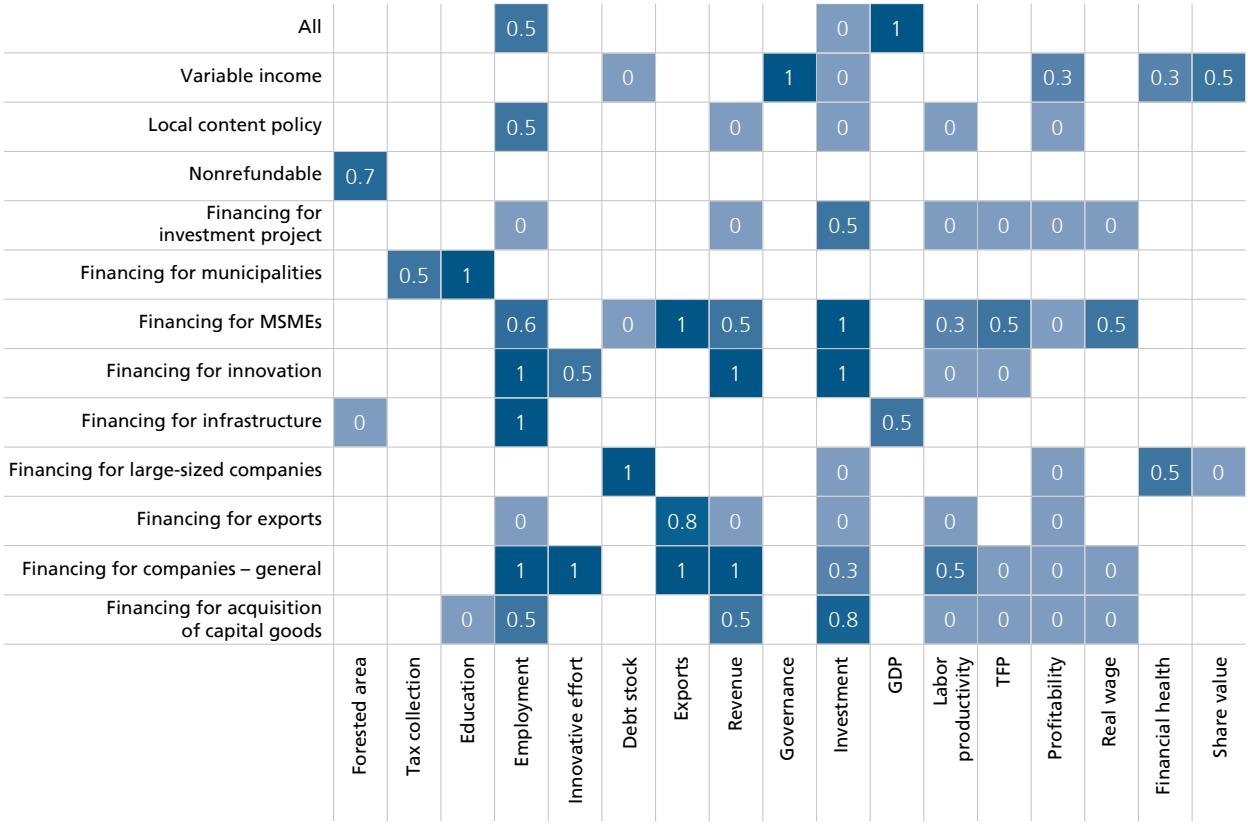
Due to the large number of evaluations released after 2017, it makes sense to revisit these key findings to see to what extent they have been changed by the new work. Inspired by the presentation made in the *Effectiveness Report* 2017 (BNDES, 2018), Graph 21 consolidates the results of the impact evaluations already disclosed regarding the Bank, now considering the period between 2007 and 2019. The graph is organized per type of support (line) and impact dimension (column), while the color of each cell indicates the proportion of evaluations that find positive impact.[15]

The analysis of Graph 21 indicates that the new set of pieces of evidence did not change the main conclusions presented in the *Effectiveness Report* 2017 (BNDES, 2018). BNDES Exim was re-evaluated, and the impact on export performance was inconclusive.[16] Even so, 80% of the evaluations that analyzed BNDES Exim effects on export performance found positive results.

15 To be classified as positive, the impact should remain statistically significant at 10% in the different specifications used in each work.

16 Grimaldi *et al.* (2018), applying a DiDM estimation through MARVIm, find positive impacts for the stacked data in 2008-2011. When the exercise is redone for specific years, however, the results lose significance. For the purposes of this consolidation, this result is considered inconclusive.

GRAPH 21: PROPORTION OF EVALUATIONS THAT FIND POSITIVE IMPACT PER TYPE OF SUPPORT AND IMPACT DIMENSION



Source: Elaborated by the authors.

The two evaluations released in 2018 that addressed financing for MSMEs analyzed employment and turnover; one found positive impacts and the other was inconclusive.[17] Considering all evaluations of financing for MSMEs, at least half of them found evidence of positive impact on employment, exports, investment and revenues, in line with the *Effectiveness Report* 2017 (BNDES, 2018).

Regarding impact dimensions, Graph 21 points to the same pattern observed previously. The columns associated with employment, revenue, exports and investment have darker colors – indicating greater proportion of positive impacts. Productivity-related columns have lighter colors. Considering only recent evaluations, positive

17 Grimaldi *et al.* (2018) found positive impact of BNDES Finame and the BNDES Card on revenue, employment level and investment of the companies supported. Goldszmidt *et al.* (2018) found positive impacts of microcredit on entrepreneurs, but only when they are in more vulnerable regions. For purposes of this consolidation, the second case is treated as inconclusive.

impacts were found on employment and investment, but not on productivity variables.[18]

One aspect still little explored in the literature of evaluations of BNDES's impact is the diversity of institutions involved. Graph 22 seeks to summarize the main actors involved in the study of the Bank's effectiveness, as well as their connections. For this purpose, the main educational or research institution linked to each author of the works listed here was considered. The size of each outermost segment of the circle refers to the amount of evaluations already produced by each center. The size of the innermost circle segment represents the work that was done in partnership with other centers. The connections between different institutions indicate a partnership between them – darker colors point to a greater amount of work or co-authors involved in the partnership.

As can be seen, more than 17 institutions have already been involved in the effort to evaluate BNDES's effectiveness, the main ones being mentioned by name in Graph 22. As expected, a significant portion of the results already produced is directly or indirectly linked to BNDES – 15 out of 50. But other research centers also stand out. Fundação Getulio Vargas (FGV) is the second main producer of knowledge in this literature, followed by the set of foreign educational institutions and the Institute for Applied Economic Research (Ipea) – with, respectively, 10, seven, and seven works each.

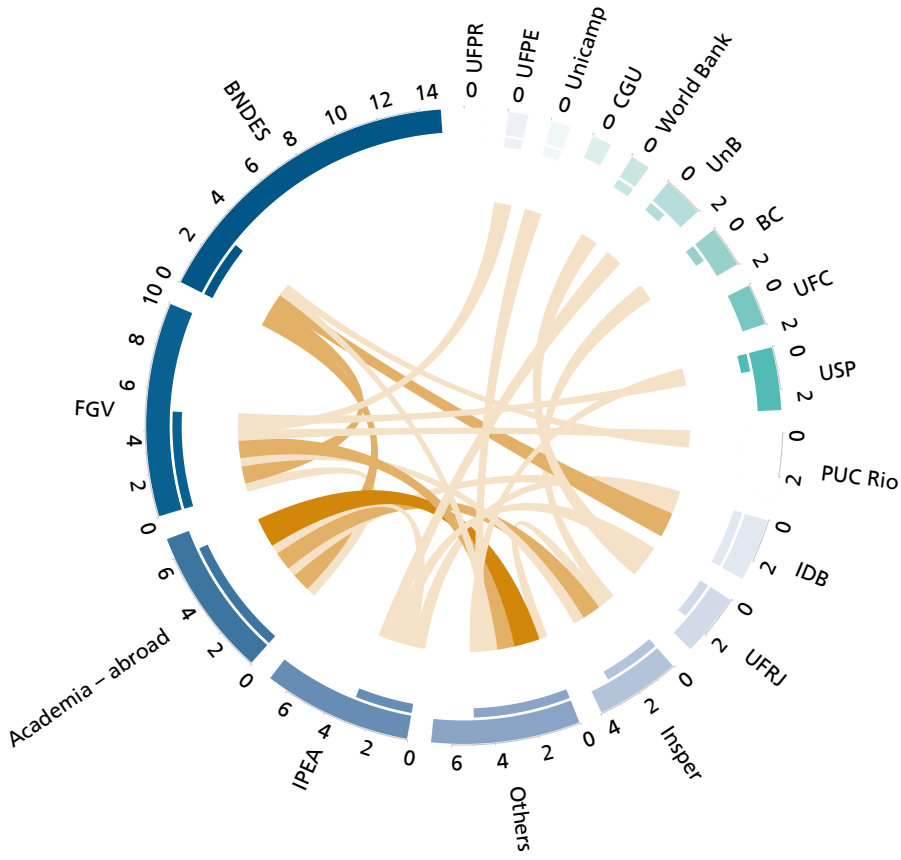
Despite producing a significant amount of analysis, to date BNDES has worked relatively little in partnership with other research centers. For comparison purposes, about 20% of analyzes carried out with BNDES's involvement had some other partner institution – highlighting colleges abroad and the IDB. In the case of FGV, for example, this rate is 50%, and 85% of the studies developed by colleges abroad had partnerships.

This is an aspect that should be addressed by the EPS over the next few years. To increase integration with other institutions,

18 Sousa and Ottaviano (2018), Grimaldi *et al.* (2018) and Calice, Ribeiro and Byskov (2018) studied BNDES' performance impact on productivity. The first two did not find a significant impact, while the latter pointed to negative (albeit modest) impacts on the total aggregate productivity of the factors of the Brazilian economy.

the BNDES M&E team has directed efforts to enter into technical cooperation agreements that enable joint work and the provision of data to external evaluators interested. Examples of such efforts are the agreements signed with FGV, PUC-Rio, IDB and Ipea. Other partnerships are expected to be established in the near future.

GRAPH 22: RELATIONS BETWEEN INSTITUTIONS THAT STUDIED BNDES'S IMPACTS



Source: Elaborated by the authors.

EVALUATIONS OF BNDES'S EFFECTIVENESS PROMOTION SYSTEM IN 2017-2018

Impact evaluations are typically data- and econometric techniques-intensive activities. Consequently, they are often costly and time consuming. This is why the BNDES EPS focuses its impact evaluations only on a strategic set of topics, particularly those not yet covered by the interest of experts and scholars.

An example of this guidance is in evaluating BNDES's local content policy impacts on the Brazilian capital goods sector. In practice since the late 1960s, this way of action by BNDES did not yet have an evaluation that applied causal identification techniques.

Another recent evaluation addresses BNDES Exim Post-shipment Services effects on the Brazilian supply chain. Although the exports theme has already been covered by other studies, none of them focused specifically on this modality – which finances construction services exports.

BNDES maintains its efforts to understand its impacts on the innovation of Brazilian companies, a crucial theme to promote productivity gains. Other evaluations reported in this section equally address important issues, such as access to credit for micro and small businesses (BNDES Card), local effects of renewable energy adoption (wind power financing), and fiscal health of municipalities supported by BNDES Pmat Finem.

