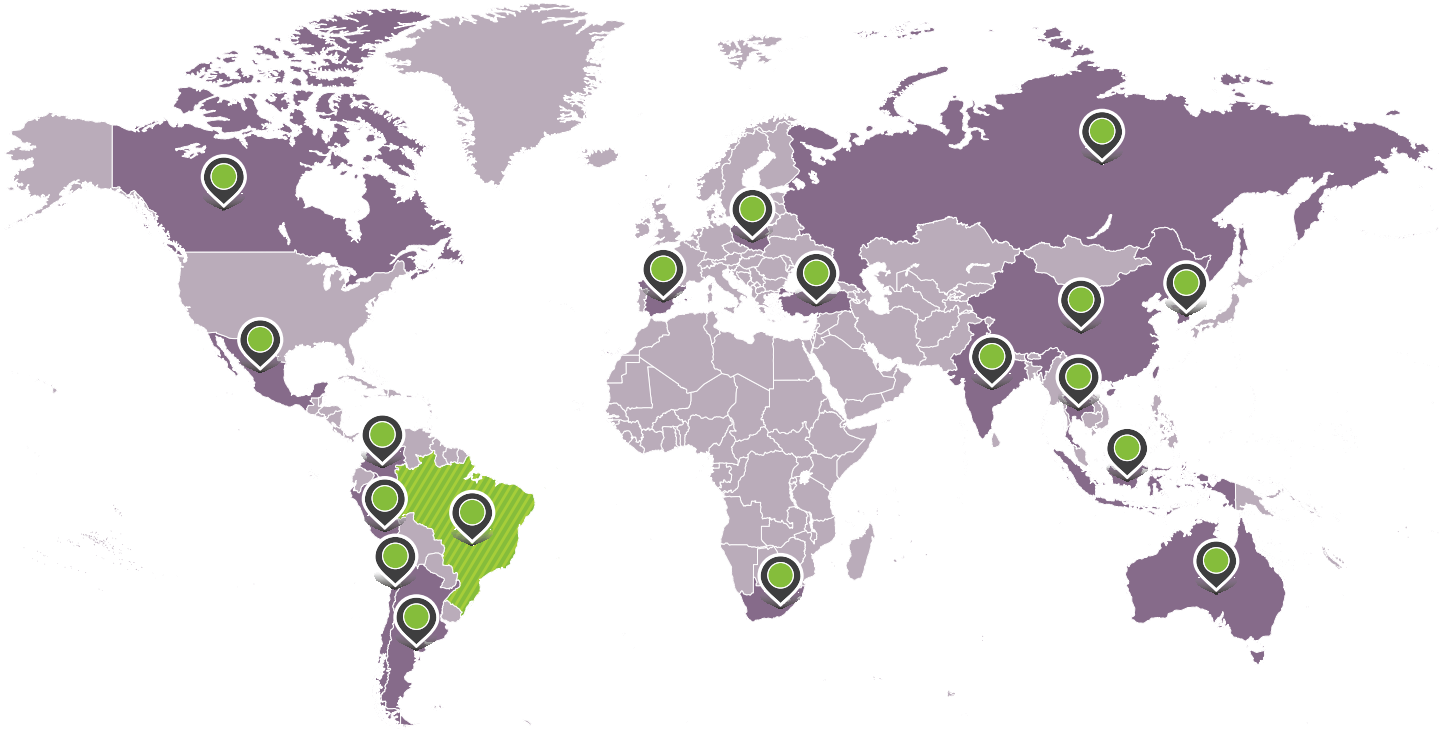


# **BRAZIL COMPETITIVENESS REPORT** **2017-2018**

**A COMPARISON WITH SELECTED COUNTRIES**

BRASÍLIA – 2018



# BRAZIL COMPETITIVENESS REPORT 2017-2018



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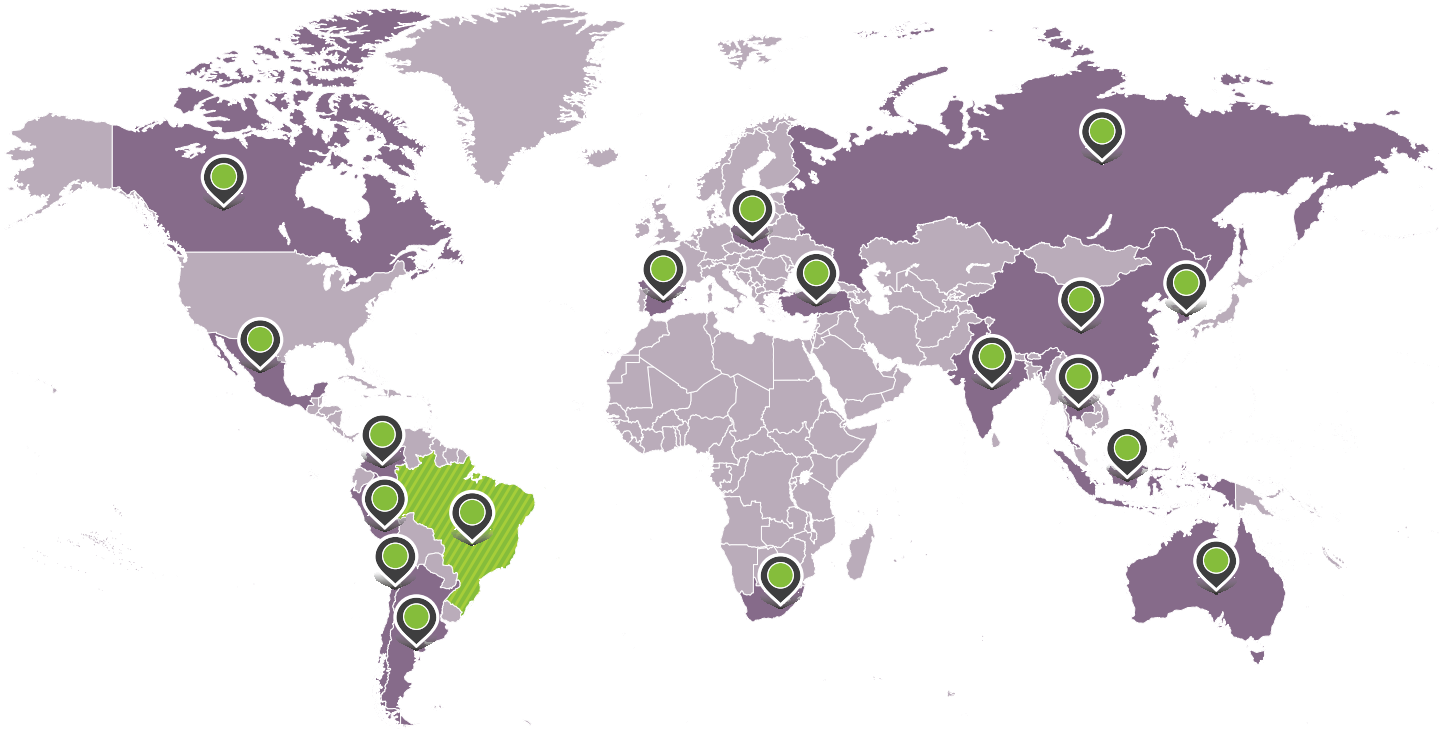
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National Confederation of Industry  
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# BRAZIL COMPETITIVENESS REPORT 2017-2018

BRASÍLIA

2018

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CNI

**Research and Competitiveness Unit – GPC**

CATALOGING IN PUBLICATION

N748b

National Confederation of Industry

Brazil Competitiveness Report 2017-2018 : a comparison with selected countries. –

Brasília : CNI, 2018.

101 p. : il.

1. Industry - Brazil. 2. Industry - Growth. 3. Industry – Competitiveness. I. Title.

CDU: 67(81)

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## Preface

One of the missions of the National Confederation of Industry (CNI) is that of enhancing industry's competitiveness in both the foreign market and domestically. With this focus, we prepared the report *Brazil's Competitiveness: a comparison with selected countries*.

The study was built on the assumption that increasing the productivity of enterprises is necessary but not sufficient to improve their ability to compete in good conditions. Competitiveness depends on companies taking action and on the business environment, on appropriate infrastructure, on government policies.

Based on the *Strategic Map of Industry 2013-2022*, the report identifies the determining factors in this effort and compares Brazilian indicators with those calculated for 17 similar economies.

The results presented here reinforce how urgent it is for Brazil to make progress on the competitiveness agenda. Brazil has remained in the next-to-last position since the 2012 edition, when we started to publish the general ranking.

Our expectation is that this report will contribute to pointing out Brazil's shortcomings and strengths. More than that, we hope it will be an invitation to action.

Industry and Brazil cannot wait to take decisive action any longer.

**Robson Braga de Andrade**

President of the National Confederation of Industry (CNI)





# 1. SUMMARY OF RESULTS



## Brazil remains second to last in the overall ranking

Improvement in labor productivity is offset by inefficient infrastructure, lower depreciation of the Brazilian currency (real), and lower support for innovation

**Changes were recorded in Brazil's position in the rankings for seven of the nine competitiveness-determining factors under analysis, but the country remains second to last in the overall ranking – ahead of Argentina.** Brazil is now ranked in the top third (between 1<sup>st</sup> and 6<sup>th</sup> place) in one competitiveness-determining factor, compared to zero cases in the 2016 ranking. The factors in which the country occupies the middle third (between 7<sup>th</sup> and 12<sup>th</sup> place) fell from four to two, while the factors in which it is in the bottom third (between 13<sup>th</sup> and 18<sup>th</sup> place) rose from five to six.

**Among the nine factors, Brazil is only ranked in the top third in Availability and cost of labor.** In Competition and scale of domestic market and in Education, the country is in the middle third. In the other factors, Brazil is ranked in the bottom third of the ranking (last six positions).

**Brazil occupies the last position in Availability and cost of capital, Macroeconomic environment, and Business Environment.** The country has the highest real short-term interest rate and the highest interest rate spread, ranking last in Capital cost. In Macroeconomic environment, it shows the highest general government net debt interest payments and the second lowest investment rate of the economy. In Business environment, Brazil occupied the last spot in Irregular payments and bribes, Transparency of government policymaking, Ease of starting a business, and Hiring and firing practices.

**Compared with the previous edition, Brazil gained positions in Availability and cost of labor, reflecting the recovery of labor productivity in Brazilian industry and an increase in the country's labor force.** Brazil climbed seven positions in Availability and cost of labor (from 11<sup>th</sup> to 4<sup>th</sup> place), moving up from the middle to the top third. In Taxation, the country gained one position (from 16<sup>th</sup> to 15<sup>th</sup> place), but remained in the same third.

**The improvement in labor productivity was offset by a loss of competitiveness in other factors, which prevented the country from advancing in the overall ranking.** In the Technology and innovation factor, the reduced government support for innovation resulted in the country losing positions (from 11<sup>th</sup> place out of 16 countries to 13<sup>th</sup> among 17) and falling to the bottom third of the ranking. Brazil also lost positions in Infrastructure and logistics, Macroeconomic environment, Business environment, and Education, but remained in the same third.

**In Infrastructure and logistics, Brazil lost two positions and is now ranking second to last.** The country experienced a decline in the indicator measuring the population's access to information and communication technologies, and in International logistics it was outperformed by Argentina in the indicator measuring export and import logistic costs. In the other sub-factors – Transport infrastructure and Energy infrastructure – Brazil continued to rank last.

FIGURE 1 - COMPETITIVE POSITION OF THE 18 SELECTED COUNTRIES



<ul style="list-style-type: none"> <li><span style="display: inline-block; width: 20px; height: 10px; background-color: #28a745; margin-right: 5px;"></span> The country is in the third of countries in a more favorable position (positions 1 to 6)</li> <li><span style="display: inline-block; width: 20px; height: 10px; background-color: #ffc107; margin-right: 5px;"></span> The country is in the middle third (positions 7-12)</li> <li><span style="display: inline-block; width: 20px; height: 10px; background-color: #dc3545; margin-right: 5px;"></span> The country is in the bottom third (positions 13-18)</li> </ul>	<p>ARG: Argentina AUS: Australia CAN: Canada CHL: Chile CHN: China COL: Colombia</p> <p>ESP: Spain IDN: Indonesia IND: India KOR: South Korea MEX: Mexico PER: Peru</p> <p>POL: Poland RUS: Russia THA: Thailand TUR: Turkey ZAF: South Africa : Brazil</p>
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Note: The overall ranking was built based on the simple average between the figures for each country in the nine competitiveness factors. For more details, see the methodological note in the fifth section.

In the Macroeconomic environment and Business environment factors, Brazil moved down one position and was surpassed by Argentina, standing in last place now. In Macroeconomic environment, special mention should be made of the lower depreciation of the Brazilian currency, with the country moving down eight spots in the Real exchange rate variable. In Business environment, the only change recorded in Brazil's position was in the Rule

of Law variable (down from 11<sup>th</sup> to 10<sup>th</sup> place); in most variables associated with this factor, the country remained in last place.

**In the overall ranking of the 18 selected countries, there are virtually no changes.** Canada, South Korea, Australia, China, Spain and Chile remain in the top third, while Argentina, Brazil, Peru, Colombia, Mexico and India are still in the bottom third of the ranking. The only change is that India climbed up one position (from 14<sup>th</sup> to 13<sup>th</sup> place), switching places with Mexico, and Russia lost two positions (from 8<sup>th</sup> to 10<sup>th</sup> place).

**While Argentina shows significant progress, Brazil still outperforms it.** Apart from overcoming Brazil in Macroeconomic environment and Business environment, Argentina is also better positioned in three other factors – Availability and cost of capital, Infrastructure and logistics, and Education. In the overall ranking, the only reason why Brazil did not lose its position to Argentina is because in the factors in which it is better positioned, its performance is significantly superior. On the other hand, in the factors in which Argentina is better positioned, the distance from the Brazilian average is significant only in Infrastructure and logistics.



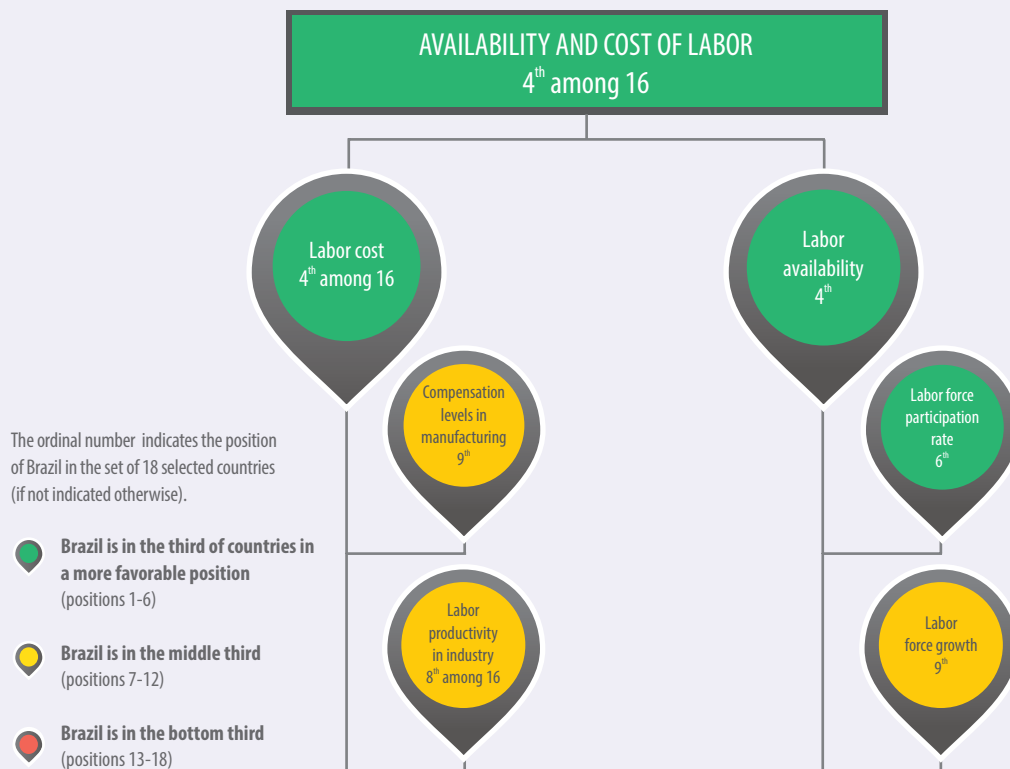




## **2. BRAZIL'S** COMPETITIVENESS FACTORS

## 2.1 AVAILABILITY AND COST OF LABOR

**FIGURE 2 - BRAZIL'S POSITION IN THE AVAILABILITY AND COST OF LABOR FACTOR AND ITS ASSOCIATED SUB-FACTORS AND VARIABLES**



### Brazil regains its competitiveness in Availability and cost of labor

○ Brazil is ranked 4<sup>th</sup> in the Availability and cost of labor factor among the 16 countries considered in the study<sup>1</sup>, occupying the top third of the ranking.

Of the nine competitiveness-determining factors, this is the only factor in which Brazil occupies the top third, ranking among the top five countries. Both the Labor availability and Labor cost sub-factors contributed to the positive result achieved by Brazil.

In Labor availability, the country is in the top third of the ranking, mainly on account of its performance in the variable Labor force participation rate, where it ranks 6<sup>th</sup>.

<sup>1</sup> No information is available for Argentina and Russia in this factor.

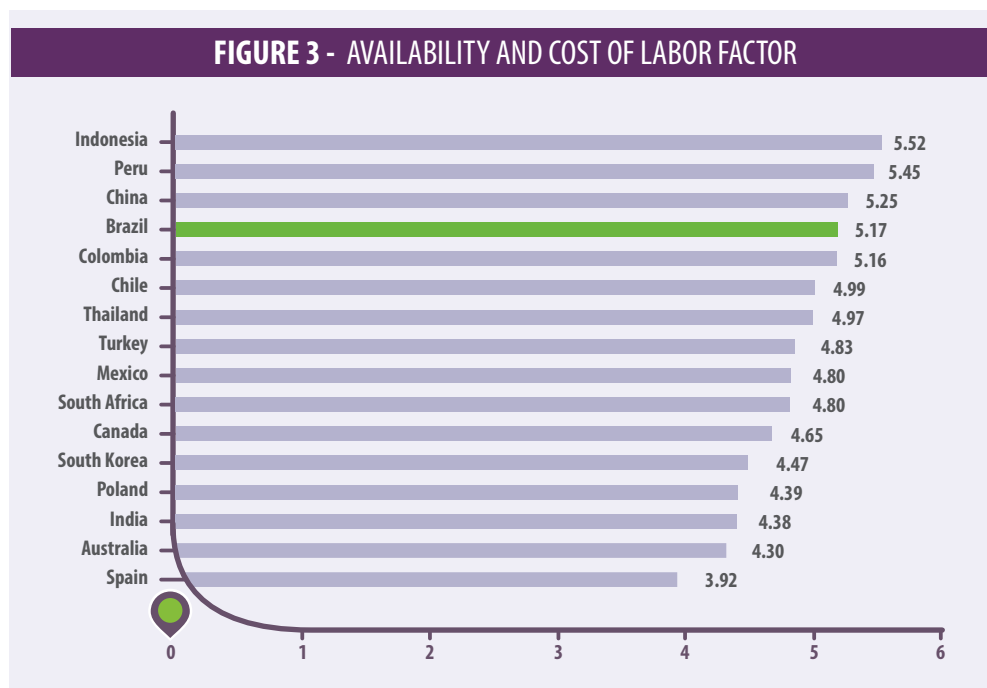
In Labor cost, Brazil is in the top third of the ranking (in the green third, in 4<sup>th</sup> place), although it occupies the middle third (yellow third) in the two variables associated with this sub-factor (it ranks 9<sup>th</sup> in Compensation level in manufacturing and 8<sup>th</sup> in Labor productivity in industry out of 16 countries).

This is because South Korea, Spain, Canada and Australia, which are the top-ranked countries in the Labor productivity in industry variable, fell to the bottom of the ranking in the Labor cost sub-factor. This result reflects the low competitiveness of these countries in the variable Compensation level in manufacturing, with hourly compensation costs significantly exceeding those observed in most high-ranking countries.

Compared with the 2016 ranking, Brazil climbed up seven positions in the Availability and cost of labor factor – the most pronounced improvement among the 16 countries considered – and is once again in the top third of the ranking.

In the Labor cost sub-factor, Brazil rose from 12<sup>th</sup> to 4<sup>th</sup> place (among 16 competitors) as a result of the increase in labor productivity in Brazilian industry, which was the highest among the 16 countries. In the ranking for this variable, the country climbed from 15<sup>th</sup> to 8<sup>th</sup> place.

In terms of Labor availability, the fact that Brazil gained six positions is explained by the recovery of the labor force growth rate variable, which returned to positive territory (up from -0.05% in 2014 to 1.03% in 2016), and by the positions lost by some countries.

