Supporting Brazil’s Future Readiness: An Innovation, Technology and Talent Readiness Roadmap

Report by Portulans Institute for the Confederation of National Industries, Brazil (2020)

Prof. Soumitra Dutta, Dr. Rafael Escalona Reynoso, Carolina Rossini and Isabella Wilkison
Founded in 2019, the Portulans Institute (PI) is an independent nonprofit, nonpartisan research and educational institute based in Washington DC. Portulans mission is:

- To develop cross-community knowledge and dialogue on how people, technology and innovation contribute to sustainable and inclusive growth.
- To inform policy-makers, by producing independent, rigorous metrics and data-based research.
- To collaborate with private sector leaders in driving a business agenda that invests in people, technology, and innovation for a prosperous common future.
- To host and co-organize events and conferences on the above issues affecting human-centric sustainable economic prosperity.

The Report to be presented, in partnership with CNI, is unprecedented and applies a new and cutting-edge methodology based on years of experience of the Portulans team, which includes the creators and data scientist of the Global Innovation Index, do Network Readiness Index and Global Talent e Competitiveness Index.
Introduction

Assist the improvement of Brazil’s level of future readiness by building competitiveness in innovation, talent, and technology – referred to as the ‘ITT’ triangle.

Using data-driven insights the Report offers an overview of Brazil’s current future readiness status by reflecting on the country’s capacity to:

- Maximize the potential of its local and regional assets to create new technological and industrial landscapes,
- Develop and retain skilled talent, and
- Absorb and benefit from new technology.
This approach assesses Brazil’s competitiveness in innovation, talent, and technology.

To do so it merges:

- Research findings from international organizations;
- Insights and recommendations from the local private sector, and
- the outcome from the use of a technical assessment tool (FREA).
Methodology (2/4)

First Stage:

1. Examine Brazil’s current science, technology and innovation systems (STIS):
   - Understand and map the future readiness landscape.
   - Identify key priorities and focus areas.
   - Find existing roadblocks.

2. Assess insights and recommendations from:
   - International organizations.
   - Local industry and entrepreneurial sectors - key policy research and studies from CNI and MEI.

Methodology (3/4)

Second Stage:

- Future Readiness Evaluation Approach (FREA): Data-driven exploration of Brazil’s ITT triangle and the strength of institutions and infrastructure as fourth underlying dimension.

- The approach defines a **Future Readiness Index** (FRI) that merges into a single analytical tool components from:
  - The Global Innovation Index (GII),
  - The Global Talent Competitiveness Index (GTCI)
  - The Network Readiness Index (NRI)
Third Stage:

- Scenario assessment based on the FRI and previous findings to gather information on how to achieve a future readiness state for Brazil that displays:
  - Strengthened innovation
  - Improved talent
  - Better technology
  - Solid institutions and infrastructure

- Generate a list of general and decurrent recommendations by merging data-driven insights from the FREA, findings from simulations, and research insights drawn from international organizations and the private sector.
The FREA considers innovation, talent, and technology as key factors of competitiveness.

Combined these shape Future Readiness by leveraging into a single component, the ITT triangle (ITT).

This approach offers a better understanding of how economies are positioned and harness the combined power of these three factors to prepare for a post pandemic global competition.
The FRI ranks the Future Readiness of 47 high-performing economies.

Each of its four pillars represents a component of the ITT triangle.

The mapping of 67 indicators coming from the three global indices is designed to avoid overlaps across dimensions.
FRI: General results

Institutions & Infrastructure:
1. Norway
2. Singapore
3. Sweden
4. Finland
5. Japan
6. Denmark
7. Germany
8. New Zealand
9. Netherlands
10. Canada

Innovation:
1. Switzerland
2. U.S.
3. Sweden
4. Japan
5. R. of Korea
6. Denmark
7. Netherlands
8. Israel
9. Canada
10. Singapore

Talent:
1. Singapore
2. U.S.
3. Australia
4. Switzerland
5. Ireland
6. Netherlands
7. Norway
8. Sweden
9. Canada
10. Finland

Technology:
1. Singapore
2. Norway
3. Denmark
4. Sweden
5. Netherlands
6. U.S.
7. U.K.
8. Switzerland
9. Finland
10. Ireland

FRI:
1. Singapore
2. Switzerland
3. Sweden
4. U.S.
5. Denmark
6. Netherlands
7. Finland
8. Norway
9. U.K.
10. Japan

46. Brazil
37. Brazil
41. Brazil
44. Brazil
44. Brazil
Brazil ranks 8 out of 12 among middle-income group economies.

This puts Brazil behind Colombia, but in the lead regarding Argentina, India, and Mexico.
Brazil ranks 4th among the 5 BRICS countries in the FRI:

• In Talent and technology, Brazil is in 3rd place, behind China and Russia, but ahead of India and South Africa.
• Brazil ranks 4th in Innovation, slightly above India.
• But Brazil is the last - 5th - in Institutions and Infrastructure..