Impact of support for exports: BNDES Exim Post-shipment Services

BNDES's financing for services exports, which began in 1997, focuses on the insertion and participation of Brazilian service companies abroad, in particular constructive engineering services. In this sector, the lack of financing can hinder exports of domestic companies even if they are technically qualified,[19] as well as inhibiting

19 See Santos and Catermol (2008).

the formation of a network of suppliers of goods and services for external projects.[20]

BNDES's performance in this segment is mainly based on the BNDES Exim Post-shipment Services line (hereinafter called Post-shipment Services). This line offers financing conditions compatible with those available in the international market, seeking to foster Brazilian high-value-added exports and technology-intensive services, as well as goods and other associated services for large projects abroad. Once a commercial contract with a foreign counterpart has been entered into, BNDES's financing encourages the exporting company to seek domestic suppliers – hereafter referred to as sub-suppliers[21] – of goods and services (inputs) required to perform the Bank-financed service.

By the end of 2018, Post-shipment Services had a history of 146 operations,[22] financing exports to 15 countries, with disbursements of US$ 10.5 billion, of which some 66% of the principal amount in dollars had already been amortized. Much of this portfolio – 137 operations, corresponding to US$ 9.9 billion, or 94.4% of disbursements – is covered by the Export Credit Insurance (SCE)/Exports Guarantee Fund (FGE).

It is verified that relatively few Brazilian companies have been directly supported through this line, as the international engineering market worldwide is characterized by the concentration in large-sized companies and by the existence of considerable barriers to entrance. However, under the BNDES financing, it was possible to identify about 4,800 sub-suppliers in the operations financed, and two thirds were MSMEs. Machines, equipment, safety materials and pipelines are examples of goods that are usually purchased from domestic suppliers. In response to this positive demand shock, sub-suppliers' output is expected to increase and, to make this increase possible, these companies may need to employ more workers. Thus, in addition to the competitive insertion of the large engineering and construction companies, with increased employment, income

20 When companies operate abroad without financing from their home country, they are expected to purchase goods and services from suppliers that are cheaper, closer, or have financing for exports from their own country.

21 These companies are suppliers for the exporting company and sub-suppliers for works abroad.

22 Considering operations contracted and with some disbursement made.

and foreign exchange generation provided by their performance, the objective is that support represents a relevant stimulus for this supply chain.

Like other BNDES's instruments, Post-shipment Services has the increase of production and employment in Brazil as one of its objectives. However, there is no *a priori* guarantee that this chain of logical associations will function as expected. For example, one can imagine a situation in which the sub-supplier performs the contracted service and reduces other activities, maintaining production constant. Therefore, to know if the line is able to reach its objectives, it is necessary to evaluate whether the relations of the logical model are verified empirically.

To investigate the extent to which the goal of income generation and employment in the sub-supplier chain was achieved, an impact evaluation was made through a partnership between BNDES's M&E and exports teams, with IDB's support for review.[23] Several authors had already investigated the effects of BNDES's credit on exports of companies supported.[24] However, this was the first study to focus on sub-suppliers of operations supported by Post-shipment Services.

To implement this impact evaluation, an extensive array of microdata was used, combining information from BNDES, Rais, Annual Survey of Industry (PIA), Annual Survey of Trade (PAC) and Annual Survey of Services (PAS).[25]

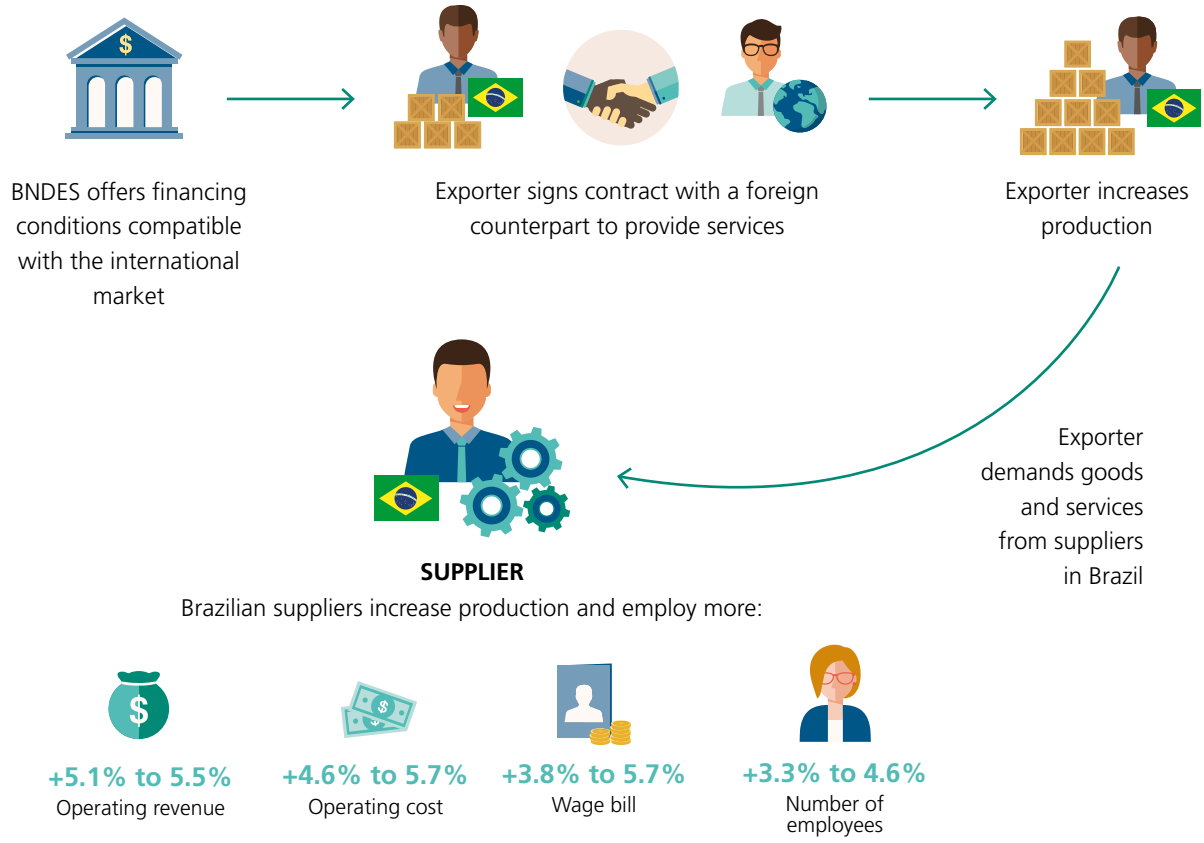
BNDES's data includes goods and services supplied within the scope of Post-shipment Services operations. The information includes supplier identification (CNPJ); free-on-board (FOB) value (in US dollars); year of shipment of the good or of the service rendered; NCM classification (Mercosur Common Nomenclature) of goods, and category of services rendered. In the analysis presented here, goods and services were aggregated per sub-supplier (CNPJ root) and year, generating the "treatment base."

23 The full evaluation can be found in Pinto, Roitman and Hirata (2019).

24 For example, Lobo and Silva (2012); Galleti and Hiratuka (2013); Alvarez, Prince and Kannebley Jr. (2014); and Schmidt (2012).

25 Data from Rais, PIA, PAC and PAS refer to the period from 2003 to 2014 and were obtained directly from the responsible institutions: Ministry of Economy and IBGE.

LOGIC OF THE SUPPORT BY MEANS OF POST-SHIPMENT SERVICES: MAPPING OF INDIRECT IMPACT ON PRODUCTION AND EMPLOYMENT IN THE SUB-SUPPLIER CHAIN



Source: Elaborated by the authors.

To deal with selection bias, methods that combined propensity score matching with regression adjustments were applied. The estimates provided pointed to the positive effect of Post-shipment Services on sub-suppliers' operating revenues (around 5%), with operating costs expanding by a similar magnitude. That is, in response to the demand of the exporting company, the sub-suppliers also expand the cost, due to the need for more inputs to enable a higher level of production.

When analyzing the impact on the employment dimension, there was also an expansion of the wage bill (by about 5%) and number of employees (by approximately 4%). The effect on employment seems to be mainly associated with higher worker retention, as suggested

BNDES's exports support resulted in impacts that went beyond the benefits to the direct exporter, generating positive effects on revenue (5%), wage bill (5%) and the number of employees (4%) of the chain sub-suppliers.

by the results of dismissals and admissions. In regressions where the dependent variable is a measure of dismissals, the estimated coefficient for the treatment variable is negative, that is, the proportion of dismissed employees would have been higher in the absence of Post-shipment Services. When the dependent variable is a measure of admissions, the estimated coefficient for the treatment variable is not statistically significant, indicating no effect on this variable. The sub-suppliers' investment was also analyzed, but the estimates obtained do not reveal a robust effect on this variable.

Altogether, the results indicate that BNDES's support has positively impacted companies that supply goods and services for service exports, suggesting that the benefits of the support went beyond the direct exporter and extended to other companies, with a confirmed impact on at least the components of the first link in the Brazilian production chain. The effect on operating expenses suggests that additional links may also have been stimulated.

Impact on company innovation

This section is aimed at presenting the results of the evaluation of BNDES's support for business innovation. The study, conducted by BNDES's researchers, seeks to estimate the effects of this support on the innovation efforts of the companies supported and on these companies' innovation results.

The study described fits into a broader context of a project to evaluate BNDES's innovation support effectiveness, which has been carried out since 2017 on IBGE Restricted Access Room (SAR). The first stage of the project focused only on effects on efforts and found positive impacts of the Bank's support on companies' R&D expenditures (MACHADO; MARTINI; GAMA, 2017). In the second stage of the project, it was sought to estimate the effects on companies' innovation results, as well as expanding the set of effort indicators. Effort indicators considered were: R&D expenditures, internal R&D expenditures, total innovation expenditures, machinery and

equipment expenditures, and other innovation expenditures. Outcome indicators considered were total revenue and revenue from new products launched.

The choice of the innovation theme for this project is associated with the fact that its promotion has been a strategic priority for BNDES's financial support policy since the mid-2000s, mainly due to its potential to generate productivity gains for companies. Investments in innovation are characterized by the presence of externalities that hinder the private appropriation of their returns and are considered financial activities perceived as high risk. As a result, private funding conditions tend to be insufficient or inadequate for R&D activities, a condition that is aggravated in less developed capital markets such as Brazil. Thus, the role of development banks, such as BNDES, is justified to develop appropriate financial products to support companies in carrying out these activities. In addition, this project fits into the context of BNDES's pursuit of continuous evaluation of the effectiveness of its ways of financial support, both for institutional learning purposes and for accountability to society.

BNDES currently supports innovation projects through nonrefundable,[26] variable income and credit instruments. The study focused only on credit support in 2004-2014, as it is the most common way of support, besides being most involved in contracting innovation projects. Over the period evaluated, the Bank's innovation credit lines can be broken down into "innovation lines" and support through sector programs. BNDES's innovation support lines/programs evaluated primarily financed R&D projects for development of new or improved products, or capacity building projects to undertake systemic innovative efforts. Fundable items covered R&D activities such as employee training, acquisition of intellectual property rights, patent and trademark registration, plant R&D designs and activities and labor engaged in R&D activities, among others. Innovation support instruments were based on special financial conditions to encourage companies to invest in R&D projects compared with both the market and the Bank's other lines of credit, besides flexibilization of the credit risk policy in some cases, as for smaller companies.