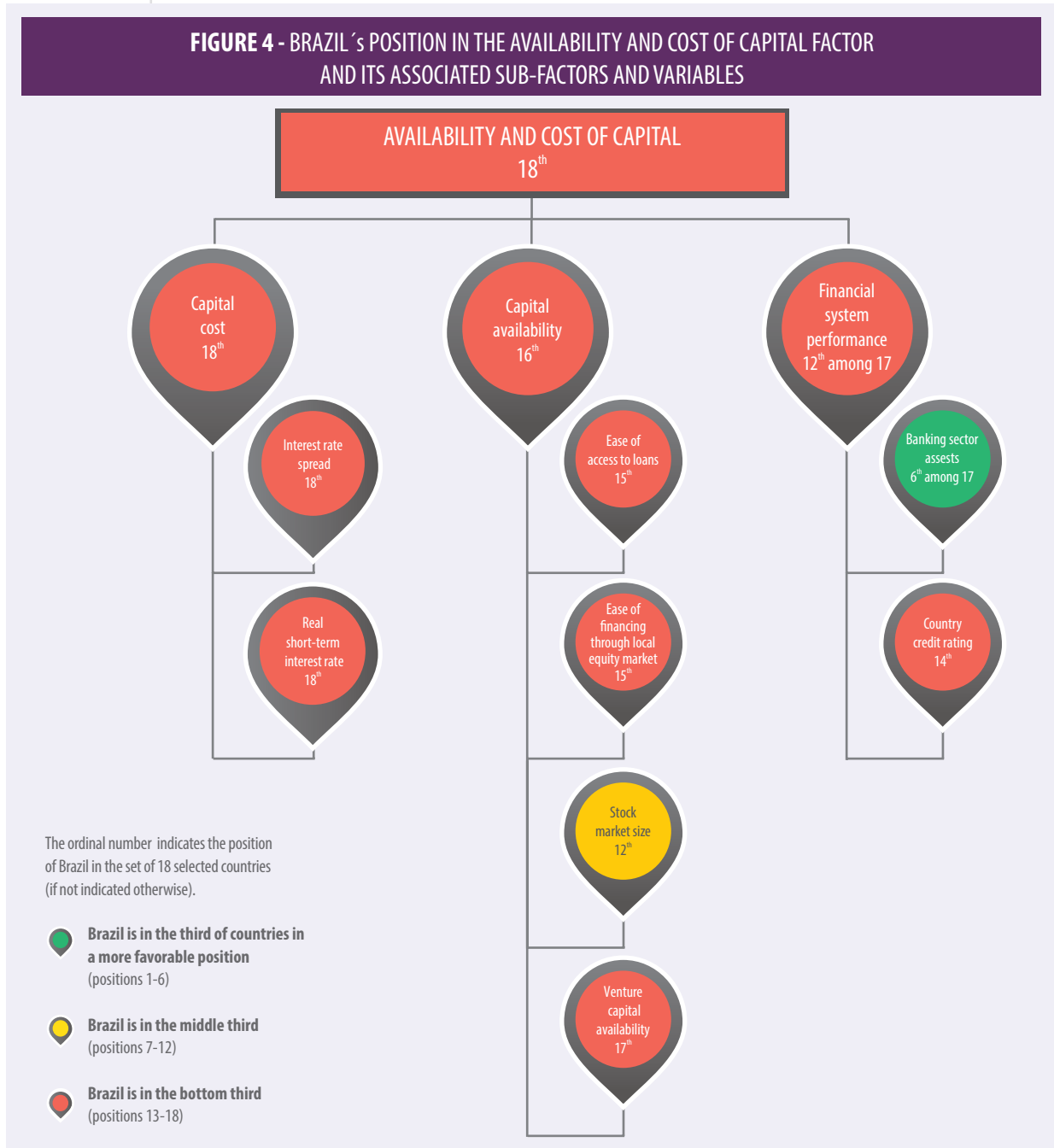


Source: CNI

Note: Average scores (0 = worst performance; 10 = best performance)

# 2.2 AVAILABILITY AND COST OF CAPITAL

**FIGURE 4 - BRAZIL'S POSITION IN THE AVAILABILITY AND COST OF CAPITAL FACTOR AND ITS ASSOCIATED SUB-FACTORS AND VARIABLES**



## With the highest interest rate and highest banking spread, Brazil ranks last

Brazil occupies the last position in the ranking for the Availability and cost of capital factor. In all dimensions evaluated – cost, availability, and financial system performance – Brazil is among the worst performing countries.

With the highest real short-term interest rate (10.8% in 2016) and the highest interest rate spread (39.7% in 2016), Brazil ranks last in the Capital cost sub-factor. Countries in the second-to-last spot in the ranking show much lower values than Brazil: the second highest interest rate is that of Russia (3.3%) and the second highest interest rate spread is that of Peru (13.8%).

In all financing modes assessed in connection with the Capital availability sub-factor – bank loans, stock market, and venture capital – the only indicator for which Brazil is not in the bottom third of the ranking (last six spots) is the variable that measures the stock market size, where it ranks in the middle third (12<sup>th</sup> place). Despite the intermediate position in this variable, Brazil ranks 15<sup>th</sup> in terms of ease of financing through local equity market.

In the Financial system performance sub-factor, Brazil is in the bottom third of the ranking after it lost positions in the Country credit rating variable, where it occupies the 14<sup>th</sup> spot. In the Banking sector assets variable, also associated with this sub-factor, the country ranks 6<sup>th</sup>, with assets accounting for 126.6% of GDP in 2016.

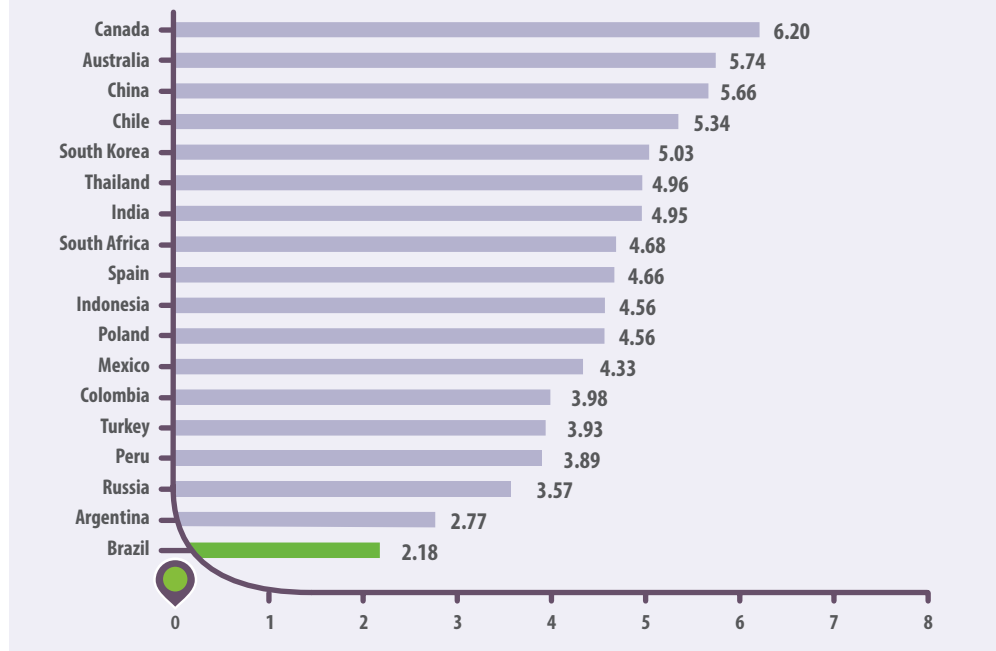
Compared with the 2016 ranking, Brazil showed a worse performance in the only sub-factor in which it occupied an intermediate position. In Financial system performance, the country lost three positions and fell to the bottom third of the ranking (from 9<sup>th</sup> to 12<sup>th</sup> place). This result reflects the downgrade of Brazil's credit rating in the country credit rating classification prepared by the international magazine Institutional Investor. On a scale from 0 to 100, Brazil's credit rating decreased from 61.7 in 2015 to 55.5 in 2016, the biggest decline observed among the 18 countries.

Brazil only made progress in the variables measuring capital availability in the local stock market. The fact that the country climbed four positions in Stock market size (from 16<sup>th</sup> to 12<sup>th</sup> place) deserves special mention. Despite the progress, the country remained unchanged in 16<sup>th</sup> place in the Capital availability sub-factor. Overall, Brazil continued to rank last in the factor Availability and cost of capital.

It is worth noting that South Africa took a turn for the worse in Availability and cost of capital, dropping to the middle third after falling from 4<sup>th</sup> to 8<sup>th</sup> place. The negative result is driven by a general deterioration in the assessment of ease of access to financing in the country. In the variable measuring the ease of access to bank loans<sup>2</sup>, the country experienced the biggest decline, losing 11 positions.

<sup>2</sup> Qualitative variable that measures how easy it is for businesses to obtain a bank loan in the country.

**FIGURE 5 - AVAILABILITY AND COST OF CAPITAL FACTOR**



Source: CNI

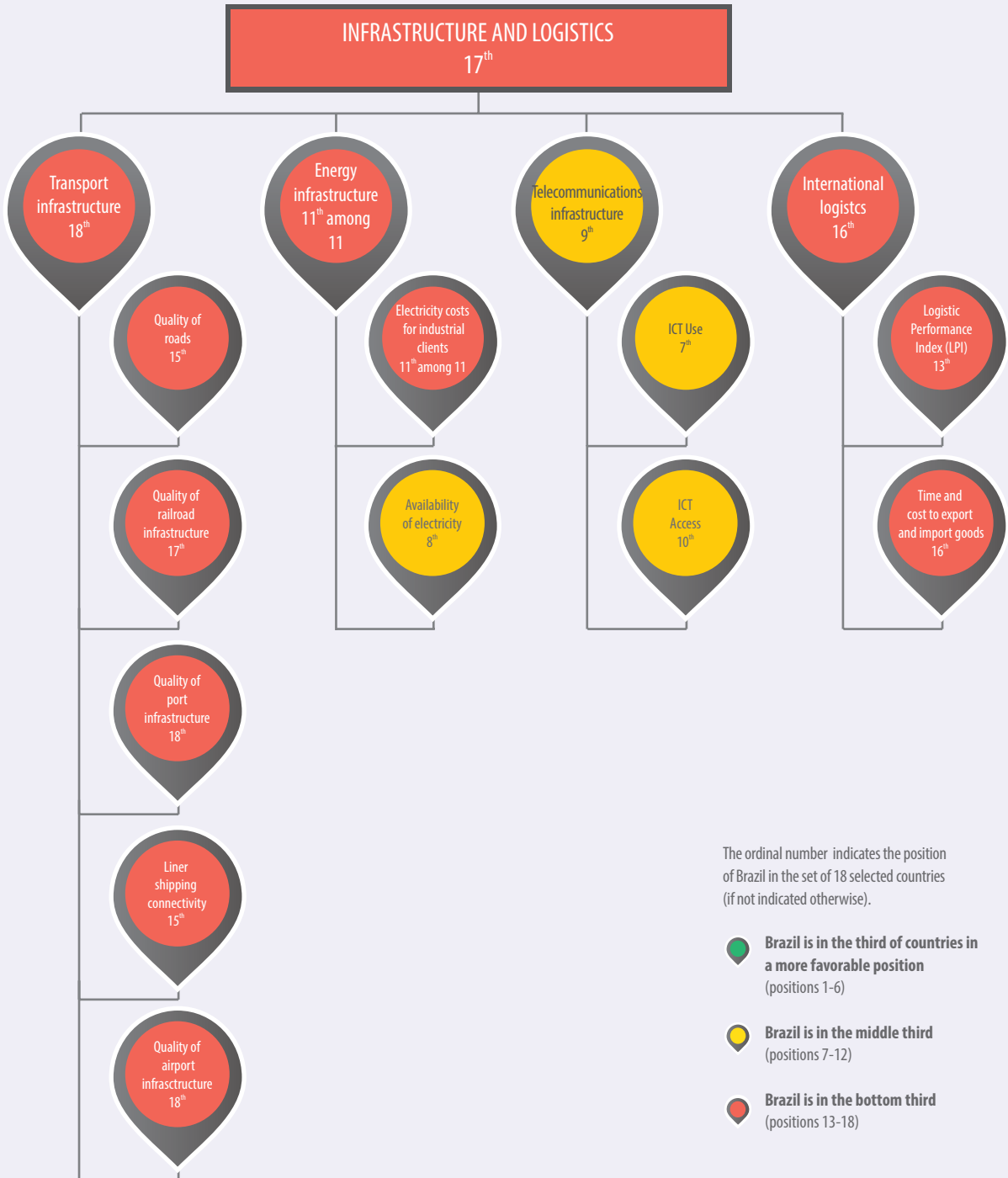
Note: Average scores (0 = worst performance; 10 = best performance)





# 2.3 INFRASTRUCTURE AND LOGISTICS

**FIGURE 6 - BRAZIL'S POSITION IN THE INFRASTRUCTURE AND LOGISTICS FACTOR AND ASSOCIATED SUB-FACTORS AND VARIABLES**



## Low competitiveness in transport infrastructure and high energy costs

In Infrastructure and logistics, Brazil ranks 17<sup>th</sup>. The result reflects the country's low competitiveness in the Transport infrastructure, Energy infrastructure, and International logistics sub-factors. Telecommunications infrastructure is the only factor in which Brazil is not in the bottom third of the ranking (last six places), with the country occupying the 9<sup>th</sup> spot (middle third).

Brazil is in the bottom third in the ranking across all transportation modes – roads, railroads, and port and air transport infrastructure – ranking last in the Transport infrastructure sub-factor. Among the transportation modes, the country achieved its highest scores in the following variables: Quality of roads, based on an opinion survey, and Liner shipping connectivity<sup>3</sup>, ranking 15<sup>th</sup> in both.

With the highest electricity costs for industrial clients among the 11 countries considered<sup>4</sup> (US\$ 0.15 per Kwh in 2016), Brazil is also ranked last in the Energy infrastructure sub-factor. In Chile, the country with the second highest electricity rates, this cost amounts to US\$ 0.12. In the Availability of electricity variable, which measures the ratio of electricity output to GDP, Brazil ranks 8<sup>th</sup> among 18 competitors (middle third).<sup>5</sup>

In Telecommunications infrastructure, Brazil occupies the 7<sup>th</sup> spot in the variable measuring Internet use among the general population. In the variable that measures the population's access to information and communication technologies (landline, mobile phone, computer, and Internet access), the country is also in the middle third of the ranking, but in a lower position (10<sup>th</sup> place).

In relation to the 2016 ranking, one can see that Brazil improved its scores across all transportation modes, but due to how other competing countries evolved, the country only made progress in the Quality of roads variable, moving up from 16<sup>th</sup> to 15<sup>th</sup> place. In Liner shipping connectivity, Brazil showed a worse performance and fell 3 positions (from 12<sup>th</sup> to 15<sup>th</sup> place). As a result, it continued to rank last in Transport infrastructure.

In Telecommunications infrastructure, Brazil lost one position (down from 8<sup>th</sup> to 9<sup>th</sup> place), reflecting the loss of competitiveness in both variables associated with this sub-factor. In the variable measuring the population's access to information and communication technologies, the country experienced a decline in the indicator and fell one position. In the variable measuring the use of these technologies, Brazil was overtaken by Chile.

It is also worth noting that Russia gained six positions in the indicator measuring the time and cost of export and import logistics, up from 18<sup>th</sup> to 12<sup>th</sup> place. Brazil moved up only one position in this indicator (from 17<sup>th</sup> to 16<sup>th</sup> place) and was outperformed by Argentina, which rose from 16<sup>th</sup> to 14<sup>th</sup> place. As a result, Brazil moved down from 15<sup>th</sup> to 16<sup>th</sup> place in the International logistics sub-factor. Overall, the country lost two positions in the Infrastructure and logistics factor (down from 15<sup>th</sup> to 17<sup>th</sup>).

<sup>3</sup> The index is the average of five components: (a) number of ships; (b) container-carrying capacity of ships; (c) maximum vessel size; (d) number of services; and (e) number of companies that deploy container ships on services from and to a country's ports.

<sup>4</sup> The data for Brazil are an estimate by CNI based on tariff data provided by ANEEL and on the Central Bank's exchange rate. No information is available for Australia, China, India, South Africa, Spain, Thailand and Peru. These countries are not included in the ranking.

<sup>5</sup> The indicator is the ratio of energy output to GDP. In the 2016 ranking, the calculation was based on GDP in constant 2005 U.S. dollars. In the current edition, the calculation is now based on GDP in constant 2010 U.S. dollars adjusted for purchasing power parity (PPP). For the comparison with the 2016 ranking, the indicator was recalculated and Brazil's position was revised from 7<sup>th</sup> to 10<sup>th</sup>.

**FIGURE 7 - INFRASTRUCTURE AND LOGISTICS FACTOR**

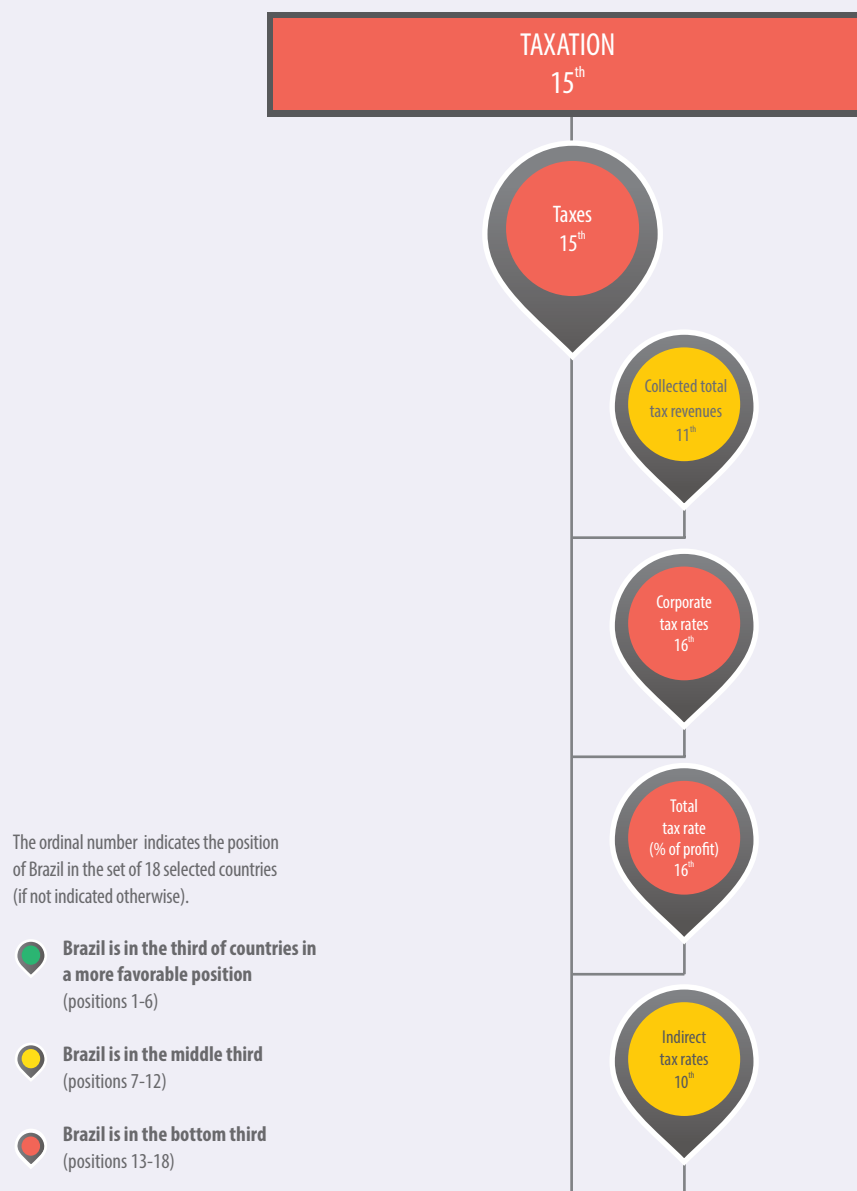


Source: CNI  
Note: Average scores (0 = worst performance; 10 = best performance)



## 2.4 TAXATION

**FIGURE 8 - BRAZIL'S POSITION IN THE TAXATION FACTOR AND ASSOCIATED SUB-FACTORS AND VARIABLES**



## Brazil still ranks in the bottom third in Taxation

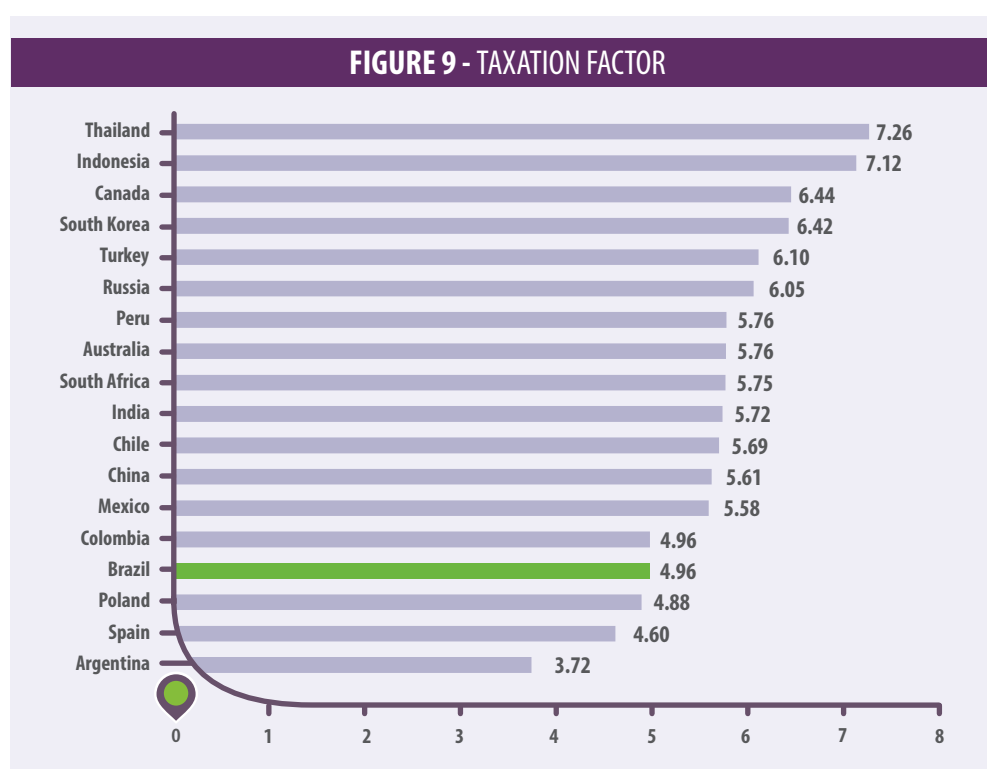
In the Taxation factor, Brazil is in the bottom third of the ranking, occupying the 15<sup>th</sup> spot.