Source: FRI database
Brazil ranks 4 out of 6 economies among regional peers.

- Although Brazil tops in Innovation in this sample, its score is almost 50% less than the high-income group average.
- Brazil also trails in the sample in Institutions and Infrastructure and Technology.

Source: FRI database
**FRI: Brazil strengths and opportunities (4 / 4)**

<table>
<thead>
<tr>
<th>Strength</th>
<th>Code</th>
<th>Pillar/sub-pillar/indicator</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1.3</td>
<td></td>
<td>Global R&amp;D companies, average expenditure top 3</td>
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<tr>
<td>2.3.</td>
<td></td>
<td>Business Sophistication</td>
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<tr>
<td>2.3.5</td>
<td></td>
<td>ICT services imports</td>
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<tr>
<td>2.4.4</td>
<td></td>
<td>Intellectual property receipts</td>
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</tr>
<tr>
<td>3.1.5</td>
<td></td>
<td>Gender development gap</td>
<td>10</td>
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<tr>
<td>3.2.4</td>
<td></td>
<td>Use of virtual professional networks</td>
<td>23</td>
</tr>
<tr>
<td>4.2.1</td>
<td></td>
<td>Use of virtual social networks</td>
<td>20</td>
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<tr>
<td>4.2.4</td>
<td></td>
<td>Government online services</td>
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<tr>
<td>4.3.5</td>
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<td>E-Participation</td>
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<tr>
<td>4.3.6</td>
<td></td>
<td>Gender gap in Internet use</td>
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<tr>
<td>4.4.2</td>
<td></td>
<td>High-tech exports</td>
<td>26</td>
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<table>
<thead>
<tr>
<th>Opportunity</th>
<th>Code</th>
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<th>Rank</th>
</tr>
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<tr>
<td>1.</td>
<td></td>
<td>Institutions &amp; Infrastructure</td>
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<tr>
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<td></td>
<td>Regulatory environment</td>
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<td></td>
<td>Government effectiveness</td>
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<td>1.1.4</td>
<td></td>
<td>Regulatory quality</td>
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<td>1.1.5</td>
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<td>Corruption</td>
<td>45</td>
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<tr>
<td>1.2.2</td>
<td></td>
<td>Ease of doing business</td>
<td>46</td>
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<tr>
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<td></td>
<td>General infrastructure</td>
<td>47</td>
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<tr>
<td>1.3.3</td>
<td></td>
<td>Gross capital formation, % GDP</td>
<td>46</td>
</tr>
<tr>
<td>2.2.</td>
<td></td>
<td>Market Sophistication</td>
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</tr>
<tr>
<td>2.2.4</td>
<td></td>
<td>Applied tariff rate, weighted mean</td>
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<tr>
<td>3.1.2</td>
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<td>International students</td>
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<td>3.4.</td>
<td></td>
<td>Skills</td>
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<td>3.4.5</td>
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<td>Availability of scientists and engineers</td>
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<tr>
<td>4.1.</td>
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<td>ICT</td>
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<td>ICT skills</td>
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<tr>
<td>4.2.5</td>
<td></td>
<td>Government promotion of investment in emerging technologies</td>
<td>42</td>
</tr>
<tr>
<td>4.4.3</td>
<td></td>
<td>Labor productivity per employee</td>
<td>45</td>
</tr>
</tbody>
</table>
While data for all other economies is kept constant (*ceteris paribus*), the values used in each of the following test for Brazil are forecast values for the year 2020.

Goal: Show potential areas of major impact for policy making.

- Most forecasts are produced using the additive error, additive trend, and additive seasonality (AAA) version of the Exponential Smoothing (ETS) algorithm.
- In each of these procedures the predicted value for Brazil is a continuation of the historical values in the specified target date, which should be a continuation of the timeline for the selected indicator.
- For each test either the forecast, lower confidence bound, or the upper confidence bound value is used as specified. Forecast values represent the average of the lower and upper confidence bound values.
Updated and Enhanced Body of Active Researchers: Nearly 35% increment in researchers per million persons - from 888 to 1,197.