26 For more information, see box on BNDES Funtec, BNDES's main instrument for nonrefundable innovation support (p. 139 of this report).

In the evaluation, data were used at company level based on information from the Industrial Survey of Technological Innovation (Pintec)[27] and from BNDES in the period 2004-2014. Pintec is a database that aims to explore and measure the innovative activities developed by companies in the industrial and service sectors, as well as monitoring their evolution over time. In turn, BNDES's data cover information on innovation loans to companies contracted in the period.

To address a possible bias in estimating the effects on innovative efforts, a problem associated with selecting companies that receive BNDES's credit, a fixed-effect-estimation approach was adopted. To estimate the relation between R&D expenditures and innovation results, an instrumental variable approach was applied along with the control of fixed effects over time. The instrument used was the company's access status to BNDES's innovation loans in the period under analysis, in order to incorporate variations brought by BNDES in the explanatory variable of interest, that is, R&D expenditures. The idea of choosing this instrument is based on the economic relation that underlies the design of BNDES's direct support for companies' innovative activities. Direct support is intended to increase company-level R&D expenditure through this channel to stimulate innovation (results). In this logic, this instrument would be appropriate since BNDES monitors the destination of the resources lent in relation to its use by companies in the activities previously agreed upon in the innovation project.

27 Data obtained directly from IBGE.

BNDES FUNTEC – SYSTEMIC ANALYSIS OF ITS EFFECTIVENESS

As part of the advances in structuring and executing BNDES Funtec support (a nonrefundable innovation support instrument that seeks to promote scientific and technological research applied to projects developed by technological institutions – IT with the intervention of companies), BNDES applied a methodology *ex ante* analysis as a basis to verify the results obtained by this fund. The objectives of systemic analysis of effectiveness (SAE) on BNDES Funtec are structured into three perspectives: competencies, systemic processes and technological development. To measure whether the fund contributed to the achievement of the objectives defined in the SAE, output and outcome indicators were defined for each objective.

Based on the elements of the SAE, a first effectiveness evaluation was carried out in 2016, which considered the projects contracted since 2007 with investments completed until 2014. In 2019, a second round of fund effectiveness evaluation was finalized, maintaining a continuous learning process and seeking to understand the main results and contributions of later projects. An expanded set of indicators compared to the first evaluation was used, obtained through the application of questionnaires specific to ITs, companies and BNDES's operational managers responsible for financial support.

The evaluation analysis universe consisted of projects supported by BNDES Funtec with investments completed between January 2015 and May 2017 that had not been included in the first evaluation. This universe totaled 20 projects, which received about R$ 139.3 million, in current values, from BNDES's disbursements. Twenty one ITs and 19 intervening companies (IC) participated in these projects.

In the perspective "Competences," results of the objective of expanding the supply of skilled labor are highlighted, with advances in technical training by both IT and IC. In 81% of support there was IT training, and in 72% of support there was IC training, totaling 225 people trained.

The perspective "Systemic Processes" showed that 57% of ITs believe that without BNDES Funtec they would not have developed the project as they did, indicating an average contribution of the instrument to directing researchers, seminars, scientific production and IT projects in the focuses that are strategic for the country. However, the contribution to the other two objectives from this perspective was very positive. There has been an increase in the number of partnerships between ITs and ICs (from about 22 partnerships on average before support to 32 partnerships after support), suggesting that BNDES Funtec may have contributed to ITs pursuing new research projects in the productive sector.

Finally, from the "Technological Development" perspective it was found that, despite the drop in performance compared to the previous evaluation, the proportion of supported projects that were able to satisfactorily complete technological development or that had economic viability remained high: 70%. In the two evaluations, 80% of the research and development (R&D) projects were technologically and economically viable and 40% were in commercialization at the time of the evaluation. These numbers were better than in some other similar support instruments in the country and in Europe. Additionally, a larger portion of projects that involved some degree of R&D was able to file patents (60% in the current evaluation against 40% in the previous one).

In general, over the years, BNDES Funtec has evolved into greater focus and articulation with public policies for innovation in the context of the Federal Government. Understanding the importance of well-designed, perennial support themes articulated with other innovation incentive policies is crucial to achieving more effective results in relation to the financial instrument.

The results obtained by the study show evidence of positive and significant BNDES's effects on companies' R&D expenditures and total innovative expenditures. For R&D and internal R&D expenditure variables, the size of the estimates is similar and shows that supported companies tend to invest about 30% more in R&D than in the absence of support, reinforcing the pattern of results found by previous study. It is important to highlight the positive and significant impact specifically on the company's internal R&D activities, whose promotion was the focus of the innovation support lines considered here. The estimates obtained therefore indicate a complementary relation between public and private sources of financing for R&D expenditure at the enterprise level. Thus, it can be concluded that the intervention presents positive additionality regarding the effort. With regard to the effects on innovation results, early estimates appear to indicate some positive correlations of R&D expenditure with companies' innovation results in instrumental variable models, although not much can be said about the robustness of these estimates.

Companies benefiting from BNDES lines and innovation support programs tend to invest about 30% more in R&D.

Since gains in business innovation results are the desired end-effects of BNDES's innovation support, the future evaluation agenda should focus on further investigation of this relation, with a view to continually improving this way of support.

Impact on capital goods manufacturers

Generically, a local content policy (LCP) consists of a set of programs designed to induce companies, with foreign capital or not, to set up their manufacturing production in specific territories. The main arguments in defense of an LCP are directly related to the economic idea of protection for the infant industry.

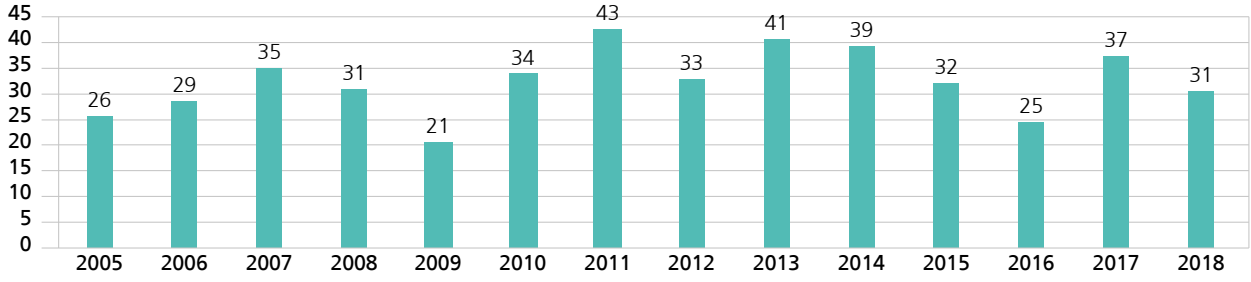
In practice, an LCP needs two elements to work. The first is an incentive for the acquisition of capital goods, represented, in the case of BNDES, by credit lines under advantageous price and term conditions. This incentive should increase demand from capital goods purchasers. Without a local content requirement, the buyer

could direct that demand to any kind of manufacturer. Here, the second element comes: a local content requirement, represented, in the case of BNDES, by the rules of Computerized Accreditation Manufacturers (CFI), which conditions the incentive to purchase eligible capital goods. As a result, only manufacturers of capital goods with certain characteristics benefit from this demand shift.

The LCP was a particularly active part of BNDES's activities in the 1970s and 1980s, and it is still present in the Bank's actions.[28] Between 2005 and 2018, for example, the LCP influenced 33% of the total disbursed by the Bank on average – ranging from a minimum of 21% in 2009 to a maximum of 43% in 2011 (Graph 23).

This policy seems to affect industry heterogeneously. Among the manufacturers of machinery and equipment, the automotive sector (trucks and buses) and the agricultural implements are the main beneficiaries (Graph 24). Among the suppliers of inputs, the highlights are the auto parts, metallurgy and steel industry segments (Graph 25).

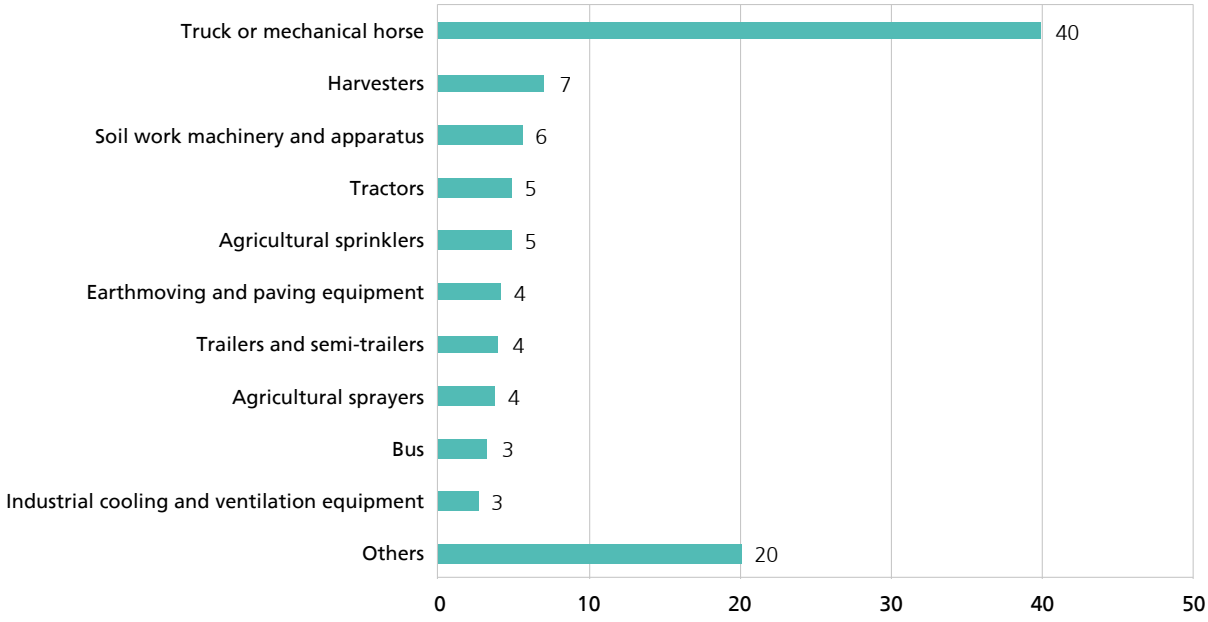
GRAPH 23: DISBURSEMENTS UNDER INFLUENCE OF THE LCP (% OF THE TOTAL DISBURSED BY BNDES)



Source: Elaborated by the authors.
Note: It Includes amounts related to BNDES Finame and sub-credits related to the acquisition of machinery and equipment in BNDES Finem projects. However, capital goods financed under BNDES Finem that were not included in the operation system as a sub-credit could not be considered.