The result reflects the country's poor performance in Total tax rate (% of profit) and in Corporate tax rates, ranking 16<sup>th</sup> in both variables. In Brazil, the amount of taxes and contributions paid by companies – measured as a percentage of their profits – is much higher than that observed in most countries considered in the study (68.4% in 2017). Compared to Canada, the top-ranked country, this figure is 3 times higher, according to the World Bank's Doing Business 2018 survey.

In the other two variables associated with this sub-factor – Collected total tax revenue and Indirect tax rates – Brazil occupies an intermediate position in the ranking.

Compared with the 2016 ranking, Brazil moved up from 14<sup>th</sup> to 10<sup>th</sup> place in the Indirect tax rates variable, reflecting a decline in the average tax rate in Brazil (down from 19% in 2016 to 18% in 2017). Overall, Brazil rose from 16<sup>th</sup> to 15<sup>th</sup> place in the Taxation factor, switching places with Poland.

Finally, special mention should be made of Colombia's decline in the Taxation factor. Colombia lost positions in three of the four variables associated with the Taxes sub-factor, reflecting an increase in taxes in the country (indirect tax rates and corporate tax rates) and collected total tax revenues. As a result, the country fell from 5<sup>th</sup> to 14<sup>th</sup> place in the Taxation factor, moving down from the upper third to the bottom third of the ranking<sup>6</sup>.

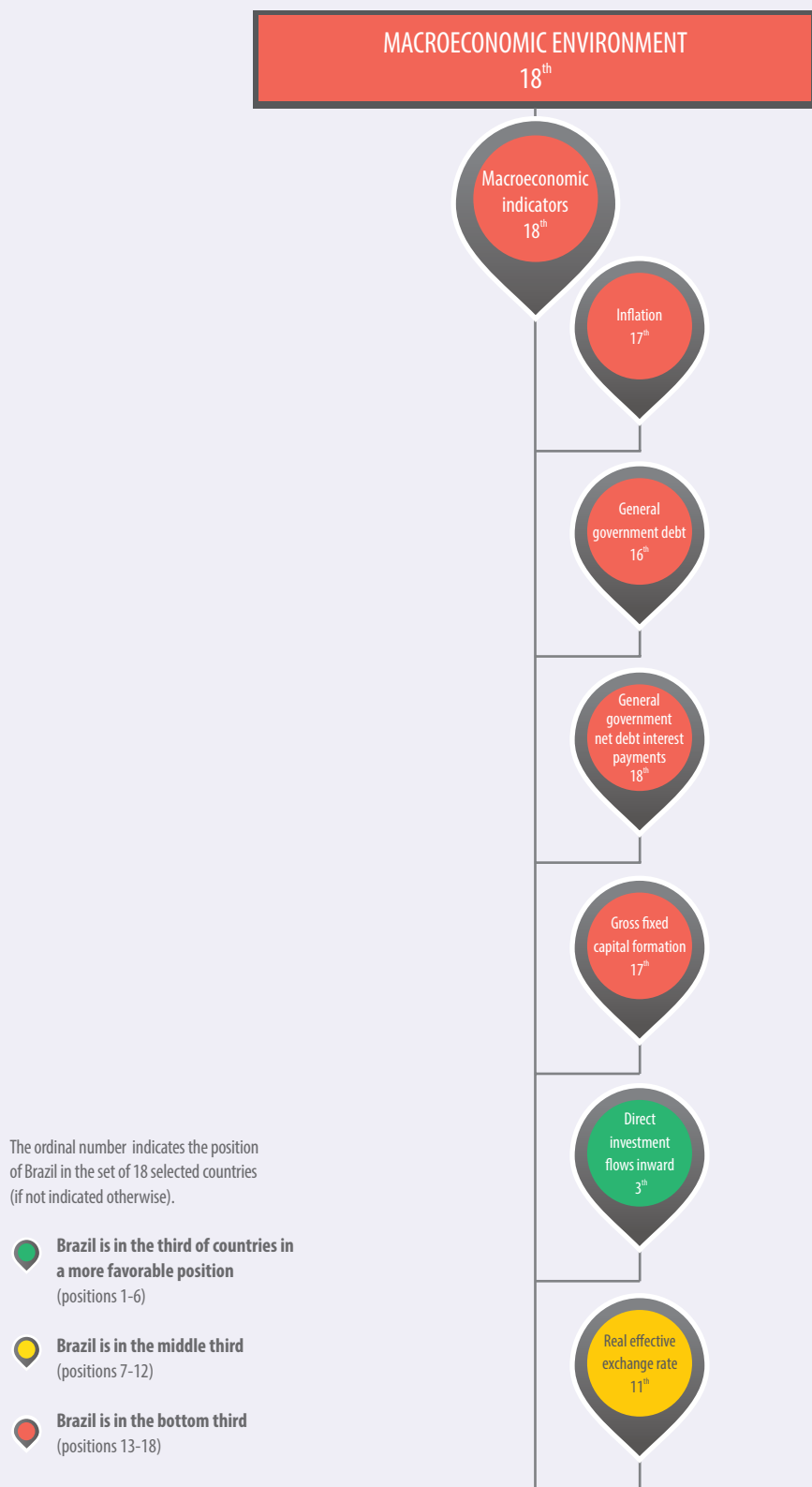


Source: CNI  
Note: Average scores (0 = worst performance; 10 = best performance)

<sup>6</sup> It should be noted that the IMD revised the data for Colombia's collected total tax revenues (measured as a percentage of GDP). 2014's figure of 11.6% was revised upward to 18.1% based on the IMD Competitiveness Yearbook 2017. In 2015, the figure stood at 18.7%. Based on the revised value, Colombia would have lost fewer positions in the Taxation factor (from 11<sup>th</sup> to 14<sup>th</sup>).

## 2.5 MACROECONOMIC ENVIRONMENT

**FIGURE 10 - BRAZIL 's POSITION IN THE MACROECONOMIC ENVIRONMENT  
FACTOR AND ASSOCIATED SUB-FACTORS AND VARIABLES**



## Brazil falls to last place due to unfavorable macroeconomic environment

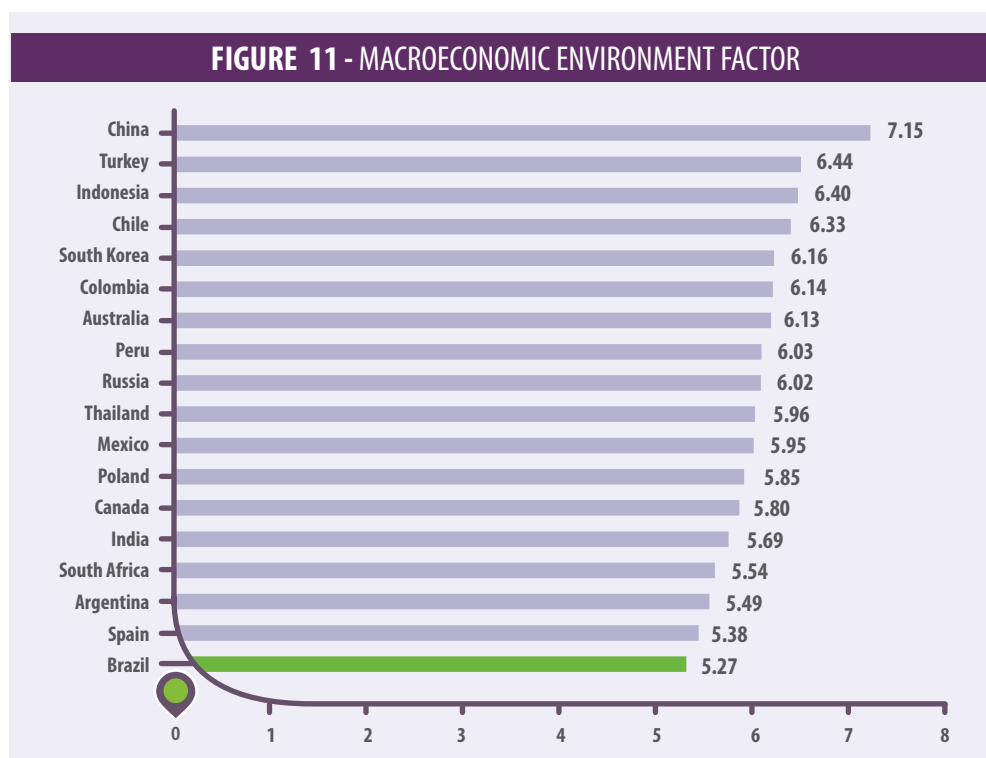
Brazil is ranked last in the Macroeconomic environment factor. A high inflation rate, gross debt and interest payments, coupled with a low investment rate, have contributed to the decline in the country's competitiveness. Among the six variables associated with this factor, Brazil is not in the bottom third of the ranking (last six places) only in Direct investment flows inward and Real effective exchange rate.

The inflation rate in Brazil, which stood at 8.7% in 2016, is second only to that of Argentina (10.6%)<sup>7</sup>. In relation to the investment rate, Brazil ranks 17<sup>th</sup> with a rate of 16.4% in 2016. In China and Indonesia, which are high-growth emerging countries, the investment rate amounted to 44.2% and 32.6%, respectively, in that same year.

In the General government debt variable, Brazil ranks 16<sup>th</sup>, ahead of Spain and Canada. In Brazil, General government debt accounted for 78.3% of GDP in 2016, compared to 99.3% in Spain and 92.3% in Canada.

However, this analysis of the gross debt-to-GDP ratio should be complemented with data on the cost of debt. Brazil has the highest interest payments on government debt among the 18 countries: in 2016, it stood at 6.5% of GDP. In Spain and Canada, nominal interest expenses account for 2.5% and 0.7% of GDP, respectively. In India, which ranks 17<sup>th</sup> – just ahead of Brazil – interest expenses accounted for 4.8% of GDP in 2016.

Compared with the 2016 ranking, special mention should be made of the fact that the Brazilian currency depreciated less significantly (1.6%) and that Brazil lost 8 positions in the ranking for the real exchange rate variable<sup>8</sup>, falling to the middle third (11<sup>th</sup> place). Overall, Brazil switched position with Argentina, falling to last place in the Macroeconomic environment factor.



Source: CNI

Note: Average scores (0 = worst performance; 10 = best performance)

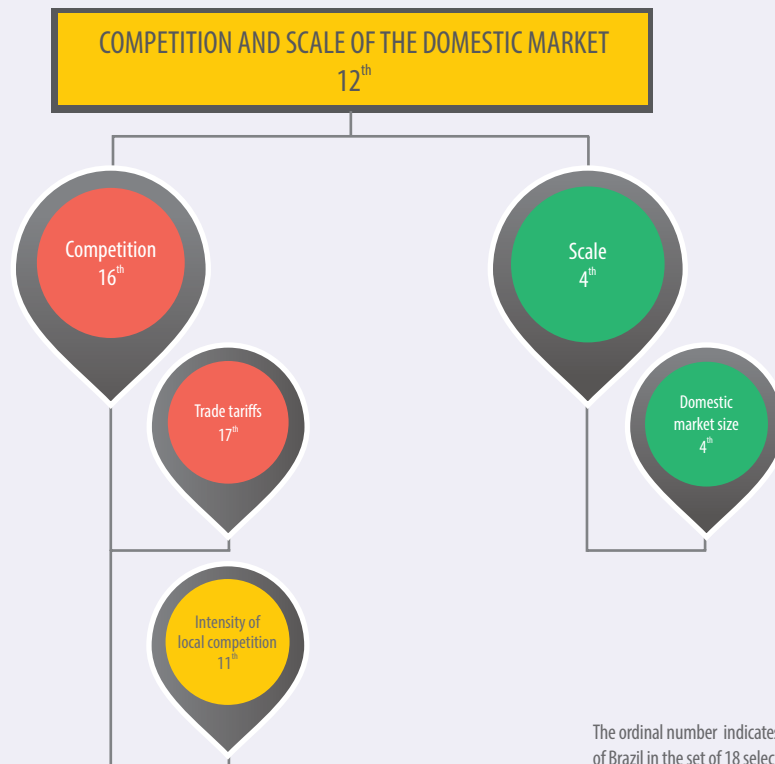
<sup>7</sup>The data for Argentina taken from the Global Competitiveness Report 2017-2018 refers exceptionally to 2013.

<sup>8</sup>This variable measures the extent to which the real exchange rate in December 2016 varied in relation to the average monthly rates recorded in the last five years to December 2016. This is interpreted as follows: the more depreciated the exchange rate, the more it contributes positively to the competitiveness of countries.



## 2.6 COMPETITION AND SCALE OF DOMESTIC MARKET

**FIGURE 12 - BRAZIL'S POSITION IN THE COMPETITION AND SCALE OF THE DOMESTIC MARKET FACTOR AND ASSOCIATED SUB-FACTORS AND VARIABLES**



The ordinal number indicates the position of Brazil in the set of 18 selected countries (if not indicated otherwise).

-  **Brazil is in the third of countries in a more favorable position** (positions 1-6)
-  **Brazil is in the middle third** (positions 7-12)
-  **Brazil is in the bottom third** (positions 13-18)

## Low competition hinders progress in Competition and scale of domestic market

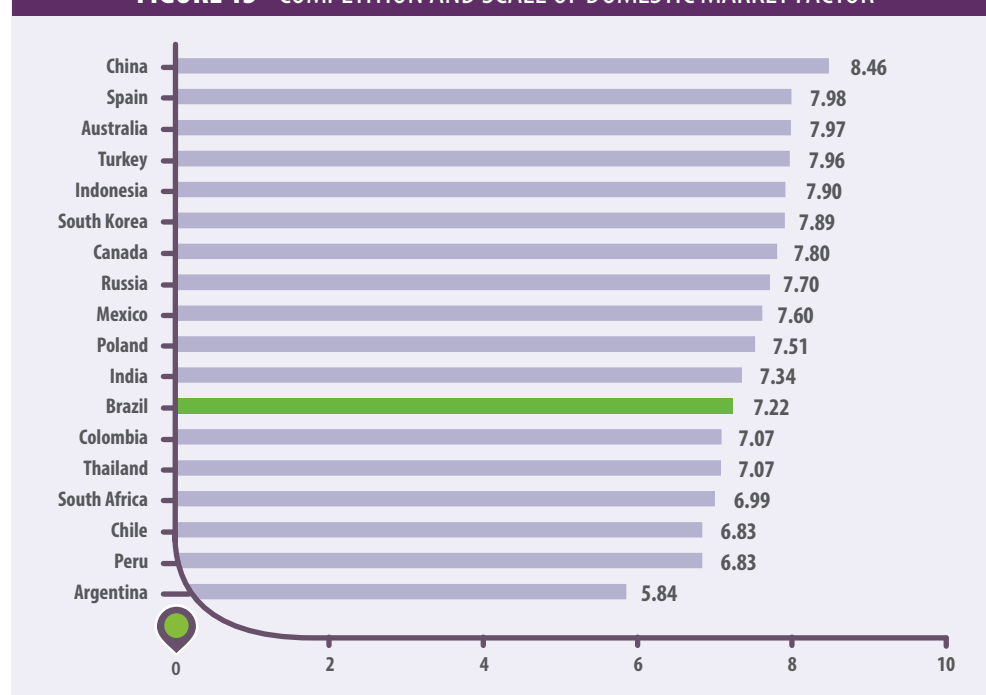
In the Competition and scale of domestic market factor, Brazil is in the middle third of the ranking and occupies the 12<sup>th</sup> spot. This result reflects the country's positive performance in the Scale sub-factor, as it has the fourth largest domestic market. The Competition sub-factor in turn has contributed negatively to Brazil's competitiveness, particularly with respect to its performance in the Trade tariffs variable.

Brazil has the second highest average tariff rate paid on imported goods: the figure amounted to 12.08% in 2016, trailing India, whose rate reached 12,91% in the same year. The figure for Brazil is so much higher than that observed in the top-ranked countries that the negative effect caused by this variable prevails. In Thailand, which ranks 14<sup>th</sup>, the average rate is 7.25%<sup>9</sup>. Spain and Poland are tied in 1<sup>st</sup> place with an average rate of 1.11%.

Compared to the 2016 ranking, Brazil only showed a change in the ranking for the Intensity of local competition variable, moving up from 12<sup>th</sup> to 11<sup>th</sup> place. Brazil's score in this variable, which is based on an opinion survey, remained virtually unchanged (up from 5.26 to 5.28 on a scale from 1 to 7). The result reflects the two positions lost by Poland, which fell from 10<sup>th</sup> to 12<sup>th</sup> place.

The fact that Turkey moved up in the Scale sub-factor also deserves special mention. Turkey posted the largest increase in the indicator measuring the domestic market size<sup>10</sup>, moving up from 9<sup>th</sup> to 7<sup>th</sup> place and displacing South Korea and Canada. All in all, Turkey ranked fourth in the Competition and scale of domestic market factor.

**FIGURE 13 - COMPETITION AND SCALE OF DOMESTIC MARKET FACTOR**



Source: CNI

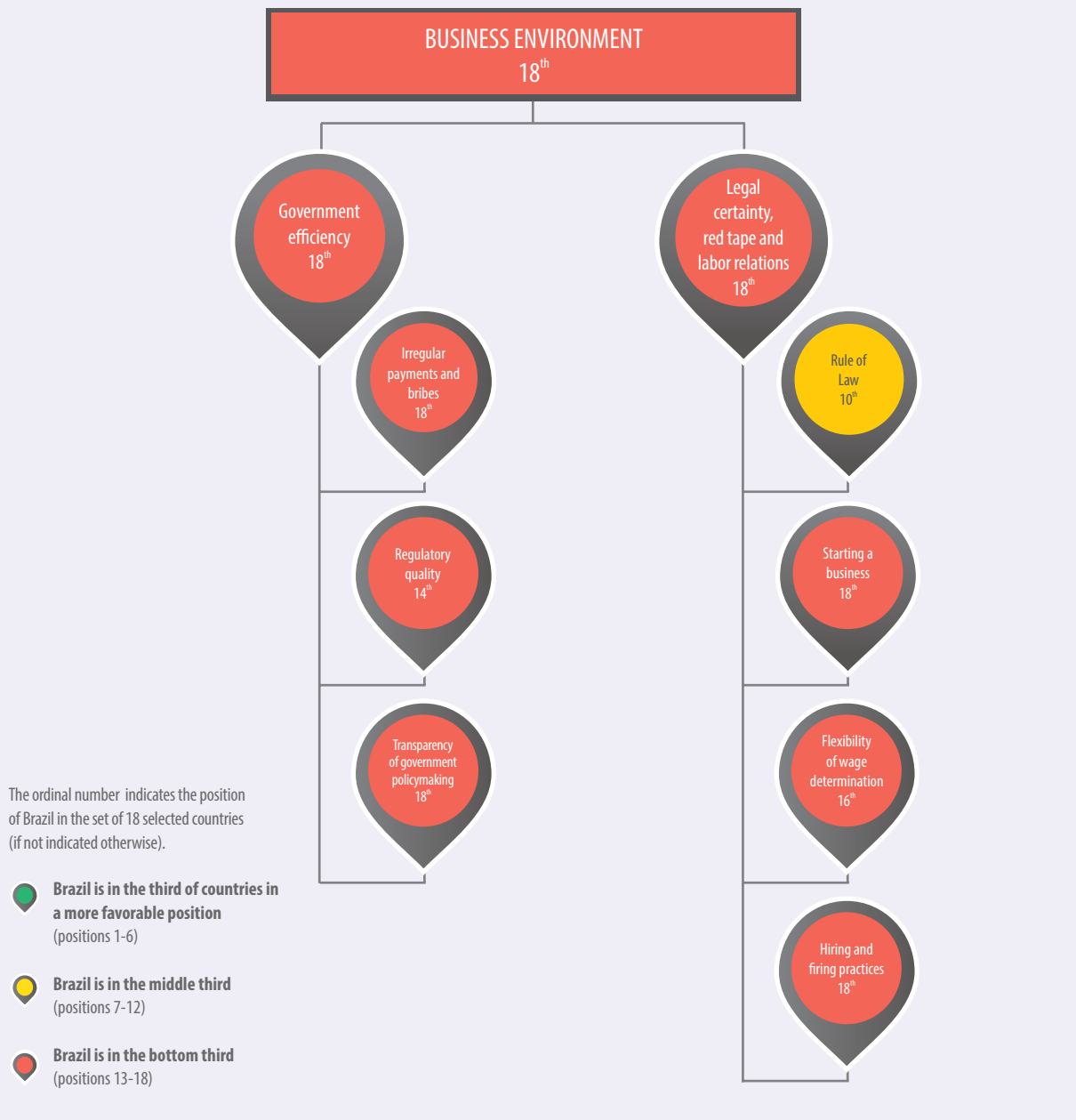
Note: Average scores (0 = worst performance; 10 = best performance)

<sup>9</sup> The data for Thailand taken from the Global Competitiveness Report 2017-2018 refer to 2015.