Increased Gross Expenditure on R&D (GERD) as a Percent of GDP: Increment of nearly 16% - from reported 1.26% to 1.46%. (But comparatively to other countries, still low)

Higher volume of venture capital deals: Increase of almost 41% - from the 67 deals reported to 94.

Expanded Cultural and Creative Services Exports: Information services (SI3) from $53.8 to $56.88 million; advertising, market research, and public opinion polling services (SJ22) from $935.6 to $1,072.27; audiovisual and related services (SK1) from $153.23 to $366.62 million; and Heritage and recreational services (SK23) from $43.30 million $47.48. Conversely, the value for total trade remaining at $161,027 million.
## FRI Scenarios: Strengthened Innovation

### Results

<table>
<thead>
<tr>
<th>Code</th>
<th>Pillar/sub-pillar/indicator</th>
<th>Original Rank</th>
<th>Strengthened Innovation Rank</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>FRI</td>
<td>Future Readiness Index (out of 47)</td>
<td>44</td>
<td>44</td>
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<tr>
<td>2.</td>
<td>Innovation</td>
<td>37</td>
<td>35</td>
<td>2</td>
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<tr>
<td>2.1.</td>
<td>Research &amp; Development</td>
<td>35</td>
<td>33</td>
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<tr>
<td>2.1.1</td>
<td>Researchers</td>
<td>40</td>
<td>39</td>
<td>1</td>
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<tr>
<td>2.1.2</td>
<td>Gross expenditure on R&amp;D (GERD)</td>
<td>29</td>
<td>24</td>
<td>5</td>
</tr>
<tr>
<td>2.2.3</td>
<td>Venture capital deals</td>
<td>36</td>
<td>35</td>
<td>1</td>
</tr>
<tr>
<td>2.4.2</td>
<td>Cultural and creative services exports (% of total trade)</td>
<td>34</td>
<td>29</td>
<td>5</td>
</tr>
</tbody>
</table>
FRI Scenarios: Improved Talent (4/10)

Tests:

- **Increased tertiary enrollment:** An increase of 8.3% in tertiary enrollment ratio from close to 50.5% to 54.72%.

- **Upgraded pension system:** Expansion of nearly 30% from the reported 52.5% to an estimate of 64.3%.

- **Expanded environmental protection:** Enhanced EPI components (40% increment for environmental health and 60% for ecosystem vitality), resulting in an expansion of 10% in a forecast value for Brazil from 60.7 to 66.77.

- **Increased availability of scientists and engineers more available:** This perception stands at 3.4 on a scale from 0 to 7. Using the latest update from the World Economic Forum Global Competitiveness Index an alternative forecast value is set at 3.88
### FRI Scenarios: Improved Talent (5/10)

**Results**

<table>
<thead>
<tr>
<th>Code</th>
<th>Pillar/sub-pillar/indicator</th>
<th>Original Rank</th>
<th>Improved Talent Rank</th>
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<td>3.2.</td>
<td>Grow</td>
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<td>Tertiary enrolment</td>
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<td>Retain</td>
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<td>3.3.1</td>
<td>Pension system</td>
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<td>34</td>
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<tr>
<td>3.3.3</td>
<td>Environmental performance</td>
<td>39</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>3.4.5</td>
<td>Availability of scientists and engineers</td>
<td>47</td>
<td>39</td>
<td>8</td>
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</table>
**FRI Scenarios: Better Technology (6/10)**

- **Improved 4G mobile network coverage:** An increase in coverage of 11% leading to a coverage of 92% instead of 83%.

- **Enhanced government’s promotion of investment in emerging technologies:** Expansion of nearly 24% from its 2.78 current score for 2019 to a score of 3.44.

- **Improved legal framework's adaptability to emerging technologies:** An increase of nearly 5% from the 2019 score of 3.60 to a score of 3.76 for Brazil.
## FRI Scenarios: Better Technology (7/10)

### Results

<table>
<thead>
<tr>
<th>Code</th>
<th>Pillar/sub-pillar/indicator</th>
<th>Rank</th>
<th>Rank</th>
<th>Difference</th>
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<td>4.</td>
<td>Technology</td>
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<td>4.1.2</td>
<td>4G mobile network coverage</td>
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<td>People</td>
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<td>Governance</td>
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<tr>
<td>4.3.4</td>
<td>Legal framework's adaptability to emerging technologies</td>
<td>34</td>
<td>30</td>
<td>4</td>
</tr>
</tbody>
</table>
FRI Scenarios: Solid Institutions and Infrastructure (8/10)

Tests:

✓ **Increased government effectiveness**: Brazil’s value for this indicator in 2018 is -0.44. This test proposes an alternative value of -0.06 capturing an increase of 87%.