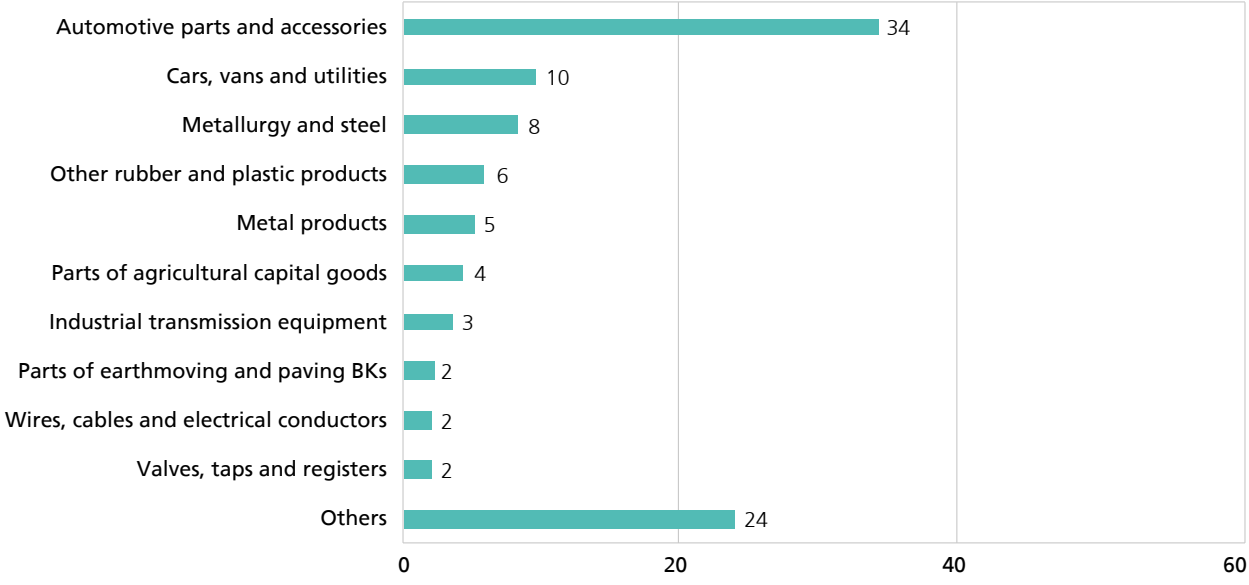
28 The 1970s and 1980s were the culmination of a broad import substitution policy that, within the BNDES' LCP, was manifested by increasing local content requirements.

GRAPH 24: CAPITAL GOODS CATEGORIES MOST FINANCED BY BNDES FINAME (% OF THE TOTAL DISBURSED)



Source: Elaborated by the authors.
Note: It considers disbursements in BNDES Finame between January 2016 and October 2018 for products that had already submitted the new accreditation worksheet. This new worksheet meant restructuring of the accreditation database, allowing greater details of the set of inputs used.

GRAPH 25: INPUT CATEGORIES MOST REQUESTED BY GOODS FINANCED BY BNDES FINAME (% OF TOTAL OF INPUTS REQUIRED)



Source: Elaborated by the authors.
Note: It considers disbursements in BNDES Finame between January 2016 and October 2018 for products that had already submitted the new accreditation worksheet. This new worksheet meant restructuring of the accreditation database, allowing greater detail of the set of inputs used.

LOCAL CONTENT POLICY – CHARACTERIZATION OF MANUFACTURERS

	ACCREDITED MANUFACTURERS		UNACCREDITED MANUFACTURERS
Number of employees	76		54
Wage bill	R$ 1,961,372		R$ 756,090
Gross revenue from industrial production (ROI)	R$ 15,457,066		R$ 3,868,636
Total investment	R$ 124,837		R$ 2,230
Input purchase	R$ 5,630,248		R$ 1,213,376

Source: Elaborated by the authors, based on data from Rais and PIA, obtained directly from the Ministry of Economy and IBGE, respectively.
Note: Median values.

Despite its relevance, the impact of the LCP on the capital goods sector had not yet been explored by causal inference techniques. Because of this, this theme was evaluated by the BNDES's M&E team.[29] The main objective was to understand the impacts of the LCP on accredited manufacturers (CFI), from 2005 to 2014. This period was chosen due to data availability. To this end, three different sources of information were used: (i) Rais; (ii) PIA (IBGE);[30] and (iii) BNDES's administrative records regarding accreditation and sale of equipment.

The evaluation sought to investigate the impacts of being CFI accredited on manufacturers' performance, and based on this, to infer second-order impacts on suppliers. In the absence of an exogenous variation, the causal inference was made by means of a genetic paired difference-in-differences model, exploring the cases of manufacturers that transitioned in CFI status during the analyzed period.[31]

BNDES-accredited capital goods manufacturers had 8% more growth in revenues from industrial operations compared to the control group.

Estimated results indicate that two years after joining the CFI, manufacturers' revenues from industrial operations are about 8% higher than their counterfactual situations. This suggests that the first step in the business logic is as expected and that exposure to the LCP has increased the demand observed by accredited manufacturers and, thus, their revenues. This result is consistent with other studies that have found increased demand for investment in BNDES-funded companies.[32]

29 See Grimaldi and Pinto (2019).

30 In the case of PIA, only the right stratum consisting of companies with more than 30 employees was used. This sample delimitation has a clear bias for the estimation and, therefore, the results obtained here should not be automatically extrapolated to smaller companies.

31 For more details on the status transition-based identification strategy, see Grimaldi and Pinto (2019). It is noteworthy that when exploring the transitions, the estimation method is using companies that first made the decision to produce in the country and then opted to join (or not) the LCP. Companies that made these two decisions at the same time are not used for causal inference purposes, basically because in these cases it is not possible to isolate the impact of the LCP. Another point worth mentioning is that by focusing only on companies that have made the transition, the number of treated companies drops dramatically (making up less than 1% of the sample). Because of this, genetic pairing has been applied as a way to deal with rare event-related problems as described by King and Zeng (2001). For more details on genetic pairing, see Diamond and Sekhon (2013).

32 See Machado and Roitman (2015); Cavalcanti and Vaz (2017); Machado, Grimaldi and Albuquerque (2018); and Grimaldi *et al.* (2018).

LOGIC OF ACTION OF LOCAL CONTENT POLICY AND ESTIMATED IMPACTS ON CAPITAL GOODS MANUFACTURERS

Accredited capital goods manufacturers observe increased potential demand for their products

+8% *Growth of 8% in treated manufacturers' revenue in comparison to the control group*

Accredited manufacturers respond to increased demand by hiring more labor and input from their suppliers.

+12% *Growth of 12% in personnel expenses of treated manufacturers*

No statistically significant impact on input purchase

Unaccredited manufacturers replace imported by domestic inputs to become accredited and take advantage of increased potential demand

No statistically significant impact on the purchase of domestic inputs

Source: Elaborated by the authors, based on PIA data, obtained directly from IBGE.

The evidence was contradictory in the second stage of the logic of action. On the one hand, the employment path seems to be positively impacted. Estimates indicate increase in personnel expenses of about 12%.[33] On the other hand, it was not possible to find a statistically significant effect on the purchase of inputs. The coefficient has the expected sign (positive), but there is a lot of dispersion in the results.

Assuming there is no impact on the purchase of inputs, how can revenue increase occur? Two mechanisms seem to be possible. The first is a TFP gain. If manufacturers expand with TFP gains, sales could be expanded by improving input efficiency. The second is a margin rise. If financing from BNDES Finame enables increase in the margin of accredited manufacturers, it would also be possible to increase revenue without raising production levels and thus the purchase of inputs.

And how to reconcile an expansion of employment level, assuming no impact on input demand and direct production costs? This may indicate that hiring of labor occurs for activities not directly linked to production.[34] Perhaps margin elevation is linked to better sales or after-sales service. Validation of such hypothesis still requires further study by the impact evaluation team.

Considering the last stage of the logic of action, there was also no evidence of a statistically significant impact on the proportion of national inputs. The results indicate that the LCP was not advantageous enough to encourage manufacturers to change their input purchasing decisions. Those that already met the local content requirement sought (and benefited from) CFI accreditation. Those that did not meet this requirement did not seem willing to increase the proportion of locally purchased inputs to join the CFI.

Still, during the reporting period the requirement for local content may have served as an eligibility barrier that directs the potential benefit of sales to a particular manufacturer profile. By restricting access only to manufacturers who already buy more locally and meet

33 In an estimate made exclusively with data from Rais (with the largest representation of MSMEs), the estimated impact on the number of employees was 16%. For more details, see Grimaldi and Pinto (2019).

34 Industrial operation cost as defined in IBGE PIA.

the minimum CFI index, the LCP would, by an intensive margin, favor the locally installed supply chain – especially in the auto parts, metallurgy and steel industries, considering Graph 25.

In general, these results are compatible with an LCP operating in an economy that already has an installed industrial park and, therefore, an established national supplier network. It is possible that an effectiveness evaluation would find different results if carried out in the context of industrialization of the 1970s and 1980s.

Finally, BNDES's local content measurement methodology was significantly changed in December 2018, taking into account other elements, besides the purchase of national inputs, such as innovative effort, exports profile, and use of qualified labor.[35] The results of this new methodology will be monitored over the next few years by the BNDES's M&E and accreditation sectors, following the rules of the EPS, but the results presented here should not be automatically extrapolated to it.

BNDES Card impact on local economies

Product based on the credit card concept, the BNDES Card finances the purchase of goods and services by MSMEs. Between 2005 and 2012, there was a large expansion in the use of the BNDES Card, which became the Bank's product with the largest number of companies supported. In 2012, about 200,000 establishments used the BNDES Card, totaling approximately R$ 9 billion in financed amount. This card expansion was geographically dispersed: in 2012, the product was used in all 558 micro-regions of the Brazilian territory.

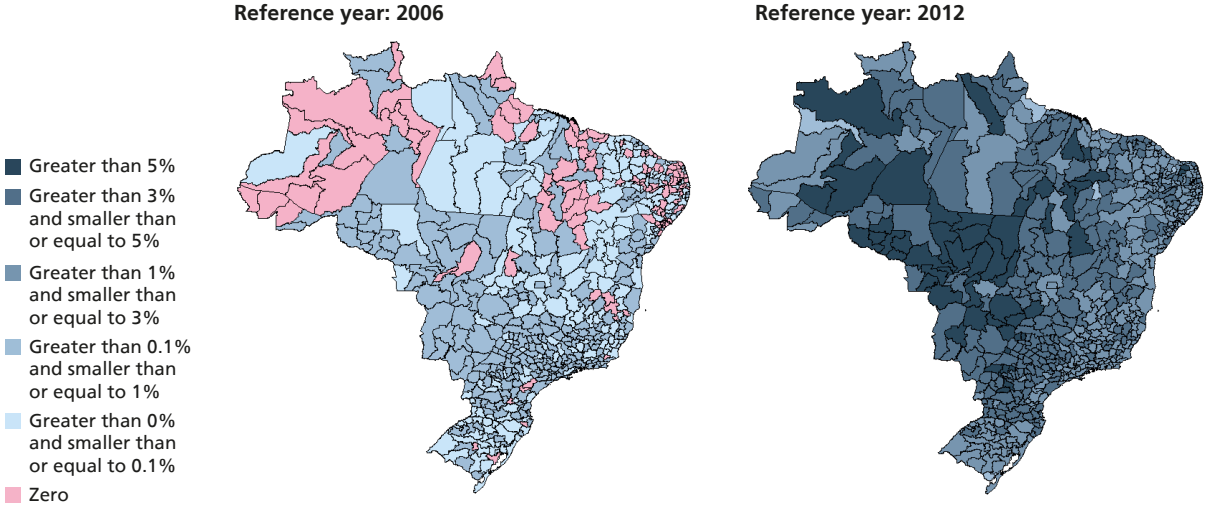
The geographic diffusion of the BNDES Card motivated an analysis of the local impacts of its expansion. The evaluation, conducted by external researchers in conjunction with the BNDES's team, sought to investigate BNDES Card financing effects on micro-regions. By analyzing impacts on micro-regions, the

35 It was the first significant change in the general rule of equipment accreditation since the early 1990s.

study differed from past BNDES Card[36] evaluations, which aimed to estimate the effects on MSMEs supported. Aggregate analysis allowed studying impacts that are difficult to measure when the analysis takes place at the company level. Examples include effects on number of establishments, entry rate of new establishments, and size distribution of establishments.