<sup>10</sup> The indicator is measured as GDP plus the value of imports of goods and services minus the value of exports of goods and services.

## 2.7 BUSINESS ENVIRONMENT

**FIGURE 14 - BRAZIL'S POSITION IN THE BUSINESS ENVIRONMENT FACTOR AND ASSOCIATED SUB-FACTORS AND VARIABLES**



## Brazil is outperformed by Argentina and ranks last place in Business environment

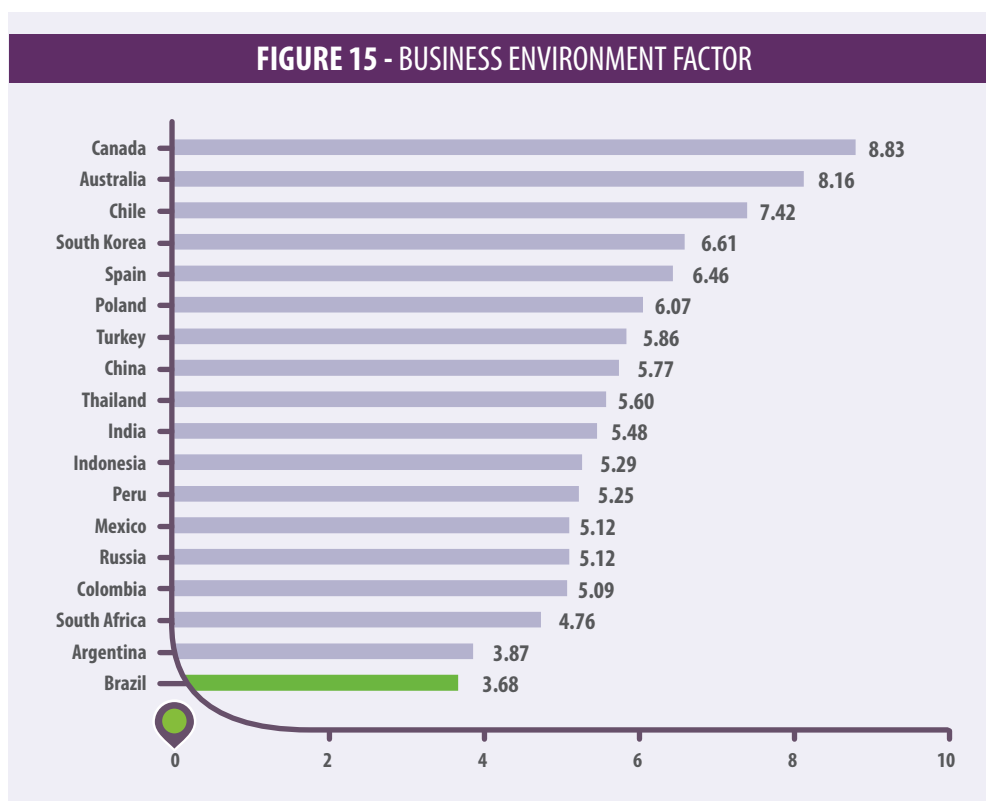
Occupying the 18<sup>th</sup> spot in the ranking for the two sub-factors – Government efficiency and Legal certainty, red tape and labor relations – Brazil ranks last in the Business environment factor.

In Government efficiency, Brazil ranks last in the ranking for both the Irregular payments and bribes and Transparency of government policymaking variables. In the Regulatory quality variable, the country ranks 14<sup>th</sup>.

In Legal certainty, red tape and labor relations, the only variable in which Brazil is not in the bottom third of the ranking (last six places) is Rule of Law, where it ranks 10<sup>th</sup>. In the variables Ease of starting a business and Hiring and firing practices, Brazil ranked last.

Compared with the previous edition, the country only made progress in the Rule of Law variable, moving up from 11<sup>th</sup> to 10<sup>th</sup> place. Yet, Brazil lost its position to Argentina in Business environment and now ranks last in this factor.

Argentina moved up from 18<sup>th</sup> to 17<sup>th</sup> place in both sub-factors. In Government efficiency, it improved its score in the Irregular payments and bribes and Transparency of government policymaking variables, which are based on an opinion survey. In Legal certainty, red tape and labor relations, Argentina moved up four positions in the variable measuring the extent to which legal rules are enforced, up from 18<sup>th</sup> to 14<sup>th</sup> place.

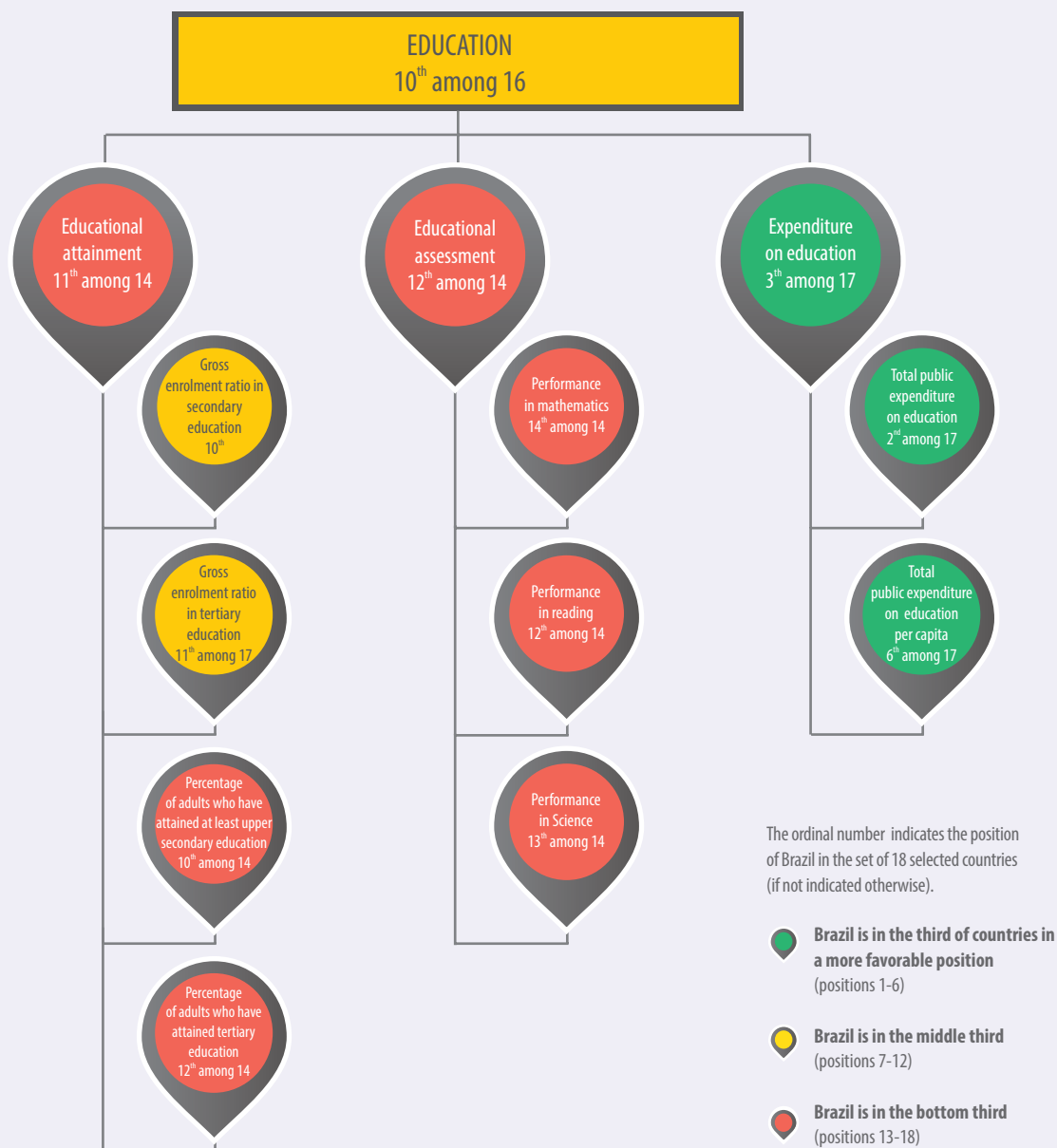


Source: CNI

Note: Average scores (0 = worst performance; 10 = best performance)

## 2.8 EDUCATION

**FIGURE 16 - BRAZIL'S POSITION IN THE EDUCATION FACTOR AND ASSOCIATED SUB-FACTORS AND VARIABLES**



## Despite high spending, Brazil makes no progress in educational attainment and educational assessment

Brazil ranks 10<sup>th</sup> among the 16 countries for which information is available for the Education factor<sup>11</sup>, occupying the middle third of the ranking.

The result is explained by the country's positive performance in the Expenditure on education sub-factor, where it ranks 3<sup>rd</sup> among the 17 countries considered<sup>12</sup>. In the other dimensions associated with the factor – Educational attainment and Educational assessment – Brazil is ranked in the bottom third of the ranking.

Brazil is in the top third of the ranking (among the six highest-ranked countries) both in the variable that measures total public expenditure on education as a percentage of GDP and in the variable measuring this spending in per capita terms. In 2015, the volume of resources earmarked for education in Brazil accounted for 6.6% of GDP, falling only behind South Africa (7.1%).

The percentage of students enrolled in secondary and tertiary education places Brazil in the middle third of the ranking. However, it is among the lowest-ranked countries in terms of percentage of adults aged between 25 and 34 who have attained at least upper secondary education. Thus, in the Education attainment sub-factor, Brazil ranks 11<sup>th</sup> among the 14 countries for which information is available<sup>13</sup>.

Regarding the quality of basic education, Brazil ranks 12<sup>th</sup> among 14 countries. The indicator is based on the PISA (Program for International Student Assessment) surveys, which are carried out every three years by the OECD. PISA assesses the knowledge and skills of 15-year-olds in science, reading and mathematics. In the three areas assessed by PISA, Brazil is in the lower third of the ranking<sup>14</sup>.

Compared with the 2016 ranking, Brazil fell from the top to the middle third of the ranking (10<sup>th</sup> place) in the Gross enrolment ratio in secondary education variable. While Brazil experienced a decline in the percentage of students enrolled, most countries recorded an increase. In the variables measuring the percentage of adults who have attained upper secondary and tertiary education, Brazil lost one position in the ranking due to Argentina's inclusion in it<sup>15</sup>.

In the Expenditure on education sub-factor, Brazil moved up from 4<sup>th</sup> to 3<sup>rd</sup> place as a result of the exclusion of Canada from the 2017-2018 ranking due to lack of data – in the previous edition, Canada ranked second.

In the final calculation, Brazil fell from 9<sup>th</sup> place out of 15 countries to 10<sup>th</sup> place among 16 countries in the Education factor. Argentina is ahead of Brazil, occupying the eighth spot.

<sup>11</sup> No information is available for China and India, which were not included in the ranking for this factor.

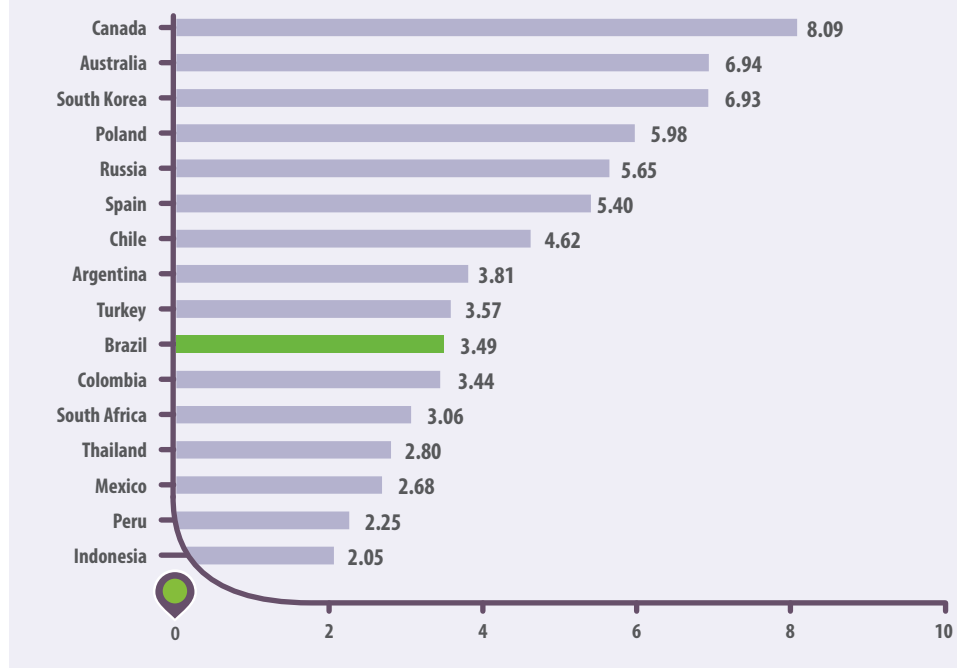
<sup>12</sup> No information is available for Canada, which is excluded from the ranking for this sub-factor.

<sup>13</sup> No information is available for China and India, Thailand, and Peru, which were not included in the ranking for this sub-factor.

<sup>14</sup> In 2015, 72 countries participated in the survey. No information is available for Argentina, China, India and South Africa.

<sup>15</sup> In the 2016 ranking, no information was available for Argentina about the variables Percentage of adults who have attained at least upper secondary education and Percentage of adults who have attained tertiary education.

FIGURE 17 - EDUCATION FACTOR



Source: CNI

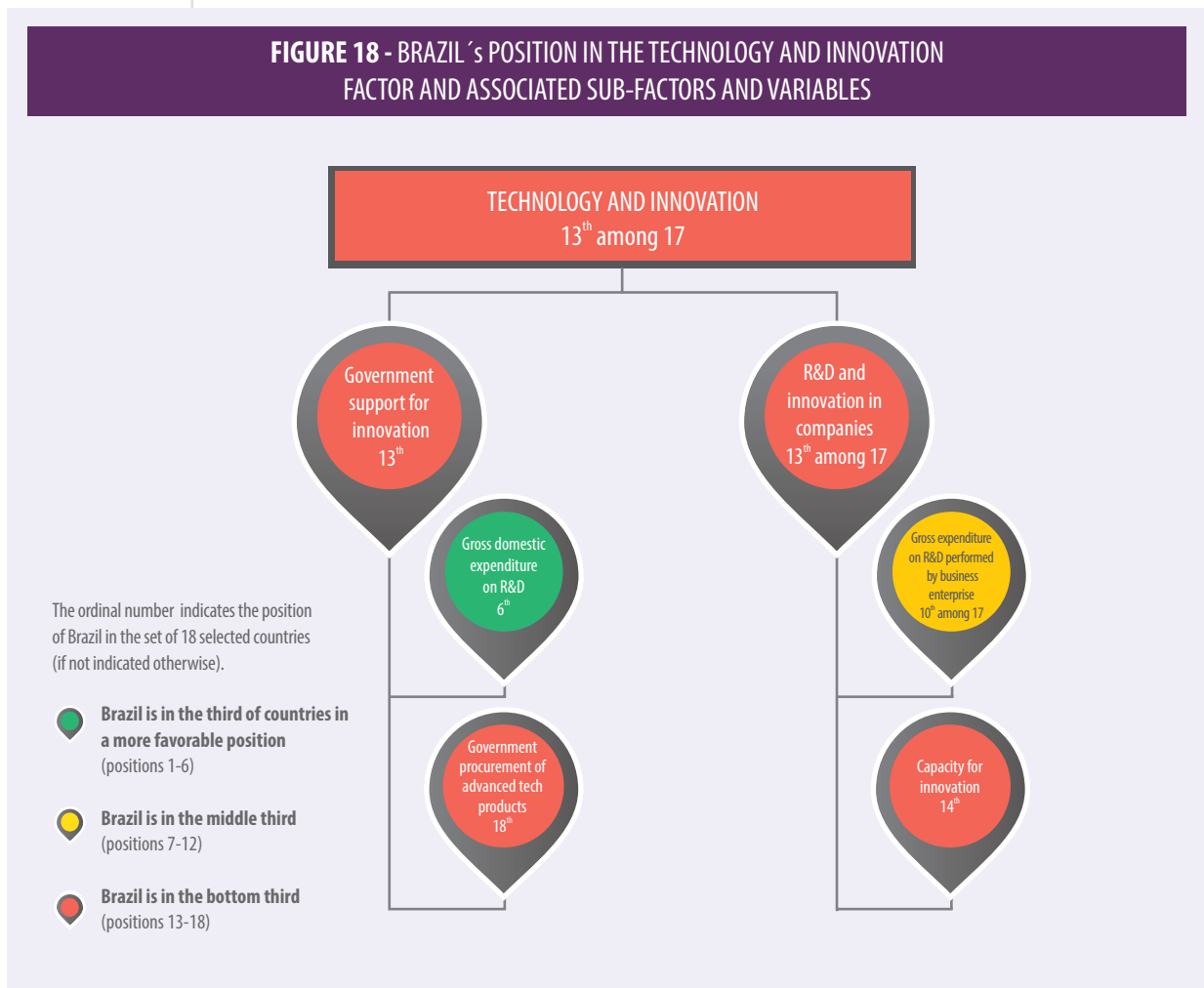
Note: Average scores (0 = worst performance; 10 = best performance)





## 2.9 TECHNOLOGY AND INNOVATION

**FIGURE 18 - BRAZIL'S POSITION IN THE TECHNOLOGY AND INNOVATION FACTOR AND ASSOCIATED SUB-FACTORS AND VARIABLES**



<sup>16</sup> No information is available for Peru, which was not included in the ranking.

<sup>17</sup> This is a variable based on an opinion survey on the stimulus to technological innovation in the country by means of government procurement.

<sup>18</sup> The source is UNESCO. The reference period for the analysis is 2015, but for some countries, the latest data available are from 2014 or 2013.

### Brazil reduces R&D spending and falls to the bottom third in Technology and innovation

Brazil ranks 13<sup>th</sup> in the two sub-factors – Government support for innovation and R&D and innovation in companies – and occupies the bottom third of the ranking for the Technology and innovation factor among the 17 countries considered in the study<sup>16</sup>.

In Government support for innovation, Brazil's weak performance is explained by its result in the variable Government procurement of advanced tech products<sup>17</sup>, where it ranks last. In the Gross domestic expenditure on R&D variable, Brazil ranks 6<sup>th</sup> among the 18 selected countries. Total spending on R&D in Brazil accounted for 1.17% of GDP in 2014, while in South Korea, the top-ranked country, this figure stood at 4.23% in 2015<sup>18</sup>.

In R&D and innovation in companies, the low ability of Brazilian companies to innovate explains the country's low score in this sub-factor. Brazil ranks 14<sup>th</sup> in the Capacity for innovation variable, occupying the bottom third of the ranking<sup>19</sup>. In Gross expenditure on R&D performed by business enterprise, the country is in 10<sup>th</sup> place out of 17 competitors, with this expenditure accounting for 0.39% of GDP in 2015. In South Korea, the effort made by the private sector in the R&D field enabled the country to rank first, with expenditures accounting for 3.28% of GDP in that same year.

Compared with the 2016 ranking, Brazil moved down three positions in Government support for innovation, falling from the middle to the bottom third (last six places) as a result of having lost positions in the two variables associated with this sub-factor. The country experienced a reduction in gross domestic expenditure on R&D and showed a lower score in Government procurement of advanced tech products.

While Brazil improved its position in the Capacity for innovation variable, moving up from 17<sup>th</sup> to 14<sup>th</sup> place, it did not make any progress in the sub-factor R&D and innovation in companies. The result reflects the fact that the country lost one position in Gross expenditure on R&D performed by business enterprise: private sector spending on R&D in Brazil fell from 0.41% of GDP in 2014 to 0.39% of GDP in 2015, while in Thailand this expenditure rose from 0.26% to 0.44% during the same period. As a result, Brazil moved down from 9<sup>th</sup> to 10<sup>th</sup> place while Thailand climbed up from 11<sup>th</sup> to 9<sup>th</sup> among 17 competitors.