✓ **Better regulatory quality**: This test proposes an alternative value of -0.21 showing an increase of 34% from the current -0.31 value for 2018.

✓ **Reduced corruption**: Brazil’s value for this indicator is 35 for the year 2018. The used proxy for this test is 48 reflecting an increase in the outcome of this index of 34%.

✓ **Cutting red-tape (improving the ease of doing business)**: This test proposes an alternative value of 71.5 for this indicator rather than the 60.01 assessed value for this indicator.
## FRI Scenarios: Solid Institutions and Infrastructure (9/10)

### Results

<table>
<thead>
<tr>
<th>Code</th>
<th>Pillar/sub-pillar/indicator</th>
<th>Rank</th>
<th>Improved Institutions and Infrastructure</th>
<th>Difference</th>
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<td>Market environment</td>
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</tr>
<tr>
<td>1.2.2</td>
<td>Ease of doing business</td>
<td>46</td>
<td>40</td>
<td>6</td>
</tr>
</tbody>
</table>
Brazil’s innovation-driven competitiveness improves 3 positions when applying a sector encompassing policy.

Single sector oriented policies show either marginal (1 position) or no overall effect in competitiveness.
Key Findings (1/7)

Investment on innovation, technology, and talent go hand-in-hand with competitive levels of innovation:

- Governments play an active role in financing Science, Technology, and Innovation in some developing economies.
- Although the percentage of GERD financed by Brazil’s government amounts to nearly 50%, this figure represents only about 0.63% of Brazil’s GDP, which is almost half in comparison to other countries part of the FRI.
Balanced and stable markets attract foreign capital investment:

- The local financial system appears far from the levels of sophistication seen in economies at higher stages of development.
Brazil records higher competitiveness in the ITT Innovation pillar than in Technology, Institutions and Infrastructure, but lacks an overarching policy framework:

- The ITT Technology pillar and the ITT dimensions of Institutions and Infrastructure are the areas that require the most immediate attention for improving Brazil’s competitiveness, as also proven by the impact scenarios.
There are serious – yet not insurmountable – hurdles to financing innovation in Brazil:

- Financing innovation in Brazil faces several serious hurdles. Critical funding gaps remain despite recent policy action.
- Further, the great diversity of investment opportunities in innovative individuals, ideas and companies across different stages of the innovation lifecycle are not sufficiently supported by infrastructure, institutions or security for investors.
Offline barriers hinder Brazil’s digital development, but opportunities persist:

- Offline insufficiencies and inefficiencies, such as bureaucratic hurdles, hinder digital development frontiers.

- As an opportunity, both international organizations and corporations note that Brazil’s chronic underinvestment in the ICT sector, combined with its projected explosion of growth over the next few years, represents a pathway for investment for international and local investors – and the improved wellbeing of Brazilian citizens.
Global talent landscapes are rapidly changing, and people-first innovation is a strategic imperative:

- Global talent landscapes are rapidly changing and evolving, as is the standard for global competitiveness stressing the need for a holistic approach to the ITT triangle, melding technical excellence with good governance and a people-first innovation strategy.
- Data projections show Brazil lagging behind if it does not invest on talent training and competitiveness.
Concluding key finding: Improvements in key areas can drastically improve Brazil’s future readiness

- Given the characteristics of the FRI – a compact, elite group of high-performing economies assessed at nearly full data coverage – a rise by three positions is a remarkable improvement.

- These results capture the importance of defining and applying policies in the areas outlined in the Report’s recommendations.

- Inaction, or the weakening of policies already in place, would curtail these areas of growth and potential, resulting in economic stagnation and the loss of decisive development opportunities.
Recommendations (1/9)

General Recommendations (1/2)

R1. Establish solid bridges between public and productive sectors
Building the necessary connections between these sectors is fundamental to achieving these objectives, along with higher levels of productivity.

R2. Outline mission oriented policies
A shared perspective coming from the private sector highlights the importance of partnering in multi-stakeholder groups for the design of mission-oriented policies and strategies, to leverage both efforts and investment mechanisms in order to advance innovation locally.
R3. Devise intersectional rather than single domain policies
Rather than aiming at ITT components individually or pursuing different implementation cycles for each component, policies should concurrently consider all of the elements of the ITT and be applied jointly.