In addition to BNDES's data, data from Rais, IBGE and BCB (2019) were used in the evaluation.[37] Rais was the source of data for the labor market and establishments, including those without employees. The GDP and population data came from IBGE, and credit stock information was taken from the BCB bases.

FIGURE 5: PROPORTION OF COMPANIES THAT USED THE BNDES CARD PER MICRO-REGION



Source: Elaborated by the authors, based on data from Rais (obtained directly from the Ministry of Economy) and the BNDES Card.
Note: The variable is defined as the ratio between the number of micro-region establishments that used the BNDES Card in the year and the total of micro-region establishments based on the same year's Rais (including establishments without employees).

A challenge for this evaluation was to isolate the BNDES Card financing effect. Since both labor market performance of a given micro-region and financing are simultaneously affected by a number of other factors, a two-step procedure for estimating the impact of card financing was chosen. In a first step, the effect of an expansion of the BNDES Card regional credit offer on the financing effectively

36 See Machado, Parreiras and Peçanha (2011), Pires *et al.* (2014), and Pires and Russel (2017).

37 Rais data refer to the period from 2005 to 2012 and were obtained directly from the Ministry of Economy. IBGE data were obtained through the IBGE Automatic Recovery System (Sidra), available at: https://sidra.ibge.gov.br/home/pms/brasil.

made with the card in the respective micro-regions was estimated. The key at this stage was to build a card offer measure that was unrelated to the other factors affecting micro-region performance. This increase in financing as a result of the supply expansion was then used to measure the impact of financing on the indicators of interest.

To define the offer measure, it was taken into consideration that goods and services that can be purchased with the BNDES Card should be previously accredited by BNDES. Thus, the availability of the BNDES Card credit for a sector depends fundamentally on the accreditation of producers of goods and services that this sector uses intensively. This logic was used to define the sectoral supply measure of the BNDES Card. To calculate it, data were used from the Input-Output Matrix or, alternatively, from the Investment Absorption Matrix, as well as the manufacturers accreditation information available regarding the BNDES Card. The BNDES Card offer for a micro-region was calculated based on sectoral offers and the participation of each sector in the economy of that micro-region.

Financing through the BNDES Card helps warm up Brazilian micro-regions' labor market.

This measure of BNDES Card credit offer per micro-region was used as an instrument for the amount financed by the card. Estimates were made in a panel covering the period 2005 to 2012, with the inclusion of micro-region fixed effects.

The results show that financing through the BNDES Card helps warm up the micro-regions' labor market. It has been estimated that 1% increase in card credit, explained by the offer expansion, causes an average increase of 0.1% in total micro-region employment. The evidence obtained suggests that the growth in financing through the BNDES Card contributes to more admissions and more dismissals in the labor market, with the first effect being greater than the second.

Estimates of the effect on the number of establishments were not statistically significant. On the one hand, the results show that the increase in the amount financed through the BNDES Card has a positive impact on the entry rate of new establishments. On the other hand, there were no effects on the survival rate of existing establishments.

The results obtained provide evidence that BNDES Card financing affects the size distribution of establishments. Estimates suggest that increase in the amount financed through the BNDES Card contributes to increasing the average number of employees per establishment and reducing the proportion of establishments with up to three employees. In addition, it has been estimated that the average number of employees at entering establishments rises with greater use of BNDES Card credit. Finally, analyses of GDP per capita and GDP per formal worker provided no evidence of effect on these variables.

Wind farm installation impact

Incentives in the wind power sector in Brazil began in 2002 through the Alternative Energy Sources Incentive Program (Proinfa). Investments are made through auctions specifically for wind power generation and also for other alternative energy sources.[38] BNDES supports the wind power sector with special financing lines for generation companies, as well as for the machinery and equipment production chains. For wind farm owners, the Bank offers two products: BNDES Finem, which supports investments in capacity increase and construction of new plants; and BNDES Finame, which finances the sale of machinery and equipment already negotiated with the respective buyers.[39]

Wind farm construction works involve the mobilization of investments in physical capital and labor, with the potential to boost the local economy in the short term. In addition, because they can coexist with other land use activities, wind farms can help the economic development of agricultural regions. Additionally, investment in wind power may be associated with increased income for smallholders due to the lease of their land for the installation of wind towers. That is, long-term impact may also occur.

To explore these assumptions, the BNDES's M&E team used the MARVIms Synthetic Control Module, presented in BNDES (2018), and a large municipal-level database, which include information from

38 See Lage and Processi (2013).

39 See Costa, Casotti and Azevedo (2009).

Aneel, IBGE, Finanças do Brasil (Finbra), School Census, and the Department of Informatics of the Unified Health System (Datasus), among others.[40]

The first question to answer was: does the installation of wind farms affect the GDP per capita of the locations receiving the investment? Due to data limitations, the analysis focused on 37 municipalities benefited from 2007 to 2014 for the start-up of their first wind farm (Table 31).[41] Potential controls (that is, the donor pool) include 5,490 municipalities that do not have wind farms.[42] A synthetic control was constructed for each treated unit, based on combinations of untreated municipalities throughout Brazil. In all cases, impacts were measured from the start of the civil works at the wind farms.[43]

TABLE 31: LIST OF MUNICIPALITIES EVALUATED, YEAR AND POWER OF THEIR FIRST WIND FARM

MUNICIPALITY	Treatment year	Power granted (MW)	Work time (years)
Acaraú – CE	2008	70,800	2
Amontada – CE	2009	54,600	0
Aracati – CE	2007	10,500	1
Areia Branca – RN	2012	20,000	1
Barra dos Coqueiros – SE	2012	34,500	0
Beberibe – CE	2008	25,600	0
Boituva – SP	2012	2.24	0
Brotas de Macaúbas – BA	2011	95,190	1
Cabo de Santo Agostinho – PE	2012	2,000	0
Caetité – BA	2011	296,820	3

(continued)

40 Martini *et al.* (2018) bring the details of the evaluation performed.

41 IBGE's municipal GDP per capita series is available up to 2015.

42 The municipality of Gravatá (PE) was excluded since, although its first wind power plant was under construction in 2010, the works only began in 2005, and then there is lack of data for analysis. Another 42 municipalities that received their first wind farm before 2007 or after 2014 were disregarded as they could not be analyzed as treated or used as controls.

43 The average construction time in this sample was 557 days, or about a year and a half.

(continuation)

MUNICIPALITY	Treatment year	Power granted (MW)	Work time (years)
Camocim – CE	2008	105,000	1
Cururupu – MA	2008	22.5	0
Galinhos – RN	2012	118,570	2
Guamaré – RN	2010	51,000	0
Guanambi – BA	2011	167,840	3
Igaporã – BA	2011	143,840	3
Itarema – CE	2012	30,000	2
Iturama – MG	2012	156	0
João Câmara – RN	2011	39,600	1
Macaparana – PE	2010	4,950	0
Mataraca – PB	2007	10,200	0
Palmares do Sul – RS	2010	9,200	0
Paracuru – CE	2007	25,200	1
Parazinho – RN	2011	466,000	3
Parnaíba – PI	2008	18,000	0
Pedra Grande – RN	2012	118,400	2
Pelotas – RS	2014	1.98	0
Pombos – PE	2009	4,950	1
Sant'Ana do Livramento – RS	2011	60,000	0
São Francisco de Itabapoana – RJ	2010	28,050	0
São Miguel do Gostoso – RN	2013	51,200	1
Sento Sé – BA	2012	90,000	1
Sobradinho – BA	2012	48,000	1
Trairi – CE	2012	55,392	1
Tramandaí – RS	2010	70,000	1
Tubarão – SC	2014	2,099.5	0
Xangri-lá – RS	2014	27,675	0

Source: Elaborated by the authors, based on data from Aneel (2019).

After analyzing the results of the synthetic control estimators, three needed to be disregarded from the analysis: Guamaré (RN), Sobradinho (BA) and Galinhos (RN). The first two showed results that differed from the others for reasons unrelated to wind power production. Guamaré suffered its biggest crisis in 2011 due to the drop in oil prices in the region, a sector on which its economy is very dependent. Sobradinho had one of its biggest droughts in 2013, which emptied its water reservoir and compromised the supply of energy from its hydroelectric plant. In M&E language, these municipalities received adverse treatment concomitantly with the installation of wind farms, so that the causal impact could not be isolated. For the municipality of Galinhos, the adjustment of the synthetic control in the pretreatment period was not adequate, so that a consistent counterfactual situation for the impact verification was not found.[44]

The GDP *per capita* of the municipalities that received the installation of wind farms grew by 10% on average, between two and three years after the beginning of its construction.

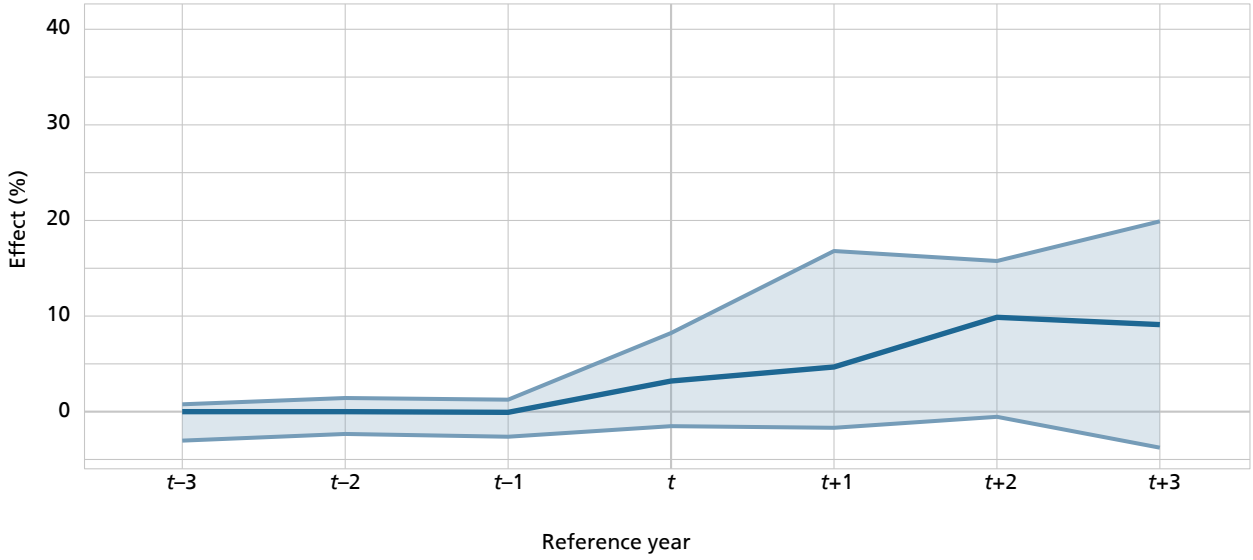
Graph 26 presents the estimated effects for the remaining 34 municipalities. Despite the high dispersion, it is observed that the median of the estimated impact represents a significant expansion of about 10% of municipal GDP per capita between two and three years after the start of construction. The time horizon analyzed (up to three years after the start of the works) does not allow knowing whether such impacts are sustained in the long term. However, investigating whether the effects are more closely related to the operation of wind plants or the civil works required for their installation may provide clues in this regard.