All in all, Brazil lost two positions in the Technology and innovation factor, falling from the middle to the bottom third of the ranking (down from 11<sup>th</sup> to 13<sup>th</sup> place). Thailand in turn moved up from 12<sup>th</sup> to 11<sup>th</sup> place in the ranking.

**FIGURE 19 - TECHNOLOGY AND INNOVATION FACTOR**



Source: CNI  
Note: Average scores (0 = worst performance; 10 = best performance)

<sup>19</sup> This is a variable based on an opinion survey on the innovation capacity of companies.





### **3. BRAZIL'S COMPETITIVE ADVANTAGES AND DISADVANTAGES AS COMPARED TO THOSE OF EACH OF THE 17 SELECTED COUNTRIES**



The charts included in this section compare the evaluation of Brazil's performance with that of each of the 17 selected countries in relation to the nine factors that have a bearing on the competitive capacity of their companies.

The results of the evaluation of Brazil and of a given country in relation to a specific competition-related factor are shown on a spider web chart. Each radius on the chart corresponds to one of the nine factors and originates at the center of the circle. The factors are identified by a capital letter.

The farther from the center of the circle, the better the result achieved by the country in relation to that competitive factor (on a scale of 0-10). The distance between two points on the same radius indicates the performance differential between Brazil and a given country with regard to the competitiveness factor associated with the radius.

The colored lines, which connect points in the different radii and are associated with a country, have no specific meaning, as they are only a means to provide an overview of the position of the two countries in relation to the set of nine factors considered.

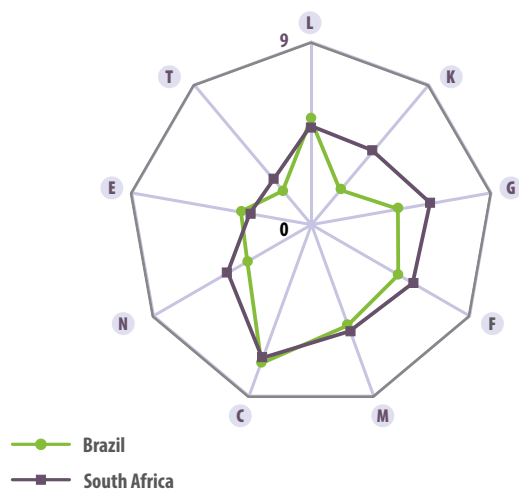
The indication of the axes associated with each of the competitiveness factors follows the following correspondence:

- L availability and cost of labor
- K availability and cost of capital
- G infrastructure and logistics
- F taxation
- M macroeconomic environment
- C competition and scale of the domestic market
- N business environment
- E education
- T technology and innovation

**COMPETITIVENESS  
FACTORS**

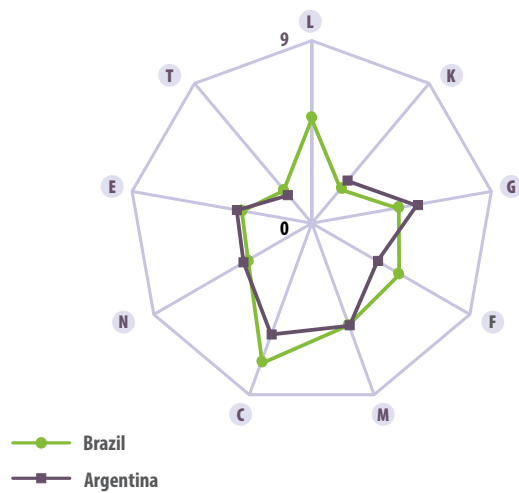
- L** availability and cost of labor
- K** availability and cost of capital
- G** infrastructure and logistics
- F** taxation
- M** macroeconomic environment
- C** competition and scale of the domestic market
- N** business environment
- E** education
- T** technology and innovation

**FIGURE 20 - BRAZIL – SOUTH AFRICA COMPARISON**



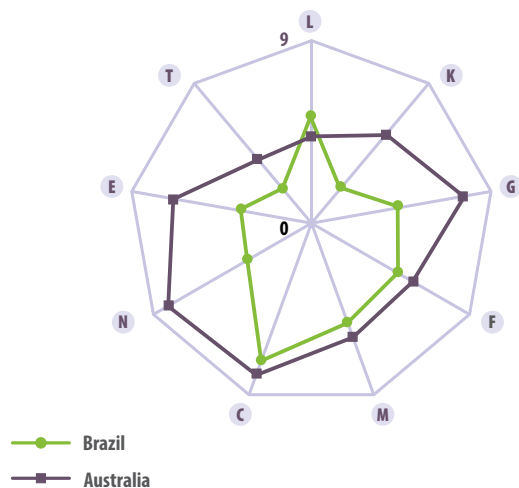
	Brazil	South Africa
Availability and cost of labor	5.2	4.8
Availability and cost of capital	2.2	4.7
Infrastructure and logistics	4.5	5.7
Taxation	5.0	5.8
Macroeconomic environment	5.3	5.5
Competition and scale of the domestic market	7.2	7.0
Business environment	3.7	4.8
Education	3.5	3.1
Technology and innovation	2.7	3.4

**FIGURE 21 - BRAZIL – ARGENTINA COMPARISON**



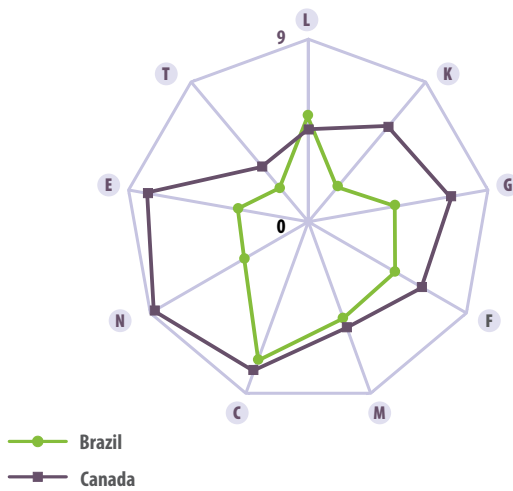
	Brazil	Argentina
Availability and cost of labor	5.2	
Availability and cost of capital	2.2	2.8
Infrastructure and logistics	4.5	5.3
Taxation	5.0	3.7
Macroeconomic environment	5.3	5.4
Competition and scale of the domestic market	7.2	5.8
Business environment	3.7	3.9
Education	3.5	3.8
Technology and innovation	2.7	2.3

**FIGURE 22 - BRAZIL – AUSTRALIA COMPARISON**



	Brazil	Australia
Availability and cost of labor	5.2	4.3
Availability and cost of capital	2.2	5.7
Infrastructure and logistics	4.5	7.3
Taxation	5.0	5.8
Macroeconomic environment	5.3	6.1
Competition and scale of the domestic market	7.2	8.0
Business environment	3.7	8.2
Education	3.5	6.9
Technology and innovation	2.7	5.0

**FIGURE 23 - BRAZIL – CANADA COMPARISON**

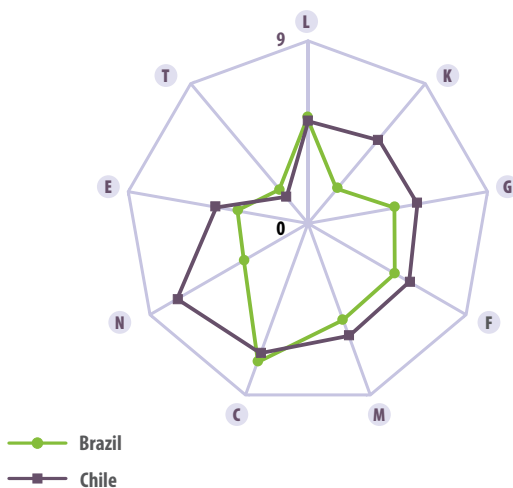


	Brazil	Canada
Availability and cost of labor	5.2	4.7
Availability and cost of capital	2.2	6.2
Infrastructure and logistics	4.5	7.4
Taxation	5.0	6.4
Macroeconomic environment	5.3	5.8
Competition and scale of the domestic market	7.2	7.8
Business environment	3.7	8.8
Education	3.5	8.1
Technology and innovation	2.7	4.3

**COMPETITIVENESS  
FACTORS**

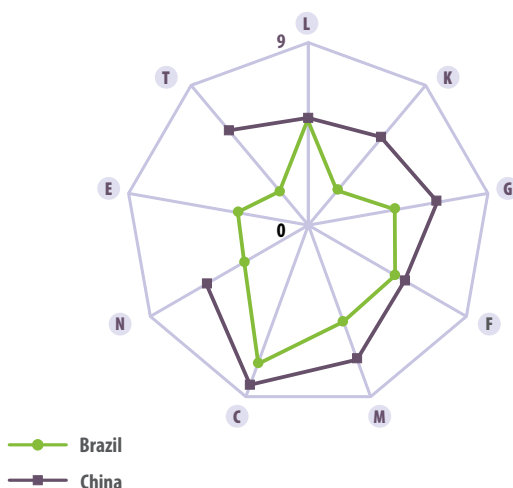
- L availability and cost of labor
- K availability and cost of capital
- G infrastructure and logistics
- F taxation
- M macroeconomic environment
- C competition and scale of the domestic market
- N business environment
- E education
- T technology and innovation

**FIGURE 24 - BRAZIL – CHILE COMPARISON**



	Brazil	Chile
Availability and cost of labor	5.2	5.0
Availability and cost of capital	2.2	5.3
Infrastructure and logistics	4.5	5.5
Taxation	5.0	5.7
Macroeconomic environment	5.3	6.1
Competition and scale of the domestic market	7.2	6.8
Business environment	3.7	7.4
Education	3.5	4.6
Technology and innovation	2.7	2.2

**FIGURE 25 - BRAZIL – CHINA COMPARISON**



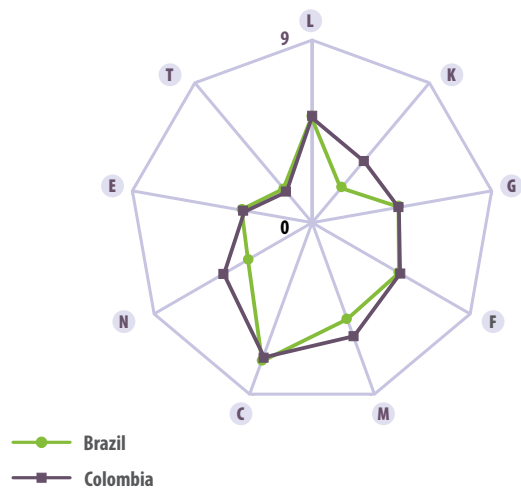
	Brazil	China
Availability and cost of labor	5.2	5.2
Availability and cost of capital	2.2	5.7
Infrastructure and logistics	4.5	6.6
Taxation	5.0	5.6
Macroeconomic environment	5.3	7.1
Competition and scale of the domestic market	7.2	8.5
Business environment	3.7	5.8
Education	3.5	
Technology and innovation	2.7	5.6



**COMPETITIVENESS  
FACTORS**

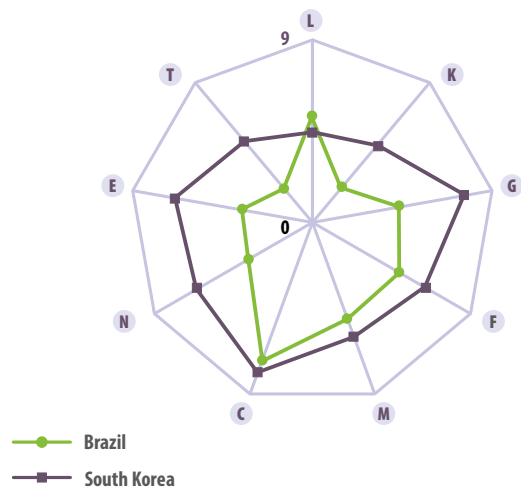
- L** availability and cost of labor
- K** availability and cost of capital
- G** infrastructure and logistics
- F** taxation
- M** macroeconomic environment
- C** competition and scale of the domestic market
- N** business environment
- E** education
- T** technology and innovation

**FIGURE 26 - BRAZIL – COLOMBIA COMPARISON**



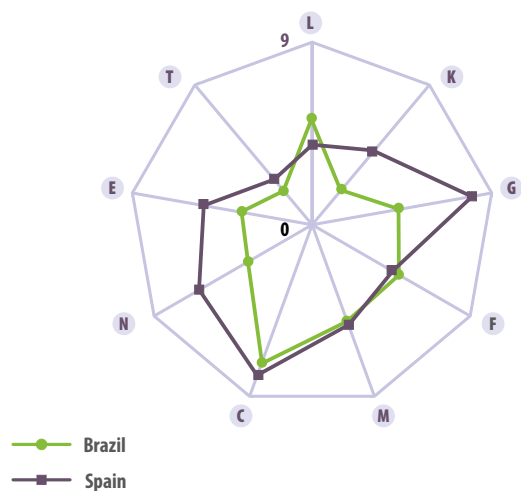
	Brazil	Colombia
Availability and cost of labor	5.2	5.2
Availability and cost of capital	2.2	4.0
Infrastructure and logistics	4.5	4.2
Taxation	5.0	5.0
Macroeconomic environment	5.3	6.2
Competition and scale of the domestic market	7.2	7.1
Business environment	3.7	5.1
Education	3.5	3.4
Technology and innovation	2.7	2.2

**FIGURE 27 - BRAZIL – SOUTH KOREA COMPARISON**



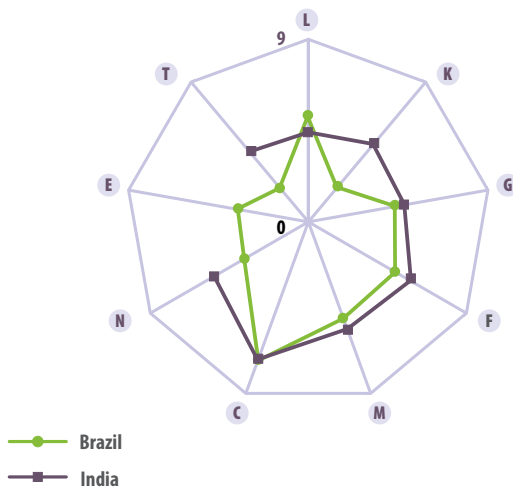
	Brazil	South Korea
Availability and cost of labor	5.2	4.5
Availability and cost of capital	2.2	5.0
Infrastructure and logistics	4.5	7.7
Taxation	5.0	6.4
Macroeconomic environment	5.3	6.3
Competition and scale of the domestic market	7.2	7.9
Business environment	3.7	6.6
Education	3.5	6.9
Technology and innovation	2.7	7.7

**FIGURE 28 - BRAZIL – SPAIN COMPARISON**



	Brazil	Spain
Availability and cost of labor	5.2	3.9
Availability and cost of capital	2.2	4.7
Infrastructure and logistics	4.5	8.3
Taxation	5.0	4.6
Macroeconomic environment	5.3	5.5
Competition and scale of the domestic market	7.2	8.0
Business environment	3.7	6.5
Education	3.5	5.4
Technology and innovation	2.7	3.4

**FIGURE 29 - BRAZIL – INDIA COMPARISON**

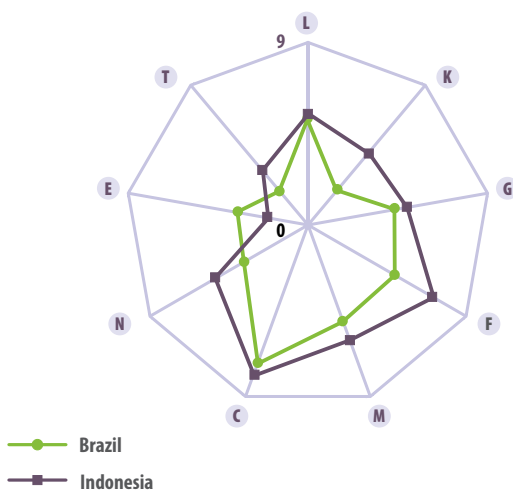


	Brazil	India
Availability and cost of labor	5.2	4.4
Availability and cost of capital	2.2	5.0
Infrastructure and logistics	4.5	4.7
Taxation	5.0	5.7
Macroeconomic environment	5.3	5.9
Competition and scale of the domestic market	7.2	7.3
Business environment	3.7	5.5
Education	3.5	
Technology and innovation	2.7	4.0

**COMPETITIVENESS  
FACTORS**

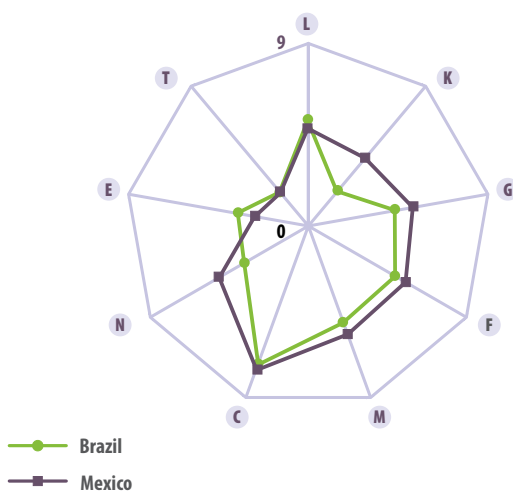
- L** availability and cost of labor
- K** availability and cost of capital
- G** infrastructure and logistics
- F** taxation
- M** macroeconomic environment
- C** competition and scale of the domestic market
- N** business environment
- E** education
- T** technology and innovation

**FIGURE 30 - BRAZIL – INDONESIA COMPARISON**



	Brazil	Indonesia
Availability and cost of labor	5.2	5.5
Availability and cost of capital	2.2	4.6
Infrastructure and logistics	4.5	4.8
Taxation	5.0	7.1
Macroeconomic environment	5.3	6.4
Competition and scale of the domestic market	7.2	7.9
Business environment	3.7	5.3
Education	3.5	2.1
Technology and innovation	2.7	3.5

**FIGURE 31- BRAZIL – MEXICO COMPARISON**

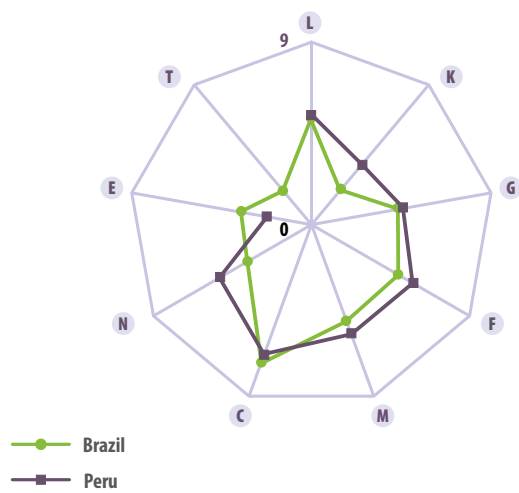


	Brazil	Mexico
Availability and cost of labor	5.2	4.8
Availability and cost of capital	2.2	4.3
Infrastructure and logistics	4.5	5.3
Taxation	5.0	5.6
Macroeconomic environment	5.3	6.0
Competition and scale of the domestic market	7.2	7.6
Business environment	3.7	5.1
Education	3.5	2.7
Technology and innovation	2.7	2.5

**COMPETITIVENESS  
FACTORS**

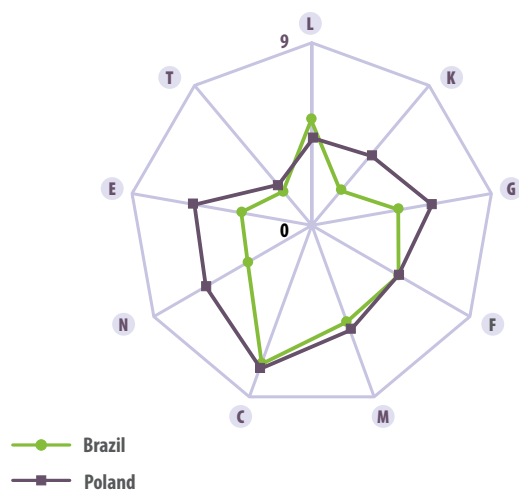
- L** availability and cost of labor
- K** availability and cost of capital
- G** infrastructure and logistics
- F** taxation
- M** macroeconomic environment
- C** competition and scale of the domestic market
- N** business environment
- E** education
- T** technology and innovation

**FIGURE 32 - BRAZIL – PERU COMPARISON**



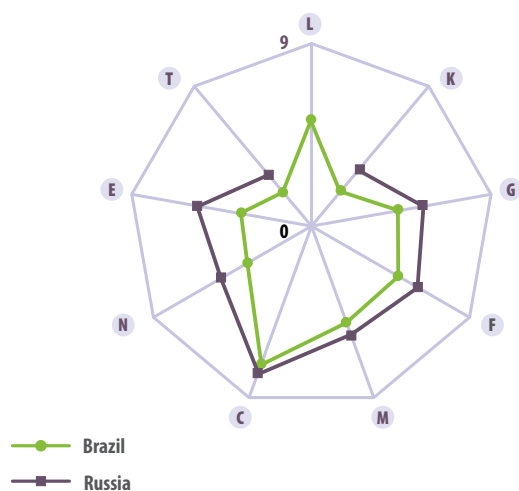
	Brazil	Peru
Availability and cost of labor	5.2	5.5
Availability and cost of capital	2.2	3.9
Infrastructure and logistics	4.5	4.5
Taxation	5.0	5.8
Macroeconomic environment	5.3	6.0
Competition and scale of the domestic market	7.2	6.8
Business environment	3.7	5.2
Education	3.5	2.3
Technology and innovation	2.7	