R4. Identify and collect data to better support the design of mission-oriented policies
The benefit from having complete and more precise information would help induce the kind of mission-oriented investments that lead to the creation of new technological opportunities and market landscapes in Brazil.
R5. Increase gross domestic expenditure on R&D

A position from the private sector highlights the need to expand rather than just preserve the current levels of GERD – especially those coming from the government. In doing so, this recommendation highlights the fundamental role that the public sector plays in ensuring the stability of and timely access to these resources. It also emphasizes the importance of having a deeper understanding of GERD and its key role for local innovation, especially for projects with multiple rounds of funding.
Improving Innovation (2 / 3)

R6. Foster an innovation investment culture via venture and risk capital markets

- Similarly, research also demonstrates that a country's innovation strategy dilutes when investors are not supported by a strong innovation ecosystem that looks both outwards – to foreign investment – and inwards – to homegrown ideas and talent.

- Thus, the country should foster an innovation investment culture based on venture and risk capital markets through various actions.
Improving Innovation (3 / 3)

R7. Promote the private sector’s engagement in innovation and entrepreneurship
Simplifying and clarifying Brazil’s legal and regulatory environments, and developing mechanisms that ensure and improve investor confidence in higher-risk ventures is essential for the expansion of local entrepreneurship and innovation.

R8. Foster an IP culture based on international guidelines for intangible creations
Engaging in additional efforts not only to further expand the internationalization of its high- and medium high-tech industry but also that of softer innovation-based products and services – including those derived from culture and tradition – can further tap Brazil’s potential to develop a lively and fully active IP Culture.
**Recommendations (6/9)**

**Improving Talent**

**R9. Tailor a talent-first innovation strategy**

- To improve this trajectory, public-private efforts should develop programs to attract and retain individuals with an expertise in strategic management and higher-level skills in emerging technologies and STEM related occupations.

- Additional programs can be designed to target workers in areas linked to soft innovation and in sectors projected to experience low displacement.

**R10. Adapt to the rapidly changing global talent landscape**

- University and industry partnerships can be promoted to help design a curriculum that focuses on the specific requirements of the ICT industry.

- Harnessing the vast higher education institutional network operating in Brazil, identified gaps in technical and other high-tech related service provision.
R11. Lead innovation and technological change by example

Governments at all levels should more actively harness new technologies and serve as an example by providing ‘a vote of confidence’ in front of the local user population.

R12. Expand local digital development frontiers

To foster an expansion of digital development frontiers, Brazilian authorities should lift any barriers to the implementation of new technologies and facilitate the execution of innovation projects through the promotion of initiatives that further facilitate their deployment. In conjunction with these initiatives, the government should implement projects that uphold environmental protection and public safety, plus initiatives underlining the importance and timely adoption of such technologies.
R13. Ramp up the design of technological regulatory frameworks

- Brazil’s public and private sectors seem to display different technological adoption paces. Data confirms that the government under-promotes the use of new technologies while the private sector adopts and adapts to these same technologies at a faster rate.

- Thus, promoting the swift enactment of regulation would not only help promote these technologies but also help create an innovation funding environment that appears not to be yet fully developed in Brazil.
Improving Institutions and Infrastructure

R14. Reduce red-tape and corruption at all levels

- To reduce red-tape and curb corruption should apply a series of adjustments in tandem.

- Additionally, to restore possibly eroded confidence in authorities, it is key to design plans to suppress the potential for political corruption and promote the integrity of political systems.

R15. Promote regional linkage and cluster development

- Brazilian authorities should develop mechanisms to boost collaboration among government agencies, academic institutions, industry, and civil society organizations.

- Regional linkage can be enhanced via the design of policies and programs to improve regional investment and collaboration, like tax incentives, reduced tariffs, and eased restrictions for high-skilled worker cross-border movement.
Conclusions

- Ensuring Brazil's future readiness through improved innovation-led competitiveness is within reach. But COVID and shortcoming in other ITT aspects are still challenges.

- A technical review of its future readiness fundamentals suggest that the design, timely implementation, and management of intersectional and holistic policy efforts weighing aspects of innovation, talent, technology and institutional redesign are key towards achieving this objective.

- The definition and implementation of coordinated, future-oriented plans and policies to address noted challenges and limitations will help Brazil achieve the economic recovery it requires in the post-pandemic global ecosystem.
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Thank You!

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