For this investigation, the percentage effect calculated on each municipality from t (year of start of construction) to $t + 3$ was regressed on a capacity indicator for the work in progress and the capacity already installed in the municipality. In addition, in order to obtain an evaluation according to the economic potential of the treated municipality in relation to the investment received, a "treatment dose" variable was created. This variable is equivalent to the ratio between the total power granted of the wind farm (in MW)

44 For more details on pretreatment adjustment, see Martini *et al*. (2018).

and the GDP per capita of the municipality.[45] All indicators used in the regressions were normalized by their means to allow a more intuitive comparison measure.

GRAPH 26: ESTIMATED IMPACT OF WIND FARM INSTALLATION: 1ST QUARTILE, MEDIAN AND 3RD QUARTILE OF PERCENTAGE DIFFERENCES BETWEEN TREATED AND SYNTHETIC CONTROLS



Source: Elaborated by the authors.
Notes: *t* marks the year when wind farm construction began. Blue lines represent the treatment effect on the 0.25, 0.5 and 0.75 quantiles .

For each pair of independent variables, a model based on stacked ordinary least squares (SOLS) and one based on fixed effects (FE) was estimated.[46] Table 32 shows the results of the estimated regressions. In none of them, the measures regarding the structure installed in the municipality were statistically significant. The work capacity was significant in both models, and the coefficient estimated by the SOLS was larger than the one estimated by FE. The "treatment dose" variable was only statistically significant in the SOLS model, which probably stems from the fact that the FE model controls the effect of the GDP per capita in the first year of work.

45 The portion was calculated using the value of GDP per capita fixed in the period in which the first plants were under construction.

46 Intuitively, the least squares model treats each individual-time pair as an independent unit in the sample. The fixed effects model, in turn, controls the effect of possible individual heterogeneities by normalizing the value of each variable by the mean of the individual to which it is associated.

TABLE 32: ESTIMATION RESULTS OF DETERMINANTS OF WIND FARMS EFFECTS ON MUNICIPAL ECONOMIES

	DEPENDENT VARIABLE: IMPACT ON GDP PER CAPITA (%)			
	FE	**SOLS**	**FE**	**SOLS**
Work capacity	19.00**	50.00***		
	(8.80)	(7.60)		
Capacity installed	-6.40	-18.00		
	(8.20)	(11.00)		
Work dose			10.00	25.00**
			(11.00)	(12.00)
Installed dose			4.80	-6.20
			(8.00)	(12.00)
Intercept		8.20		28.00***
		(9.20)		(10.00)
Observations	129	129	129	129
R2	0.05	0.28	0.02	0.04
R2 adjusted	0.03	0.27	0.01	0.04

Source: Elaborated by the authors.
Notes: *p<0,1; **p<0,05; ***p<0,01.

Based on the cases evaluated here, the main determinant of the effects seems to be the magnitude of the work performed. Empirical evidence points to the hypothesis that the impact of wind power plants on local economies is more closely linked to the mobilization of resources for civil works and, therefore, to factors that are mostly observed in the short term.

BNDES Pmat Finem and Brazilian municipalities' financial health

The Program for Modernizing Tax Administration and Managing Basic Social Sectors (BNDES Pmat) is a financing line created by BNDES in 1997, directed at Brazilian municipalities. Initially, it focused on tax administration modernization projects. Later, it

encompassed various actions aimed at improving public spending and efficiency gains in various areas of the municipality – especially in relation to general, financial and asset management, as well as the management of public services of health, education and social assistance.

BNDES Pmat is divided into two programs: BNDES Pmat Automatic (from indirect operations through accredited financial institutions) and BNDES Non Automatic Pmat Finem (from direct operations with BNDES). Both are intended to support projects to improve the efficiency, quality and transparency of municipal public management. More specifically, they seek to meet the objective of contributing to the modernization of tax administration and the improvement of public spending, so as to provide municipalities with efficient resource management, in particular through revenue growth and greater efficiency in general administration expenses, health and education. Projects that can be financed are investment projects aimed at strengthening the managerial, regulatory, operational and technological capacities of the municipal administration, focusing on improving the general administration of the municipality, tax administration, the financial and patrimonial administration, and the administration and management of the municipal secretariats, bodies and departments providing services to the community.

In the period analyzed, there were 141 operations, of which 106 (75% of the total) fall under the BNDES Finem modality, and 35 observations (24.8%) fall under the automatic modality.

This work used the MARVIm synthetic control module to investigate possible effects of BNDES Pmat Finem on the public finances of the municipalities benefited. As a universe of treated units, the evaluation initially considers 100 municipalities that benefited from operations of this type between 2006 and 2015. To this end, two indicators of interest were chosen. Firstly, tax collection, a variable directly related to the objectives of the program, which aims to modernize the municipal tax administration. Second, since improving the health of municipal finances is associated with better spending efficiency, revenue growth is desirable without being offset by accelerated spending growth. Therefore, the effect of the program on the municipal budget expenses is also estimated.

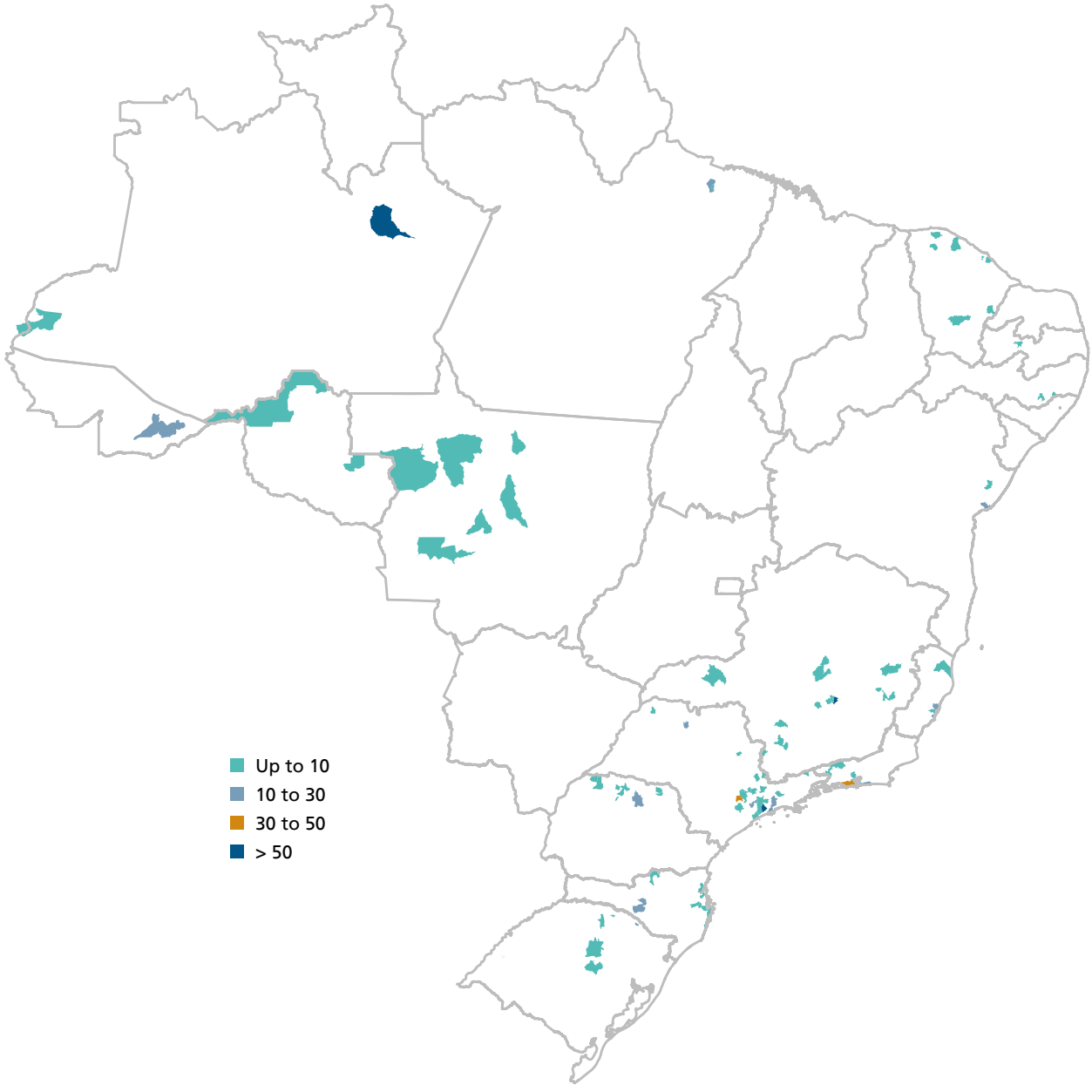
Figure 6 shows how the municipalities benefited by BNDES Pmat Finem are distributed in Brazil, along with the sum of the amount released for each one. During the analysis period, the program released a total amount of R$ 643 million. The average amount released per operation is R$ 6.1 million. There is greater concentration of municipalities benefited in the Southeast and South regions of Brazil. Regarding the amount released per municipality, the highlights are Belo Horizonte (R$ 76.4 million), Manaus (R$ 66.8 million), and São Bernardo do Campo (R$ 66 million).

The empirical strategy adopted was based on the comparison between the performance of municipalities that received support from the program and a group of other municipalities with similar characteristics, but that did not receive this treatment. The synthetic control method was used because it is considered appropriate for case studies with a micro-number of treated units. This method has already been applied by the M&E team to verify the effects of wind farm construction on municipal economies.

For the implementation of the evaluation, a municipal database was used that includes information from the Brazilian Treasury (Finbra), maintained by the National Treasury, on municipal finances, including tax revenue and budget expenditure indicators. These indicators were cross-checked with the BNDES's database, from which information was obtained on all BNDES Pmat Finem operations from 2006 to 2015. The analysis of the aggregate effects of the program was done at two levels. One for all municipalities benefited, and one for the large regions of Brazil, in a disaggregated manner.

The exercise performed sought to build a synthetic control for each treated unit, based on combinations of untreated municipalities throughout Brazil. A point to be emphasized is that the aggregate analysis of the results did not consider the complete set of 100 municipalities benefited by BNDES Pmat between 2006 and 2015. First, because of the optimization algorithm of the synthetic control method, it was necessary to exclude 25 municipalities that presented discontinuous series for the variables of tax revenues and budget expenses. Then, an analysis of pretreatment adjustment led to the exclusion of municipalities for which the synthetic control method did not work properly. This allowed an aggregate analysis of 72 cases for the effect of treatment on budget expenditure, and 65 cases for the effect on tax revenue.