**FIGURE 33 - BRAZIL – POLAND COMPARISON**



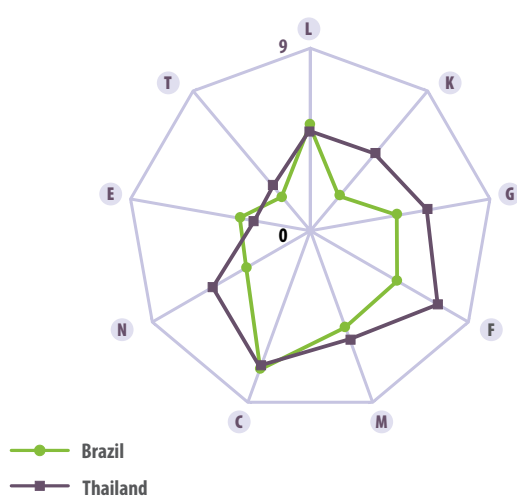
	Brazil	Poland
Availability and cost of labor	5.2	4.4
Availability and cost of capital	2.2	4.6
Infrastructure and logistics	4.5	6.1
Taxation	5.0	4.9
Macroeconomic environment	5.3	5.7
Competition and scale of the domestic market	7.2	7.5
Business environment	3.7	6.1
Education	3.5	6.0
Technology and innovation	2.7	3.0

**FIGURE 34 - BRAZIL – RUSSIA COMPARISON**



	Brazil	Russia
Availability and cost of labor	5.2	
Availability and cost of capital	2.2	3.6
Infrastructure and logistics	4.5	5.4
Taxation	5.0	6.0
Macroeconomic environment	5.3	5.9
Competition and scale of the domestic market	7.2	7.7
Business environment	3.7	5.1
Education	3.5	5.6
Technology and innovation	2.7	3.4

**FIGURE 35 - BRAZIL – THAILAND COMPARISON**

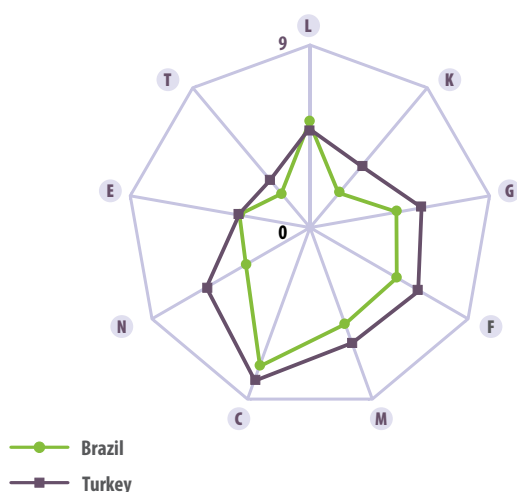


	Brazil	Thailand
Availability and cost of labor	5.2	5.0
Availability and cost of capital	2.2	5.0
Infrastructure and logistics	4.5	5.8
Taxation	5.0	7.3
Macroeconomic environment	5.3	6.0
Competition and scale of the domestic market	7.2	7.1
Business environment	3.7	5.6
Education	3.5	2.8
Technology and innovation	2.7	3.0

**COMPETITIVENESS  
FACTORS**

- L** availability and cost of labor
- K** availability and cost of capital
- G** infrastructure and logistics
- F** taxation
- M** macroeconomic environment
- C** competition and scale of the domestic market
- N** business environment
- E** education
- T** technology and innovation

**FIGURE 36 - BRAZIL – TURKEY COMPARISON**



	Brazil	Turkey
Availability and cost of labor	5.2	4.8
Availability and cost of capital	2.2	3.9
Infrastructure and logistics	4.5	5.7
Taxation	5.0	6.1
Macroeconomic environment	5.3	6.4
Competition and scale of the domestic market	7.2	8.0
Business environment	3.7	5.9
Education	3.5	3.6
Technology and innovation	2.7	3.2





## **4. EVOLUTION OF COMPETITIVENESS FACTORS OF BRAZIL**



## Comparison of ranking positions

Figure 37 shows Brazil's positions in the rankings for the 20 competitiveness sub-factors. The farther from the center of the circle, the better Brazil's position is in relation to one of those sub-factors (positions 1-18). When comparing the 2016 and 2017-2018 rankings, a shift toward the center of the figure indicates a loss of positions, suggesting that the sub-factor contributed to reducing the competitiveness of Brazilian companies.

**FIGURE 37 - EVOLUTION OF BRAZIL'S POSITION BETWEEN THE 2016 AND 2017-2018 RANKINGS BY SUB-FACTORS**



Among the 20 sub-factors, Brazil improved its position in four cases, worsened in nine of them, and remained unchanged in the seven remaining ones. Brazil is now ranking last in Macroeconomic indicators and in the two sub-factors associated with the Business environment factor. In three other sub-factors – Capital cost, Transport infrastructure, and Energy infrastructure – the country continued to occupy the last place in the ranking.



## Sub-factors in which Brazil's position improved:

- Labor cost: the country climbed eight positions, which can be explained by an increase in labor productivity in the Brazilian industry, moving up from the bottom to the middle third in the ranking for this variable.
- Labor availability: the country moved up six positions, reflecting an acceleration in the growth rate of the Brazilian labor force, which returned to positive territory.
- Taxes: Brazil gained one position as a result of the lower average indirect tax rate, switching places with Poland.
- Expenditure on education: Brazil moved up one position as a result of the exclusion of Canada from the ranking<sup>20</sup>.

## Sub-factors in which Brazil's position worsened:

- Financial system performance: Brazil lost three positions, falling to the bottom third of the ranking, as a result of its lower score in Country credit rating.
- Energy infrastructure: despite ranking last in 2016, the country lost one position as Argentina entered the current ranking in first place<sup>21</sup>.
- Telecommunications infrastructure: loss of one position, with Brazil dropping one position in the ranking for both variables associated with the sub-factor.
- International logistics: despite improving in the variable measuring time and cost of export and import logistics, Brazil lost one position in this sub-factor as a result of the more significant progress made by Argentina.
- Macroeconomic indicators: Brazil lost one position and is now ranking last, reflecting a reduction in competitiveness in the real exchange rate variable.
- Government efficiency and Legal certainty, red tape and labor relations: while Brazil moved up one position in the Rule of Law variable, it was overtaken by Argentina, falling to last place in the two sub-factors associated with the Business environment factor.
- Educational attainment: loss of one position, reflecting a worse performance in Gross enrolment ratio in secondary education and in the variables measuring the percentage of adults who have attained upper secondary and tertiary education.
- Government support for innovation: decline of three positions owing to the reduction in gross domestic expenditure on R&D and to the loss of positions in the variable Government procurement of advanced tech products.

<sup>20</sup> Canada ranked 2<sup>nd</sup> in the Expenditure on education factor in 2016, but was not included in the current ranking due to lack of information. As a result, Brazil rose from 4<sup>th</sup> to 3<sup>rd</sup> place among 17 countries.

<sup>21</sup> In 2016, Argentina was not included in the ranking due to lack of information. The country was included in the current ranking, occupying the 1<sup>st</sup> spot. As a result, Brazil fell from 10<sup>th</sup> to 11<sup>th</sup> place among the 11 countries for which information is available.

## Sub-factors in which Brazil remained in the same position:

- Capital cost; Capital availability; Transport infrastructure; Competition; Scale; Educational assessment; and R&D and innovation in companies.

## Sub-factors in which Brazil ranks last:

- Capital cost; Transport infrastructure; Energy infrastructure; Macroeconomic indicators; Government efficiency; and Legal certainty, red tape and labor relations.

## Comparison of indicator values

The graphs shown below are not based on positions, but rather on the values of the indicators associated with the 9 factors (Figure 38) and the 20 sub-factors (Figure 39). For each of these factors or sub-factors, the values recorded by Brazil are compared to the average values for the 18 countries.

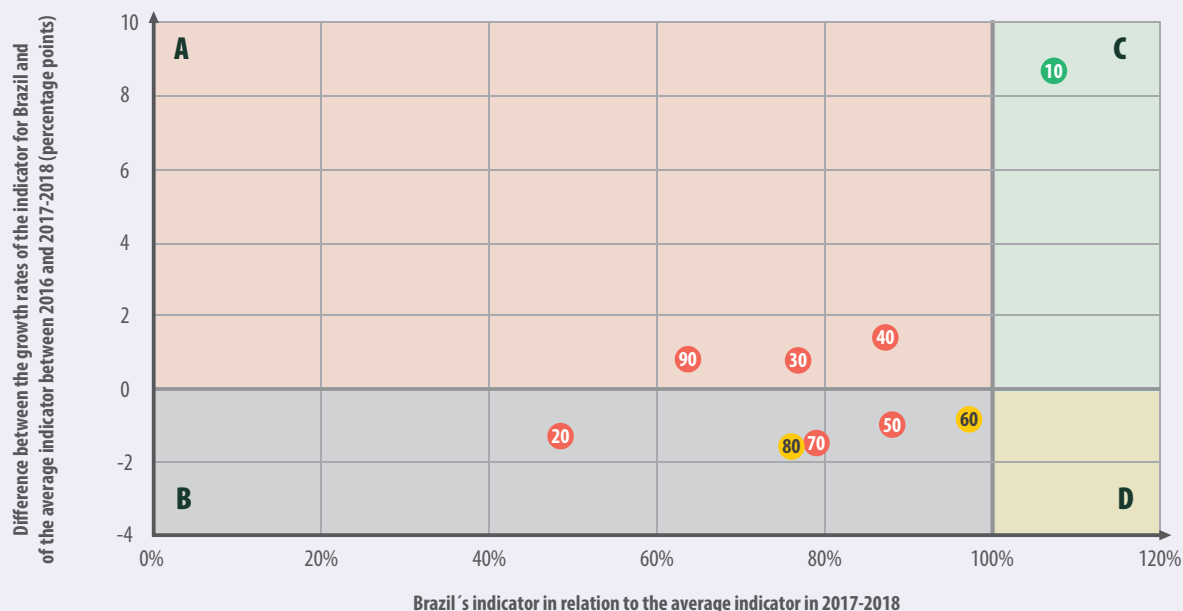
The horizontal axis shows the value of Brazil's indicator as a percentage of the average indicator, i.e. as the average values for the 18 countries included in this report – clearly indicating Brazil's relative position. Figures above 100% indicate that Brazil is above average, while those below 100% indicate that the country is below average.

The vertical axis indicates, in percentage points, the difference between the growth rates of the indicators calculated for Brazil and the average indicators for the 18 countries between the 2016 and 2017- 2018 rankings – clearly indicating whether the evolution of the factor in the country contributed to improving the competitiveness of Brazilian companies. When the difference is greater than zero, it means that Brazil's variable grew above the average rate recorded for the 18 countries, i.e. the competitiveness of Brazilian companies increased. Figures below zero mean a loss of competitiveness.

In the six factors in which Brazil is in the bottom third of the ranking, the value for the Brazilian indicator is lower than the average indicator. However, in three factors – Infrastructure and logistics, Business Environment, and Taxation – Brazil is recovering its competitiveness, occupying **quadrant A**. This quadrant shows the factors for which Brazil's indicator is lower than the average indicator, but its performance – measured in terms of the indicator's growth rate between the 2016 and 2017-2018 rankings – is higher than the average performance.

It is worth noting that while Brazil performed above the average for the selected countries, it can lose positions in the ranking if a lower-ranked competitor shows an even better performance. This was the case in Business Environment, a factor in which Brazil was outperformed by Argentina, and in Infrastructure and logistics, where it was overtaken by India.

**FIGURE 38 - COMPARISON BETWEEN BRAZIL'S PERFORMANCE AND THE AVERAGE PERFORMANCE OF THE 18 COUNTRIES BY FACTOR**



**QUADRANTS**

**A - Brazil is regaining competitiveness**

- 30 Infrastructure and logistics
- 40 Taxation
- 90 Business environment

**C - Brazil has become more competitive**

- 10 Availability and cost of labor

**B - Brazil's low competitiveness worsens**

- 20 Availability and cost of capital
- 50 Macroeconomical environment
- 60 Competition and scale of the domestic market
- 70 Education
- 80 Technology and innovation

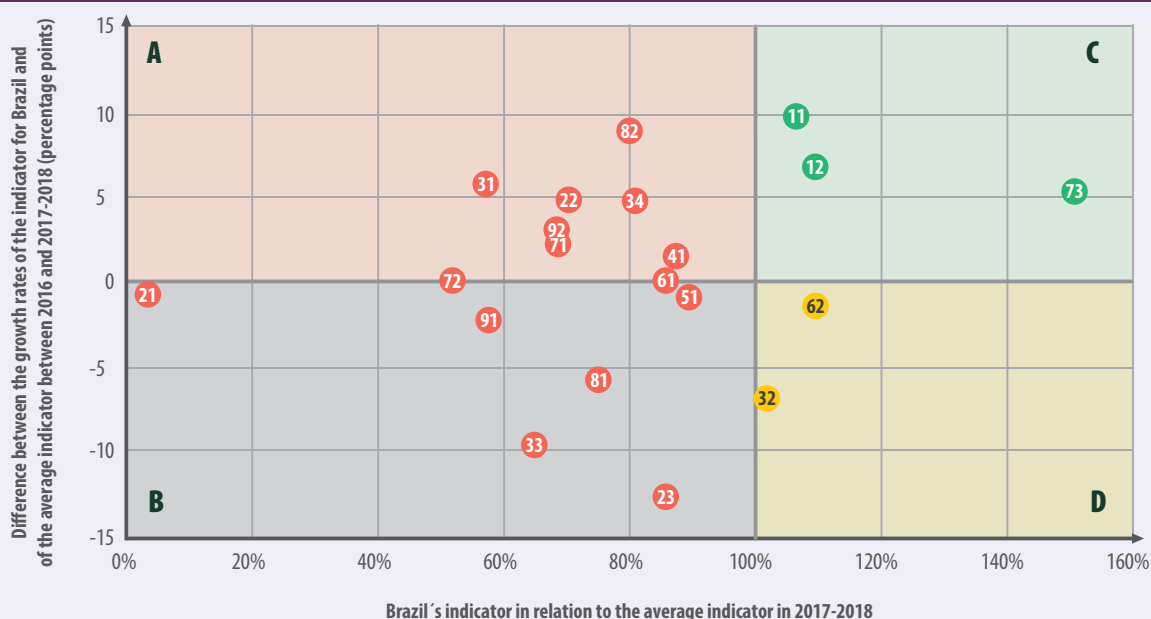
**D - Brazil's competitiveness is threatened**

In the other three factors – Availability and cost of capital, Macroeconomic environment, and Technology and innovation – Brazil is in **quadrant B**. In this case, the country's low competitiveness is worsening, meaning that Brazil's indicator is below average and its growth rate is lower than the average rate recorded for the indicators of the selected countries. Competition and scale of domestic market and Education – factors in which Brazil is in the middle third – are also in quadrant B.

Brazil is more competitive than the average of its competitors only in the Availability and cost of labor factor – where it occupies the upper third – as shown in **quadrant C**. In this case, Brazil's indicator is 7% higher than the average indicator and, during the period, the country posted a higher growth rate (2.3% against -6.5%), meaning that it is reinforcing its competitive advantage.

It is also worth noting that Brazil does not have any factors in **quadrant D**. This quadrant includes cases in which the country is more competitive than the average of its competitors, but Brazil's values grew at a lower rate during the period under analysis.

**FIGURE 39 - COMPARISON BETWEEN BRAZIL'S PERFORMANCE AND THE AVERAGE PERFORMANCE OF THE 18 COUNTRIES BY SUB-FACTOR**



**QUADRANTS**

**A – Brazil is regaining competitiveness**

- 22 Capital availability
- 31 Transport infrastructure
- 34 International logistics
- 41 Taxes
- 71 Educational attainment
- 82 R&D and innovation in companies
- 92 Legal certainty, red tape and labor relations

**C – Brazil has become more competitive**

- 11 Labor cost
- 12 Labor availability
- 73 Expenditure on education

**B – Brazil's low competitiveness worsens**

- 21 Capital cost
- 23 Financial system performance
- 33 Energy infrastructure
- 51 Macroeconomic indicators
- 61 Competition
- 81 Government support for innovation
- 91 Government Efficiency

**D – Brazil's competitiveness is threatened**

- 32 Telecommunications infrastructure
- 62 Scale

**Not ranked**

- 72 Educational assessment

Figure 39 shows the values of the indicators associated with the 20 sub-factors. Most of them (70%) are located in **quadrants A and B**, where the Brazilian indicator is lower than the average indicator, i.e. the country is less competitive than the average of its competitors. In half of them, Brazil is recovering its competitiveness, meaning its indicator increased at a faster pace (or dropped less strongly) than the average indicator during the period (quadrant A). In the other half, Brazil is becoming less and less competitive, as its indicator grew at a lower rate in the period (quadrant B).

Brazil is more competitive than the average of its competitors in five sub-factors (quadrants C and D). In three of them, Brazil's recent performance was above average: Labor availability, Labor cost, and Expenditure on education, shown in **quadrant C**. In these cases, Brazil's indicator is above average and recorded a higher growth rate during the period. They account for only 15% of all sub-factors.

Brazil's competitiveness is under threat in the Telecommunication infrastructure and Scale sub-factors, as can be seen in **quadrant D**. Brazil is more competitive than the average of its competitors in these sub-factors (Brazil's indicators account for 102% and 109% of the average indicators, respectively), but the Brazilian indicators grew at a slower pace in the period. On account of the shrinking domestic market and the decline in the indicator measuring the population's access to information and communication technologies, Brazil runs the risk of being outperformed by its competitors.







# 5. TECHNICAL NOTES





## About the report

Increasing the competitiveness of Brazilian industry and, consequently, that of the Brazilian economy as a whole is a priority on CNI's agenda. This is the main motivation for drawing up the **Brazil Competitiveness Report: a comparison with selected countries**, which was published for the first time in 2010 and again in 2012, 2013, 2014 and 2016.

In the last edition of the report, the methodology was importantly reviewed. Three new countries were included in the analysis (Indonesia, Peru and Thailand) and the determinants of competitiveness were reviewed and reorganized with the aim of improving their relationship with the Strategic Map of Industry 2013-2022. This seventh edition (2017-2018) uses the same methodology as the one used in the 2016 edition.

The reference period of the data provided in the 2017-2018 report is the latest year available for each variable and country. In most cases, 2016 is the most current year. The data for each variable and country are presented in the form of rankings at the end of the report.

The increasing attention being given to the issue of competitiveness has led to the multiplication of studies and research efforts to identify the determinants of the competitiveness of companies in a country. Those efforts have led to the periodic publication of reports comparing the competitiveness of countries from that perspective.

This report falls under this line of studies and is focused on:

- A limited set of countries that, because of their economic and social characteristics and/or position in the international market, provide a more appropriate benchmark for assessing the competitive potential of Brazilian companies;
- A restricted set of variables that are more directly related to the reality of this set of countries, which were selected based on the universe of variables contemplated in reports published by international organizations.

## Factors that affect competitiveness and associated variables

Competitiveness refers to a company's ability to compete in the market — i.e. to its ability to overcome its competitors in consumer preference. Companies are basically provided with two mechanisms to win consumer preference: price and quality.

The competitive potential of an economy can be assessed by examining the factors that influence the ability of the companies operating in it to manage those competition mechanisms effectively. For this purpose, the following elements must be considered:

- Factors that directly affect the efficiency of companies and the effectiveness with which they manage these instruments, such as:
  - Availability and cost of labor;
  - Availability and cost of capital;
  - Infrastructure and logistics;
  - Taxation;
  - Technology and innovation.
  
- Factors that have a bearing on the elements above and affect the performance of companies indirectly, such as:
  - Macroeconomic environment;
  - Competition and scale of the domestic market;
  - Business environment;
  - Education.

These factors were broken down into 20 sub-factors, to which 56 variables were associated. The starting point for assessing the competitiveness of Brazilian companies is the value attributed to these 56 variables in Brazil and 17 other countries. This set of variables comprises 38 economic variables disseminated in international and domestic databases, as well as 18 qualitative variables taken from surveys conducted by international organizations and disseminated in the following reports: “The Global Competitiveness Report” of the World Economic Forum; “IMD World Competitiveness Yearbook” of the IMD; “The Worldwide Governance Indicators” and “Connecting to Compete 2014 – Trade Logistics in the Global Economy,” both of which are published by the World Bank.

The set of variables evaluated in the current edition is the same as the one evaluated in the 2016 edition.

The table below summarizes the distribution of the variables according to factors and sub-factors. The list of the 56 variables, with their definition and an indication of their corresponding sources, can be found in section 6 of this report.