FIGURE 6: MAP OF MUNICIPALITIES BENEFITED FROM BNDES PMAT FINEM PER TOTAL AMOUNT RELEASED (R$ MILLION)



Source: Elaborated by the authors.

Graph 27 represents the trajectory and magnitude of the estimated impacts in relation to the control group. To this end, it presents the behavior of the percentage effect of the differences on the variable of interest between treaties and controls over time. The central blue line shows the median effect among all treated municipalities. Secondary lines below and above the median indicate effects on the first and third quartiles, respectively. For both variables, there is much dispersion of the calculated effects. For tax revenues, the chart only shows a positive trend in the third reference year (3.7%). For budget expenditure, the median effect is always positive, peaking at 2.5% in the third reference year after treatment.

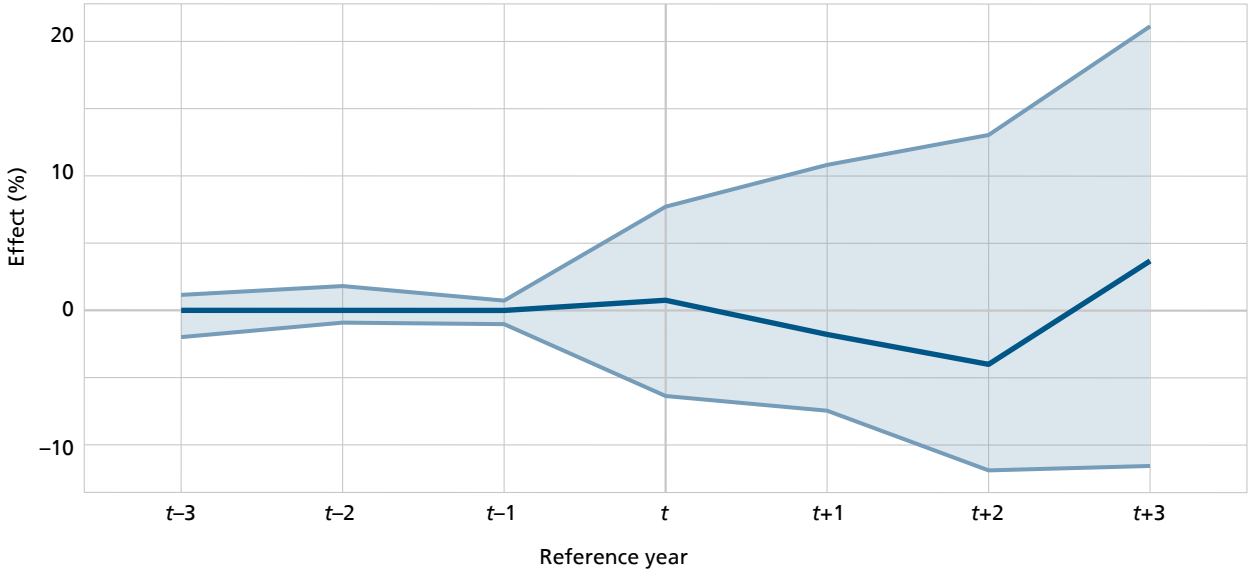
These results suggest that, on average, treated municipalities expand their tax revenues and budget expenditures more than their counterfactual situations. In addition, average revenue growth exceeds that of expenses. However, there is a large dispersion in the estimated results for each unit evaluated. Thus, for this broader set of municipalities, it was not possible to obtain clear evidence of the systematic impact of BNDES Pmat Finem.

In order to better verify the effects of BNDES Pmat Finem despite the dispersion of aggregate results, analyses were performed in subsamples, separated according to the location of municipalities along the large regions of Brazil. In general, the results observed showed that, for the North and Central-West regions, there was no visible pattern, possibly influenced by the small number of municipalities benefited in each region, as well as by the heterogeneity of size. On the other hand, the results verified for the South and Southeast regions repeated the aggregate exercise pattern for Brazil as a whole. Finally, in relation to the Northeast region, more robust results were observed.

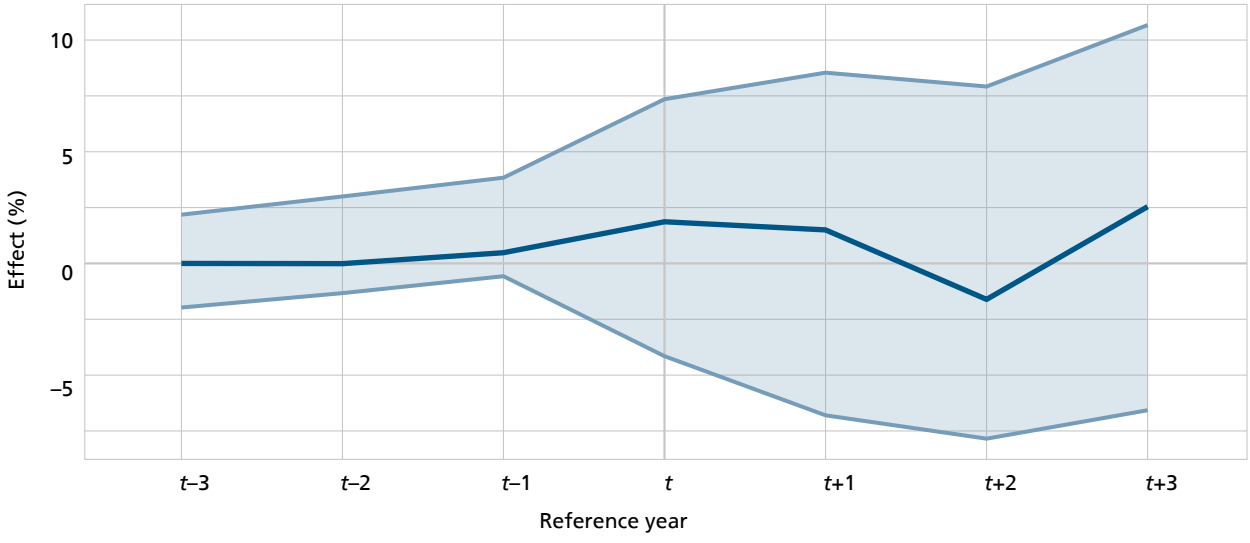
The municipalities of the Northeast benefited by the BNDES Pmat Finem total eight cases. After analyzing the quality of individual synthetic control adjustments, the aggregate analysis included eight observations to verify the aggregate effect on budget expenditure, and six observations to verify the aggregate effect on tax revenues. Therefore, previous analysis has been redone completely for this subset of municipalities.

GRAPH 27: PERCENTAGE DIFFERENCES OF EACH TREATED MUNICIPALITY (BNDES PMAT FINEM) IN RELATION TO ITS SYNTHETIC CONTROL

Graph 27a: Effect on tax revenue



Graph 27b: Effect on budget expenses



Source: Elaborated by the authors.
Note: Blue lines: treatment effect on the 0.25, 0.50 and 0.75 quantiles.

Positive results were found for both variables of interest regarding the analysis of the mean effects of the treatment over the reference years. The effects are greater from the second reference year after

treatment. BNDES Pmat Finem effects on tax revenues showed a better synthetic control adjustment, that is, a trajectory closer to zero in the pretreatment period, and greater magnitude than the effects on expenses.

Graph 28 reinforces the BNDES Pmat Finem positive impact for both variables. For tax revenues, the effect of the program was robust, with a clear break in the series, a median impact of 25.5% in the second year after treatment, and a low dispersion of results. In this case, the evidence is favorable to a causal relation, with BNDES Pmat Finem positively impacting the collection capacity of the municipalities.

For budget expenditure, the median impact peaked at 10.7% in the third reporting year after treatment. However, there was greater dispersion in results and there seems to be a growth trajectory prior to the year of treatment. Because of this, it is uncertain whether the program encouraged the municipalities benefited to spend more, or whether the support occurred when there was already a tendency to accelerate budget spending in the northeastern municipalities. Finally, it is important to highlight that, even accepting BNDES Pmat causal impact on expenses, the effects on revenues are substantially greater in magnitude, signaling a positive contribution of the program to municipal finances.

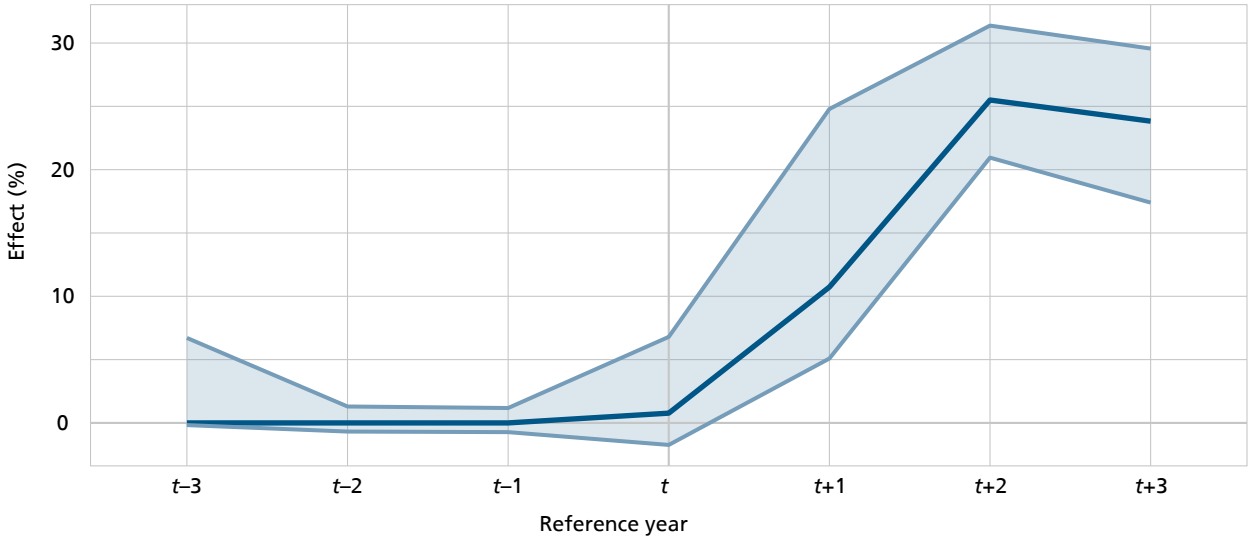
Municipalities in the Northeast Region supported by BNDES Pmat Finem had a median growth of up to 25.5% on their tax revenues

As this evaluation was based on the results of MARVIm, it is a preliminary exercise. For a better identification of the BNDES Pmat causal relation on municipal finances, it would be desirable to continue investigating the reasons for the dispersion of calculated effects on municipalities. In this case, it is essential to verify the characteristics of the most successful municipalities, especially in relation to the challenges faced by their tax management, as well as in relation to the observed fiscal fragility situation. In addition, the effect of the program appears to be greatest after the first years since its implementation. Thus, terms longer than three reference years should be observed from the time of intervention. It is also important to consider other municipal revenue and expenditure indicators, such as the breakdown of tax revenues and budget expenditures. Finally, there

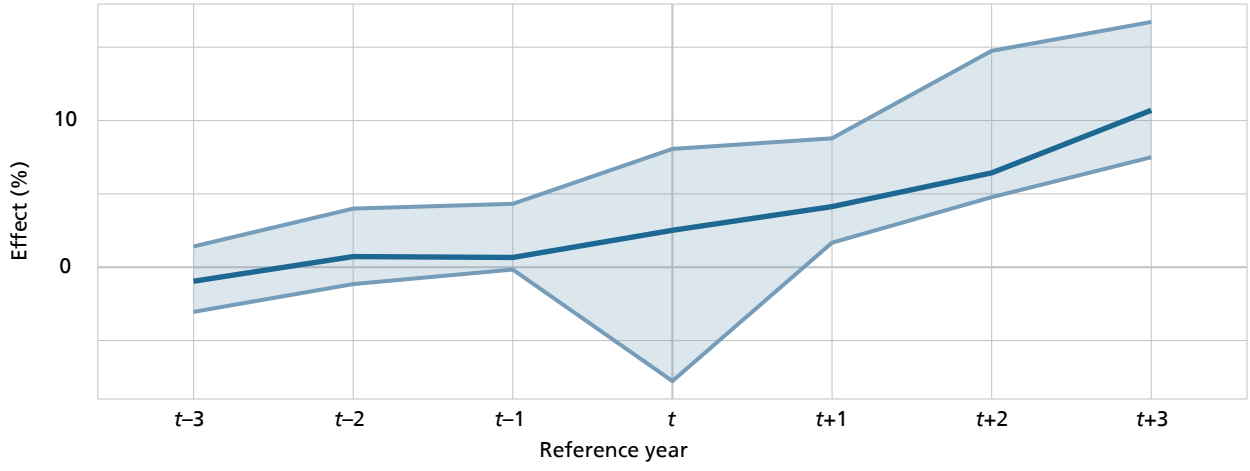
is the challenge of seeking other methods with higher potential for causality capture.

GRAPH 28: PERCENTAGE DIFFERENCES OF EACH TREATED MUNICIPALITY (BNDES PMAT FINEM) IN RELATION TO ITS SYNTHETIC CONTROL — NORTHEAST REGION

Graph 28a: Effect on tax revenue



Graph 28b: Effect on budget expenditure



Source: Elaborated by the authors.
Note: Blue lines: treatment effect on the 0.25, 0.50 and 0.75 quantiles.

THE FUTURE OF BNDES'S IMPACT EVALUATION AGENDA

At each biennial effectiveness promotion cycle, the M&E team commits to a set of impact evaluations. In addition, there is also room for BNDES's operational teams to perform their own impact evaluations with M&E team's support.

This section is part of BNDES's efforts to increase transparency, and proposes to present in advance the topics that are being studied. The BNDES M&E team takes this action as an invitation for parties interested, experts or not, to participate and eventually contribute to the Bank's effectiveness agenda during the early stages.

For 2019-2020, the M&E team has committed to a set of four evaluations:

- BNDES and the promotion of the use of technology in Brazilian education;
- BNDES and access to credit by MSMEs;
- Sanitation challenge in Brazil: BNDES's contribution;
- Impacts of urban mobility works on Rio de Janeiro Metropolitan Region (RMRJ).

BNDES and the promotion of the use of technology in Brazilian education

The public call BNDES – Connected Education – Implementation and Use of Digital Technologies in Education was presented in the previous chapter. As mentioned, this project will feature a broad M&E strategy that includes a randomized controlled trial impact evaluation (RCT). [47]

This will be made possible by the way municipal schools that will be covered by the projects were selected (paired randomization). The schools supported will receive actions with balance between

47 The randomized controlled trial was registered with the American Economic Association (AEA) and can be found at: https://www.socialscienceregistry.org/trials/3933.

the four dimensions (vision, training, digital educational resources, and infrastructure). Control group schools, located in the same municipalities as the treatment group schools, may be affected by transversal project actions – for example, engagement actions. In any case, the control group schools will not receive integrated actions that address the four dimensions. Therefore, the assumption underlying Piec (the impact of technology depends on the balance between all dimensions) is assumed.

As an alternative estimation strategy, it is also intended to employ difference-in-differences with matching estimators (DiDM) to identify schools similar to those in the treatment group in municipalities where there was no project supported by the public call. In this approach, as the control group schools would be in other municipalities, they are unlikely to be affected by projects supported by the public call.

The impact evaluation will be conducted in cooperation between BNDES and FGV and it is expected to be completed by June 2023, incorporating impact estimates on all investigated variables and an analysis of transmission mechanisms.[48]

BNDES and access to credit by MSMEs

The ability of BNDES, together with its subsidiary FINAME, to permanently affect the credit access conditions for supported MSMEs is another strategic issue considered by the institution and will be explored through an impact evaluation.

As seen in the section that reviewed recent evaluations of BNDES's impact, the literature has shown evidence that the Bank's credit promotes growth (investment, revenue, and employment) of financed MSMEs, in contrast to the results obtained by financing large corporations. The main explanation raised for this pattern is greater difficulty that MSMEs have in accessing the Brazilian formal

48 The BNDES' M&E team thanks the technical partners of the call that provided the primary data collection necessary for the identification strategy implemented here, namely: Lemann Foundation and Itaú Social Foundation. It thanks also the technical partners that contributed to the design of the experiment, in particular Miguel Foguel (Ipea) and Ricardo Paes de Barros (Insper).

credit market. However, it is necessary to directly validate this hypothesis, showing how BNDES's financial products contribute to reducing the credit restriction.

The intention is to investigate the financial constraint of companies or segments of companies of interest (size or sector, for example).[49] Based on the ratings obtained by companies or segments of companies in relation to credit restrictions, it will be possible to verify the evolution of the degree of coverage and describe the focus of BNDES's performance. Then, the intention is to estimate the impact of the Bank's actions on credit restriction measures and the investment of the companies financed.

This research will focus on the products most accessed by MSMEs: BNDES Card, BNDES Finame and Investment Guarantee Fund (BNDES FGI). Through this evaluation, the expectation is to contribute to the development of more focused and effective financial products to reduce credit restrictions in the Brazilian economy.

Sanitation challenge in Brazil: BNDES's contribution

The availability of long-term financing under stable conditions is a fundamental factor for the sanitation sector, especially for sewage, to make the necessary investments to reduce the service deficit in the country. It is understood that the BNDES System plays a decisive role in meeting this challenge, promoting, through its financing, an opportunity for municipalities and sanitation companies to accelerate their investments in the sector and improve the quality of life of their population. This theme is in line with the BNDES System's strategic planning, which defined infrastructure development as a strategic mission.

This impact evaluation aims to estimate BNDES's effect on investment in sanitation projects. Investments are expected to translate into higher levels of coverage. The results of the increase in attendance to the population, in turn, should be converted into high welfare gains, with more immediate effects on health indicators.

49 The M&E team is still analyzing which bases can be used to implement this evaluation.

Naturally, the focus of the evaluation will be BNDES Finem – Environmental Sanitation and Water Resources, the Bank's main line for the sector. This line is directed at public and private investment projects aimed at universal access to basic sanitation services and the recovery of socially degraded areas.

Impacts of urban mobility works on Rio de Janeiro Metropolitan Region

Investment in urban mobility has great potential to generate welfare gains for the population. The time spent in commuting is an important part of life for workers in large cities. In Brazilian metropolitan regions, this time is substantially high. The municipality of Rio de Janeiro, in particular, in recent years has received several investments aimed at improving urban mobility, whose impacts should be felt throughout the RMRJ.

Urban mobility is a priority focus of BNDES's role in infrastructure. Several projects of this segment were financed in the city of Rio de Janeiro in recent years. Given that the average time spent commuting in RMRJ was the longest in the country, understanding the impacts of the different urban mobility projects carried out during this period is fundamental for BNDES, both to render accounts to the population and to improve the design of future public policies for urban transport.

Regarding the expected impacts, the evaluation should include the following dimensions: (i) employment; (ii) income; (iii) effects on income and spatial inequality; (iv) travel time; and (v) pollution. In addition to these dimensions, the intention is to present other estimates of impacts on welfare-related variables, such as health impacts and traffic accidents.

Other evaluations

In addition to the evaluations previously listed, the EPS envisages that operational teams also conduct impact evaluations with M&E team's methodological support. For 2019-2020, two projects are ongoing.

The first concerns the deepening of impacts of Post-shipment Services. The analysis will again focus on companies whose goods and services have been incorporated into the supported projects (the subcontractors), but this assessment intends to use IBGE's annual survey microdata in a dynamic approach, to permit analyzing how the effects of support reverberate over time.

The second project is linked to BNDES IoT Pilots – Internet of Things (IoT). This initiative will support the experimentation of projects in three areas: rural (efficient use of natural resources and inputs, efficient use of machinery, sanitary safety and animal welfare), health (chronic diseases, promotion and prevention, management efficiency) and cities (mobility, public security, energy efficiency and sanitation). In practice, there will be several impact evaluations for each of the IoT solutions that will be tested. BNDES-supported consortia are required to assess the impact of these solutions. It will be up to the M&E team to ensure that these impact evaluations follow good practices.

PERSPECTIVES

BNDES's vision is to be recognized as the Brazilian development bank for its relevance and effectiveness. The Bank's commitment to the effectiveness of its operations has become more explicit and objective with the revision of the Corporate Monitoring and Evaluation Policy and the approval of the Macro Process of Effectiveness Promotion. These instruments have materialized into the indicators presented in this and previous reports, and also into the impact evaluations performed over time. The maturation of this process should bear fruit for organizational learning on how to implement public policies that improve the lives of Brazilian citizens.

The next steps will incorporate the disclosure of output and outcome indicators at higher levels: BNDES will objectively and measurably explicit its contribution to the country's development in the areas defined in its strategic planning. New partnerships with external actors are also expected to be established for impact evaluations. Therefore, there will be not only a greater number of evaluated interventions, but also greater independent validation of the results found. In parallel, internal evaluations are beginning to be disseminated beyond the M&E team. Using the knowledge of operational teams is fundamental to generate results closer to the Bank's daily activities. It should be noted that BNDES will continue to disclose the effectiveness studies performed over the next few years, prioritizing the themes defined in the previous section.

An additional effort on the effectiveness agenda is to make the findings used to increase BNDES's impact. To this end, it is important that the M&E team should integrate more closely with the (re) design stage of BNDES's performance, contributing to the elaboration of new financial products. Doing so without losing an adequate degree of distancing and independence, a *sine qua non* condition for the credibility of the evaluation system, will certainly be a challenge to be faced in the coming years.

Nevertheless, the transparency agenda is a partner to the effort shown in this report. Greater disclosure of data has already enabled increase in external studies of the Bank's performance. At this point, greater transparency of output and outcome indicators has the potential to trigger deeper follow-up by society. The public hearing on transparency held in 2018, in partnership with TCU, received

57 proposals. The suggestions were made in person and through the Bank's portal by public servants, professionals, private entities, nongovernmental organizations, IRS, CGU, other federal institutions, and financial institutions.

Finally, evaluating the results of an organization like BNDES is not an end in itself. It is an instrument for improving its strategic planning and policy and product formulation. The complete learning cycle from monitoring and evaluation activities is paramount to generate a more efficient and effective BNDES, capable of honoring the Bank's purpose: to transform the lives of generations of Brazilians, promoting sustainable development.

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