TABLE 1 - THE 2017-2018 REPORT: FACTORS, SUB-FACTORS AND VARIABLES	WEIGHT
<b>Availability and cost of labor</b>	
Labor cost	50%
Compensation levels in manufacturing	50%
Labor productivity in industry	50%
<b>Labor availability</b>	
Labor force participation rate	50%
Labor force growth	50%

<b>TABLE 1 - THE 2017-2018 REPORT: FACTORS, SUB-FACTORS AND VARIABLES</b>	<b>WEIGHT</b>
<b>Availability and cost of capital</b>	
Capital cost	33.3%
Interest rate spread	50%
Real short-term interest rate	50%
Capital availability	33.3%
Ease of access to loans	33.3%
Ease of financing through local equity market	16.7%
Stock market size	16.7%
Venture capital availability	33.3%
Financial system performance	33.3%
Banking sector assets	50%
Country credit rating	50%
<b>Infrastructure and logistics</b>	
Transport infrastructure	25%
Quality of roads	25%
Quality of railroad infrastructure	25%
Quality of port infrastructure	12.5%
Liner shipping connectivity	12.5%
Quality of air transport infrastructure	25%
Telecommunications infrastructure	25%
ICT Use	50%
ICT Access	50%
Energy infrastructure	25%
Electricity costs for industrial clients	50%
Availability of electricity	50%
International logistics	25%
Logistic Performance Index (LPI)	50%
Time and cost to export and import	50%
<b>Taxation</b>	
Taxes	100%
Collected total tax revenues	25%
Total tax rate (% of profit)	25%
Corporate tax rates	25%
Indirect tax rates	25%
<b>Macroeconomic environment</b>	
Macroeconomic indicators	100%
Inflation	20%
General government debt	10%
General government net debt interest payments	10%
Gross fixed capital formation	20%
Direct investment flows inward	20%
Real effective exchange rate	20%
<b>Competition and scale of the domestic market</b>	
Competition	50%
Trade tariffs	50%
Intensity of local competition	50%
Scale	50%
Domestic market size	100%

TABLE 1 - THE 2017-2018 REPORT: FACTORS, SUB-FACTORS AND VARIABLES	WEIGHT
<b>Business environment</b>	
Government Efficiency	50%
Irregular payments and bribes	33.3%
Regulatory quality	33.3%
Transparency of government policymaking	33.3%
Legal certainty, red tape and labor relations	50%
Rule of Law	33.3%
Starting a business	33.3%
Flexibility of wage determination	16.7%
Hiring and firing practices	16.7%
<b>Education</b>	
Educational attainment	33.3%
Gross enrolment ratio in secondary education	25%
Gross enrolment ratio in tertiary education	25%
Percentage of adults who have attained at least upper secondary education	25%
Percentage of adults who have attained tertiary education	25%
Educational assessment	33.3%
Performance in mathematics	33.3%
Performance in reading	33.3%
Performance in science	33.3%
Expenditure on education	33.3%
Total public expenditure on education	50%
Total public expenditure on education per capita	50%
<b>Technology and innovation</b>	
Government support for innovation	50%
Gross domestic expenditure on R&D	50%
Government procurement of advanced tech products	50%
R&D and innovation in companies	50%
Gross expenditure on R&D performed by business enterprise	50%
Capacity for innovation	50%

## Countries selected as a benchmark for assessing the competitiveness of the Brazilian economy

The competitive potential of the Brazilian economy was assessed according to Brazil's relative position in relation to a set of selected countries. It were selected countries at a similar level of development and/or with a similar size as that of Brazil, countries that compete with Brazil in third markets or with an international position similar to that of Brazil, and neighboring countries.

This set of countries includes: Argentina, Australia, Canada, Chile, China, Colombia, India, Indonesia, Mexico, Peru, Poland, Russia, South Africa, South Korea, Spain, Thailand, and Turkey.

The following table shows some structural characteristics of the economies of those countries.

TABLE 2: STRUCTURAL CHARACTERISTICS OF THE SELECTED COUNTRIES - 2016

Country	Area (thousand sq. km)	Population (millions)	GDP (billion USD)	GDP per capita, PPP (thousand USD)	Agricultural products exports (billion USD)	Total exports (billion USD)	Total imports (billion USD)
South Africa	1,219	56	295	13,3	10	75	92
Argentina	2,780	44	545	20,1	37	58	56
Australia	7,741	24	1,262	48,7	34	191	196
<b>Brazil</b>	<b>8,516</b>	<b>206</b>	<b>1,799</b>	<b>15,2</b>	<b>77</b>	<b>185</b>	<b>143</b>
Canada	9,985	36	1,530	46,4	63	390	417
Chile	756	18	247	24,1	20	61	59
China	9,563	1,383	11,232	15,4	75	2,098	1,588
Colombia	1,142	49	282	14,1	7	31	45
South Korea	100	51	1,411	37,7	11	495	406
Spain	506	46	1,233	36,3	52	289	311
India	3,287	1,300	2,264	6,7	34	264	360
Indonesia	1,911	259	932	11,7	39	145	136
Mexico	1,964	122	1,047	18,9	30	374	398
Peru	1,285	31	195	12,9	8	37	36
Poland	313	38	469	27,7	29	203	197
Russia	17,098	143	1,283	26,9	25	282	192
Thailand	513	69	407	16,9	37	215	194
Turkey	785	80	863	25,0	17	143	199

Source: World Development Indicators, World Bank; World Economic Outlook Database, Oct. 2017, IMF; WTO merchandise trade values annual dataset, World Trade Organization.

## Procedures adopted

The effect of each of the 56 variables from the standpoint of the competitiveness of Brazilian companies can be evaluated based on Brazil's position in the list of countries as ordered according to the values recorded for those variables in each of the 18 countries.

The 56 variables were aggregated into 20 sub-factors and the subsequent aggregation of those sub-factors into the nine factors mentioned above allows in turn for assessing the effect of each of these sub-factors and factors on the competitiveness of Brazilian companies. This aggregation was made according to the procedures described below.

The set of 56 variables comprises quantitative variables that reflect economic magnitudes and qualitative variables taken from surveys.

The qualitative variables are referenced on different scales, since they were taken from different surveys. Those scales were converted into a single scale (0-10 scale).

### Calculation of comparable measures (normalization)

The quantitative variables measure different magnitudes and, in many cases, they are expressed in different units. Following a procedure adopted in the Global Competitiveness Report of the World Economic Forum, these variables were normalized and converted into the same scale applied to the qualitative variables using the following formula:

$$VN_i^v = \frac{10 \times (V_i - V_{min})}{(V_{max} - V_{min})} \quad (1)$$

Where:  $VN_i^v$  is the normalized value of variable  $V$  of country  $i$ ;  $V_{max}$  and  $V_{min}$  are the maximum and minimum values in the original sample of countries from which the values for the 18 selected countries were taken, i.e. the highest and lowest observed value, and  $V_i$  is the value of country  $i$ .

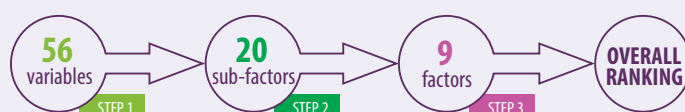
In cases of variables where the most favorable result from the standpoint of competitiveness is the lowest value, the following formula was adopted:

$$VN_i^v = \frac{10 - 10 \times (V_i - V_{min})}{(V_{max} - V_{min})} \quad (2)$$

### Aggregation of variables into sub-factors and factors

The scores for the sub-factor are the weighted average of the normalized variables associated with the sub-factor. The weights are shown in table 1 (page 66). The scores of the factors were determined by the simple average of the scores of the sub-factors associated with them.

The position of a country in the overall ranking is determined by the simple average of the scores of the nine factors.

**FIGURE 40 - AGGREGATION PROCESS**

For calculating the annual Brazil Competitiveness Report ranking, data is collected for the 56 variables and the availability of data for the 18 selected countries is checked.

There are cases in which no information on some of the variables for a country is available in the reference year, i.e. the last year available. In such cases, the most recent data available is repeated for the reference year. For example, if the reference year of a certain variable is 2016 and the most recent data available for a country is 2015, then the value for 2015 is repeated for 2016.

When the data for a country is very outdated or when no data is available for a country in any year of the series for a given variable, such missing data is excluded from the calculation of the sub-factor scores. The weighted average of the available normalized variables is calculated (the weight attributed to missing data is equally redistributed in the remaining variables).

However, if more than 50% of the variables making up a sub-factor are excluded, then the score of a country in the sub-factor is not calculated. At the factor level, if more than 50% of the scores of the sub-factors making up a factor are excluded, the country's score in the factor is not calculated.

Regarding the overall ranking, if no score can be calculated for a country for any of the nine factors, such missing value is estimated. For example, the score of Argentina for the Availability and labor cost factor could not be calculated in the current edition. The estimation process follows the methodology presented below:

- a) The scores for the Availability and labor cost factor are calculated based on the simple average of the variables for which data is available for Argentina.
- b) Based on the scores calculated in step **a**, a new ranking of countries is calculated in the Availability and labor cost factor. The ranking is new, because it is based only in the variables for which data is available for Argentina.
- c) In the original ranking, a score consistent with the position of Argentina as determined in step **b** is checked.
- d) Based on this score and its neighboring scores, a simple average is calculated to estimate the score of Argentina for which data is missing.

The cases of countries for which data is missing in the overall ranking in 2017-2018 are the following ones: Argentina and Russia for the Availability and cost of labor factor; China and India for the Education factor and Peru for the Technology and innovation factor.







## **6. LIST OF VARIABLES**

## Description and source of the variables

NAME	DESCRIPTION	SOURCE [ORIGINAL SOURCE]
<b>Availability and cost of labor</b>		
<b>Labor cost</b>		
Compensation levels in manufacturing	Total hourly compensation in manufacturing (wages plus supplementary benefits), US\$. Reference year: 2016	IMD World Competitiveness Yearbook 2017. [Passport GMID; Source: © Euromonitor International 2017 ; national sources]
Labor productivity in industry	Related GDP (PPP) per person employed in industry, US\$. Reference year: 2016	IMD World Competitiveness Yearbook 2017. [The World Bank (Development Data Group) ( <a href="http://databank.worldbank.org">http://databank.worldbank.org</a> ) ; national sources]]
<b>Labor availability</b>		
Labor force participation rate	Labour force participation rate: labor force as a percentage of the total population over 15 years old. Reference year: 2016	Key Indicators of the Labour Market (KILM) – International Labour Organization (ILO), 9th edition, 2015 [LFEP Database, 7th edition (January 2016 of the 2015 revision)]
Labor force growth	Annual percentage change. Reference year: 2016	IMD World Competitiveness Yearbook 2017. [OECD (2017), Main Economic Indicators - complete database; national sources]
<b>Availability and cost of capital</b>		
<b>Capital cost</b>		
Interest rate spread	Lending rate minus deposit rate. Reference year: 2016	IMD World Competitiveness Yearbook 2017. [International Financial Statistics Online April 2017 (IMF); national sources.]
Real short-term interest rate	Real discount or bank rate. Reference year: 2016	IMD World Competitiveness Yearbook 2017. [International Financial Statistics Online April 2017 (IMF); national sources.]
<b>Capital availability</b>		
Ease of access to loans	Variable generated from answers to the question: In your country, how easy is it for businesses to obtain a bank loan? [1 = extremely difficult; 7 = extremely easy]. Reference year: 2016-2017 weighted average	The Global Competitiveness Report 2017-2018, World Economic Forum. [Executive Opinion Survey.]
Ease of financing through local equity market	Variable generated from answers to the question: In your country, to what extent can companies raise money by issuing shares and/or bonds on the capital market? [1 = not at all; 7 = to a great extent]. Reference year: 2016-2017 weighted average	The Global Competitiveness Report 2017-2018, World Economic Forum. [Executive Opinion Survey.]
Stock market size	Market value for listed domestic companies. Percentage of GDP. Reference year: 2016	World Bank [World Federation of Exchanges database]
Venture capital availability	Variable generated from answers to the question: In your country, how easy is it for start-up entrepreneurs with innovative but risky projects to obtain equity funding? [1 = extremely difficult; 7 = extremely easy]. Reference year: 2016-2017 weighted average	The Global Competitiveness Report 2017-2018, World Economic Forum. [Executive Opinion Survey.]

NAME	DESCRIPTION	SOURCE [ORIGINAL SOURCE]
<b>Financial system performance</b>		
Banking sector assets	Percentage of GDP. Reference year: 2016	IMD World Competitiveness Yearbook 2017. [IMF Monetary and Financial Stats (MFS) April 2017]
Country credit rating	Rating on a scale of 0-100 assessed by the Institutional Investor Magazine. Reference year: 2016	IMD World Competitiveness Yearbook 2017. [Institutional Investor, September 2016]
<b>Infrastructure and logistics</b>		
<b>Transport infrastructure</b>		
Quality of roads	Variable generated from answers to the question: In your country, how is the quality (extensiveness and condition) of road infrastructure [1 = extremely poor-among the worst in the world; 7 = extremely good-among the best in the world]. Reference year: 2016-2017 weighted average	The Global Competitiveness Report 2017-2018, World Economic Forum. [Executive Opinion Survey.]
Quality of railroad infrastructure	Variable generated from answers to the question: In your country, how is the quality (extensiveness and condition) of the railroad system [1 = extremely poor-among the worst in the world; 7 = extremely good-among the best in the world]. Reference year: 2016-2017 weighted average	The Global Competitiveness Report 2017-2018, World Economic Forum. [Executive Opinion Survey.]
Quality of port infrastructure	Variable generated from answers to the question: In your country, how is the quality (extensiveness and condition) of seaports (for landlocked countries, assess access to seaports) [1 = extremely poor- among the worst in the world; 7 = extremely good-among the best in the world]. Reference year: 2016-2017 weighted average.	The Global Competitiveness Report 2017-2018, World Economic Forum. [Executive Opinion Survey.]
Liner shipping connectivity	Index generated from the average of five components: (a) the number of ships; (b) the total container-carrying capacity of those ships; (c) the maximum vessel size; (d) the number of services; and (e) the number of companies that deploy container ships on services from and to a country's ports. The base year is 2004 and the base value is the maximum value in 2004. Reference: 2017	United Nations Conference on Trade and Development, Statistics [UNCTAD, Division on Technology and Logistics, based on Containerization International Online ( <a href="http://www.ci-online.co.uk">www.ci-online.co.uk</a> ) until 2015 and MDS Transmodal ( <a href="http://mdst.co.uk">http://mdst.co.uk</a> ) from 2016 onwards]
Quality of air transport infrastructure	Variable generated from answers to the question: In your country, how is the quality (extensiveness and condition) of airports [1 = extremely poor-among the worst in the world; 7 = extremely good-among the best in the world]. Reference year: 2015-2016 weighted average	The Global Competitiveness Report 2017-2018, World Economic Forum. [Executive Opinion Survey.]
<b>Energy infrastructure</b>		
Electricity costs for industrial clients	US\$ per kwh. Reference year: 2016	IMD World Competitiveness Yearbook 2017. [OECD Energy Prices and Taxes 1/2017 (International Energy Agency); national sources.]. * Brazil: CNI estimate based on data provided by Brazilian Electricity Regulatory Agency (ANEEL) and by the Central Bank of Brazil.
Availability of electricity	Ratio between electricity output and GDP PPP, expressed in TWh/US\$ trillion. Reference year: 2014	Calculate based on data from CO2 Emissions from Fuel Combustion Highlights (2016 Edition), IEA, Paris.

NAME	DESCRIPTION	SOURCE [ORIGINAL SOURCE]
<b>Telecommunications infrastructure</b>		
ICT Use	Aggregation of the weighted values (33% each) of three indicators: (1) percentage of individuals using the Internet; (2) fixed (wired)-broadband Internet subscriptions per 100 inhabitants; (3) active mobile-broadband subscriptions per 100 inhabitants. Reference year: 2017	International Telecommunication Union (ITU) Measuring the Information Society Report 2017 [Data for all these indicators are collected by ITU]
ICT Access	Aggregation of the weighted values (20% each) of five indicators: (1) fixed telephone subscriptions per 100 inhabitants; (2) mobile cellular telephone subscriptions per 100 inhabitants; (3) international Internet bandwidth (bit/s) per Internet user; (4) percentage of households with a computer; and (5) percentage of households with Internet access. Reference year: 2017	International Telecommunication Union (ITU) Measuring the Information Society Report 2017 [Data for all these indicators are collected by ITU]
<b>International logistics</b>		
Logistic Performance Index (LPI)	Aggregation of the values (1-5 scale) of six components: (1) the efficiency of customs and border management; (2) the quality of trade and transport infrastructure; (3) the ease of arranging competitively priced shipments; (4) the competence and quality of logistics services; (5) the ability to track and trace consignments; (6) the frequency with which shipments reach consignees within scheduled or expected delivery times. Reference year: 2016	Connecting to Compete 2016. Trade Logistics in the Global Economy, World Bank, 2016
Time and cost to export and import	Distance to frontier (0-100 scale). Simple average of scores in eight indicators: (1) time and cost for documentary compliance when exporting; (2) time and cost for border compliance when exporting; (3) time and cost for documentary compliance when importing; (4) time and cost for border compliance when importing. Reference year: 2017	World Bank, Doing Business 2018
<b>Taxation</b>		
<b>Taxes</b>		
Collected total tax revenues	Percentage of GDP. Reference year: 2015	IMD World Competitiveness Yearbook 2017. [OECD Revenue Statistics 2017, Government Finance Statistics 2017; national sources.]
Total tax rate (% of profit)	Total taxes paid by a company as a percentage of its profits (the profit or corporate income tax, social contributions and labor taxes paid by the employer, property taxes, property transfer taxes, dividend tax, capital gains tax, financial transactions tax, waste collection taxes, vehicle and road taxes, and any other small taxes or fees). Reference year: 2017	World Bank, Doing Business 2018.
Corporate tax rates	Corporate tax rates. Reference year: 2017	Tax Rates Online, KPMG.
Indirect tax rates	Indirect tax rates. Reference year: 2017	Tax Rates Online, KPMG.

NAME	DESCRIPTION	SOURCE [ORIGINAL SOURCE]
Macroeconomic environment		
Macroeconomic indicators		
Inflation	Annual percent change in consumer price index (year average). Reference year: 2016 or most recent year available	The Global Competitiveness Report 2017-2018, World Economic Forum. [International Monetary Fund, World Economic Outlook Database (April 2017 edition)]
General government debt	Percentage of GDP. Reference year: 2016 or most recent year available.	The Global Competitiveness Report 2017-2018, World Economic Forum. [International Monetary Fund, World Economic Outlook Database (April 2017 edition) and Article IV Consultation Staff Reports]
General government net debt interest payments	Interest payments on government debt, obtained by the difference between General government net lending/ borrowing and General government primary net lending/ borrowing. Percentage of GDP. Reference year: 2016	Calculated based on data from World Economic Outlook Database, Oct. 2017, IMF.
Gross fixed capital formation	Percentage of GDP. Reference year: 2016	IMD World Competitiveness Yearbook 2017. [national sources] *China: World Economic Outlook Database, Oct. 2017, IMF.
Direct investment flows inward	Percentage of GDP. Reference year: 2016	IMD World Competitiveness Yearbook 2017. [UNCTADSTAT 2017 <a href="http://unctadstat.unctad.org">http://unctadstat.unctad.org</a> OECD (2017), Main Economic Indicators - complete database International Financial Statistics Online (IMF); national sources.]
Real effective exchange rate	Real effective exchange rate (monthly average) on the reference date, expressed as a percentage of the arithmetic average of the monthly rates observed from January 2012 to December 2016. Reference year: December 2016	Prepared by CNI, based on the real effective exchange rate estimated by the Bank for International Settlements.
Competition and scale of the domestic market		
Competition		
Trade tariffs	Trade-weighted average tariff rate. The weights are the trade patterns of the importing country's reference group. Reference year: 2016 or most recent year available	The Global Competitiveness Report 2017-2018, World Economic Forum. [International Trade Centre; Trade Competitiveness Map Data]
Intensity of local competition	Variable generated from answers to the question: In your country, how intense is competition in the local markets? [1 = not intense at all; 7 = extremely intense]. Reference year: 2016-2017 weighted average	The Global Competitiveness Report 2017-2018, World Economic Forum. [Executive Opinion Survey.]
Scale		
Domestic market size	Sum of gross domestic product plus value of imports of goods and services, minus value of exports of goods and services, normalized on a 1-7 (best) scale. Reference year: 2016 or most recent year available.	The Global Competitiveness Report 2017-2018, World Economic Forum.
Business environment		
Government Efficiency		
Irregular payments and bribes	Variable generated from answers to the following questions: In your country, how common is it for firms to make undocumented extra payments or bribes connected with (a) imports and exports; (b) public utilities; (c) annual tax payments; (d) awarding of public contracts and licenses; (e) obtaining favorable judicial decisions? [1 = very common; 7 = never occurs]. Reference year: 2016- 2017 weighted average	The Global Competitiveness Report 2017-2018, World Economic Forum. [World Economic Forum, Executive Opinion Survey. For more details, refer to Chapter 1.3 of The Global Competitiveness Report 2017-2018]

NAME	DESCRIPTION	SOURCE [ORIGINAL SOURCE]
Regulatory Quality	Index generated based on perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development. Ranges from approximately -2.5 (weak) to 2.5 (strong) governance performance. Reference year: 2016.	The Worldwide Governance Indicators, 2017 Update [Daniel Kaufmann, Natural Resource Governance Institute (NRGI) and Brookings Institution; Aart Kraay, World Bank Development Research Group]
Transparency of government policymaking	Variable generated from answers to the question: In your country, how easy is it for companies to obtain information about changes in government policies and regulations affecting their activities? [1 = extremely difficult; 7 = extremely easy]. Reference year: 2016-2017 weighted average	The Global Competitiveness Report 2017-2018, World Economic Forum. [World Economic Forum, Executive Opinion Survey. For more details, refer to Chapter 1.3 of The Global Competitiveness Report 2017–2018]
<b>Legal certainty, red tape and labor relations</b>		
Rule of Law	Index generated based on perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence. Ranges from approximately -2.5 (weak) to 2.5 (strong) governance performance. Reference year: 2016	The Worldwide Governance Indicators, 2017 Update [Daniel Kaufmann, Natural Resource Governance Institute (NRGI) and Brookings Institution; Aart Kraay, World Bank Development Research Group]
Starting a business	Distance to frontier (0-100 scale). Simple average of scores in four indicators: (1) procedures to legally start and formally operate a company (number); (2) time required to complete each procedure (calendar days); (3) cost required to complete each procedure (percentage of per capita income); (4) paid-in minimum capital (percentage of per capita income). Reference year: 2017	World Bank, Doing Business 2018.
Flexibility of wage determination	Variable generated from answers to the question: In your country, how are wages generally set? [1 = by a centralized bargaining process; 7 = by each individual company]. Reference year: 2016-2017 weighted average	The Global Competitiveness Report 2017-2018, World Economic Forum. [World Economic Forum, Executive Opinion Survey. For more details, refer to Chapter 1.3 of The Global Competitiveness Report 2017–2018]
Hiring and firing practices	Variable generated from answers to the question: In your country, to what extent do regulations allow flexible hiring and firing of workers? [1 = not at all; 7 = to a great extent]. Reference year: 2016-2017 weighted average	The Global Competitiveness Report 2017-2018, World Economic Forum. [World Economic Forum, Executive Opinion Survey. For more details, refer to Chapter 1.3 of The Global Competitiveness Report 2017–2018]
<b>Education</b>		
<b>Educational attainment</b>		
Gross enrolment ratio in secondary education	Number of students enrolled in secondary level, regardless of age, expressed as a percentage of the official school-age population corresponding to the same level of education. Reference year: 2014 or most recent year available	UNESCO Institute for Statistics. Education: May 2017.
Gross enrolment ratio in tertiary education	Number of students enrolled in tertiary level, regardless of age, expressed as a percentage of the official school-age population corresponding to the same level of education. Reference year: 2014 or most recent year available	UNESCO Institute for Statistics. Education: May 2017. *Canada: The Global Competitiveness Report 2017-2018, World Economic Forum.

NAME	DESCRIPTION	SOURCE [ORIGINAL SOURCE]
Percentage of adults who have attained at least upper secondary education	Percentage of adults aged between 25 and 34 who have attained at least upper secondary education. Reference year: 2016	OECD
Percentage of adults who have attained at least upper secondary education	Percentage of adults aged between 25 and 34 who have attained tertiary education. Reference year: 2016	OECD
<b>Educational assessment</b>		
Performance in mathematics	Average scores in math tests, 15-year-old students. Reference year: 2015	PISA 2015 Results (Volume I): Excellence and Equity in Education - OECD 2016.
Performance in reading	Average scores in reading tests, 15-year-old students. Reference year: 2015	PISA 2015 Results (Volume I): Excellence and Equity in Education - OECD 2016.
Performance in science	Average scores in science tests, 15-year-old students. Reference year: 2015	PISA 2015 Results (Volume I): Excellence and Equity in Education - OECD 2016.
<b>Expenditure on education</b>		
Total public expenditure on education	Percentage of GDP. Reference year: 2015	IMD World Competitiveness Yearbook 2017. [UNESCO ( <a href="http://stats.uis.unesco.org">http://stats.uis.unesco.org</a> ); Eurostat April 2017 ; national sources.] *Argentina and South Korea: UNESCO Institute for Statistics. Education: May 2017.
Total public expenditure on education per capita	US\$ per capita. Reference year: 2015	IMD World Competitiveness Yearbook 2017. [UNESCO ( <a href="http://stats.uis.unesco.org">http://stats.uis.unesco.org</a> ); Eurostat April 2017 ; national sources.]
<b>Technology and innovation</b>		
<b>Government support for innovation</b>		
Gross domestic expenditure on R&D	Percentage of GDP. Reference year: 2015	UNESCO Institute for Statistics. Science, technology and innovation: June 2017.
Government procurement of advanced tech products	Variable generated from answers to the question: In your country, to what extent do government purchasing decisions foster innovation? [1 = not at all; 7 = to a great extent]. Reference year: 2016-2017 weighted average	The Global Competitiveness Report 2017-2018, World Economic Forum. [World Economic Forum, Executive Opinion Survey. For more details, refer to Chapter 1.3 of The Global Competitiveness Report 2017-2018]
<b>R&amp;D and innovation in companies</b>		
Gross expenditure on R&D performed by business enterprise	Percentage of GDP. Reference year: 2015	UNESCO Institute for Statistics. Science, technology and innovation: June 2017. *Brazil: CNI estimate, based on gross expenditure on R&D performed by business sector from IBGE's System of National Accounts - Brazil 2010
Capacity for innovation	Variable generated from answers to the question: In your country, to what extent do companies have the capacity to innovate? [1 = not at all; 7 = to a great extent]. Reference year: 2016-2017 weighted average	The Global Competitiveness Report 2017-2018, World Economic Forum. [World Economic Forum, Executive Opinion Survey. For more details, refer to Chapter 1.3 of The Global Competitiveness Report 2017-2018]



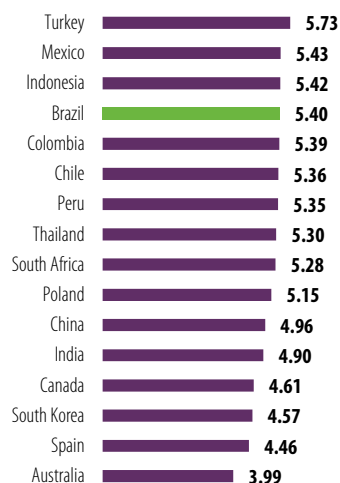




# 7. RANKINGS OF SUB-FACTORS AND VARIABLES



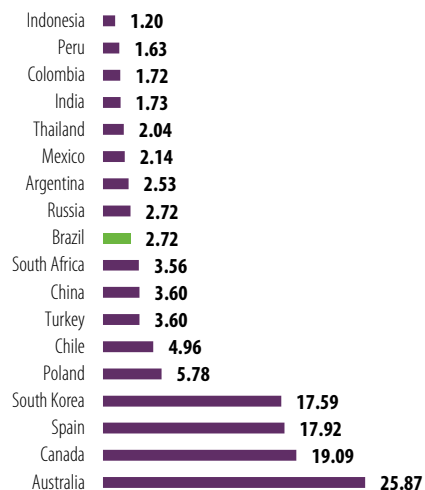
## 1 Labor cost sub-factor



Source: CNI

Note: Average scores (0 = worst performance; 10 = best performance)

## 1.1 Compensation levels in manufacturing (2016)

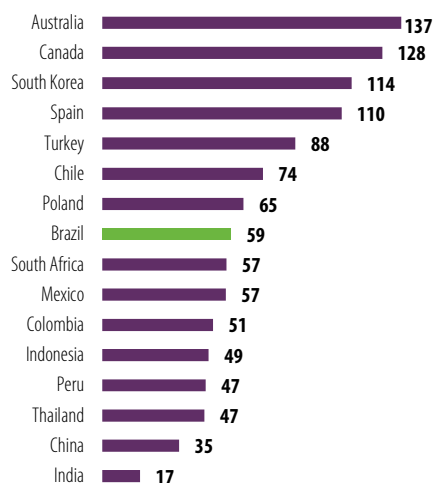


Total hourly compensation in manufacturing (wages plus supplementary benefits), US\$

Source: IMD World Competitiveness Yearbook 2017

Note: India and Turkey (2015)

## 1.2 Labor productivity in industry (2016)

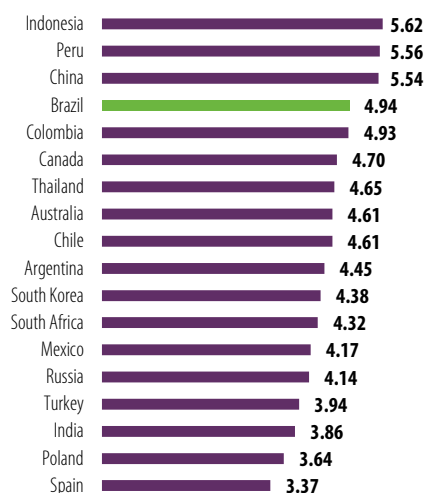


Related GDP (PPP) per person employed in industry, US\$

Source: IMD World Competitiveness Yearbook 2017

Note: Canada, China, India and Peru (2015)

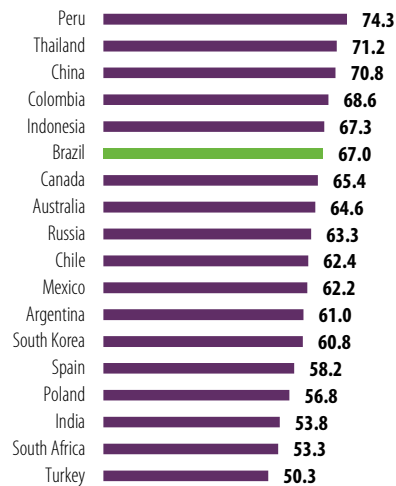
## 2 Labor availability sub-factor



Source: CNI

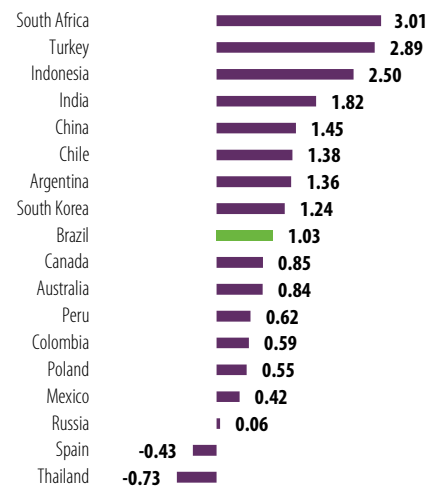
Note: Average scores (0 = worst performance; 10 = best performance)

### 2.1 Labor force participation rate (2016)



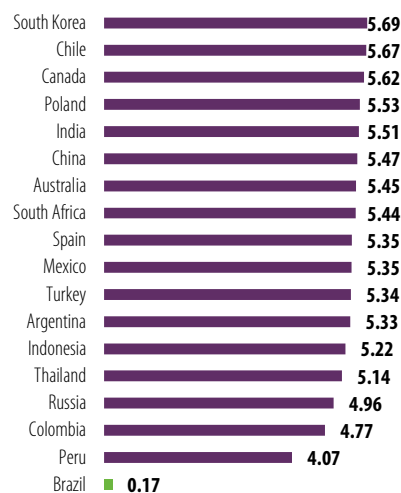
Labour force as a percentage of the total population over 15 years old  
Source: International Labour Organization (ILO)

### 2.2 Labor force growth (2016)



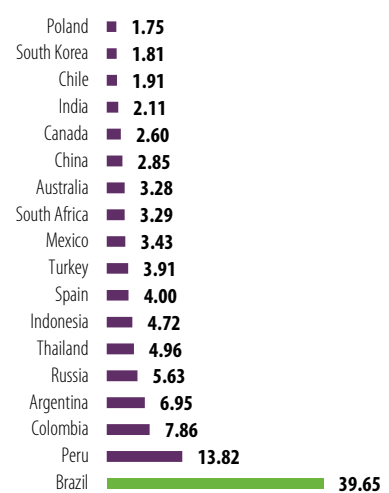
Annual percentage change  
Source: IMD World Competitiveness Yearbook 2017  
Note: Argentina and India (2014); Peru (2015)

### 3 Capital cost sub-factor



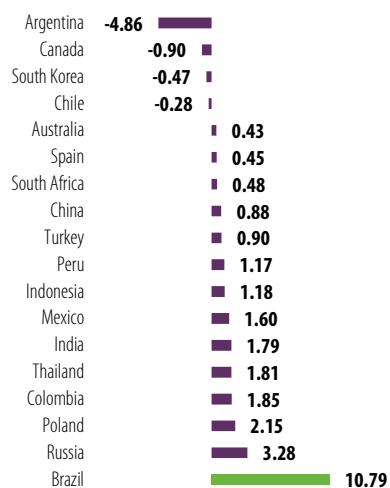
Source: CNI  
Note: Average scores (0 = worst performance; 10 = best performance)

### 3.1 Interest rate spread (2016)



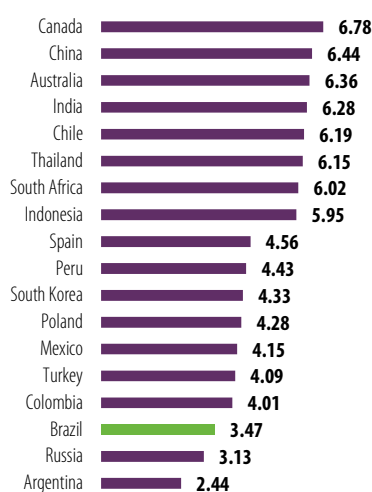
Lending rate minus deposit rate  
Source: IMD World Competitiveness Yearbook 2017  
Note: Chile and India (2015)

### 3.2 Real short-term interest rate (2016)



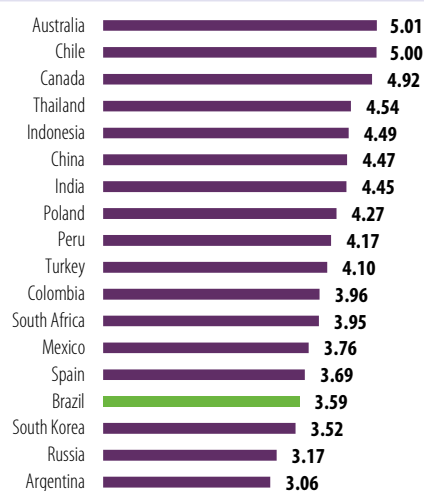
Real discount or bank rate  
Source: IMD World Competitiveness Yearbook 2017  
Note: Argentina (2014)

### 4 Capital availability sub-factor



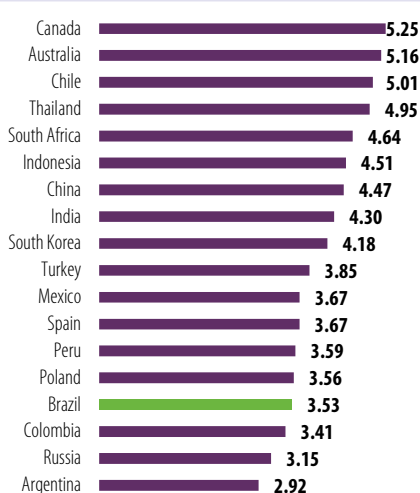
Source: CNI  
Note: Average scores (0 = worst performance; 10 = best performance)

### 4.1 Ease of access to loans (2016-2017 weighted average)



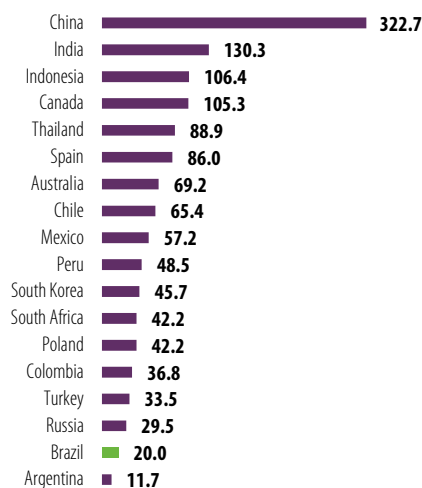
Variable generated from answers to the question: In your country, how easy is it for businesses to obtain a bank loan? [1 = extremely difficult; 7 = extremely easy]  
Source: The Global Competitiveness Report 2017-2018, World Economic Forum

### 4.2 Ease of financing through local equity market (2016-2017 weighted average)



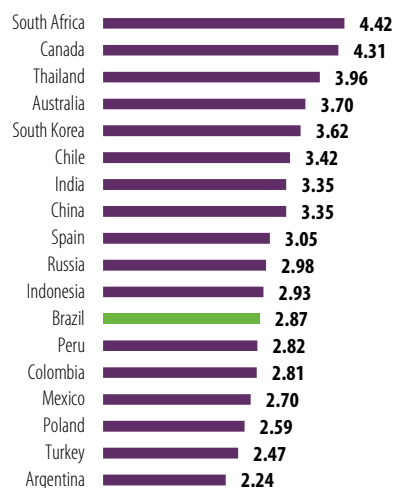
Variable generated from answers to the question: In your country, to what extent can companies raise money by issuing shares and/or bonds on the capital market? [1 = not at all; 7 = to a great extent]  
Source: The Global Competitiveness Report 2017-2018, World Economic Forum

### 4.3 Stock market size (2016)



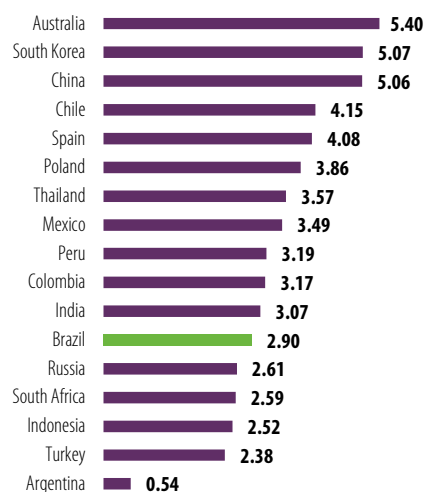
Market value for listed domestic companies. Percentage of GDP.  
Source: World Bank

### 4.4 Venture capital availability (2016–2017 weighted average)



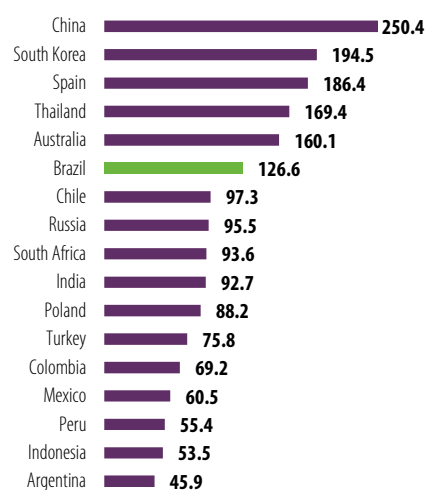
Variable generated from answers to the question: In your country, how easy is it for start-up entrepreneurs with innovative but risky projects to obtain equity funding? [1 = extremely difficult; 7 = extremely easy]  
Source: The Global Competitiveness Report 2017-2018, World Economic Forum

### 5 Financial system performance sub-factor



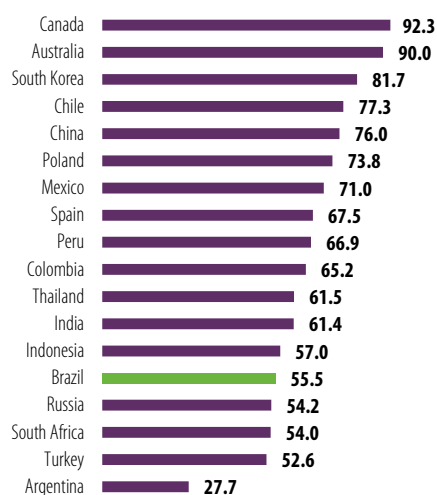
Source: CNI  
Note: Average scores (0 = worst performance; 10 = best performance)

### 5.1 Banking sector assets (2016)



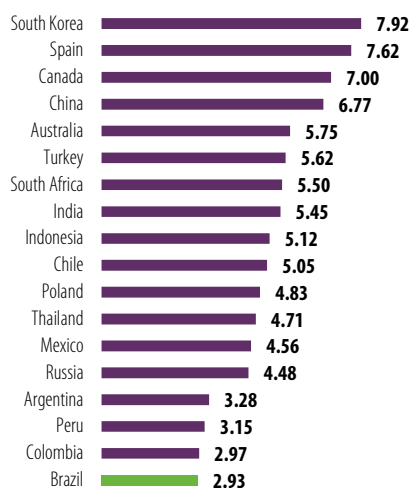
Percentage of GDP  
Source: IMD World Competitiveness Yearbook 2017  
Note: Colombia, India, Peru, Russia and Spain (2015)

## 5.2 Country credit rating (2016)



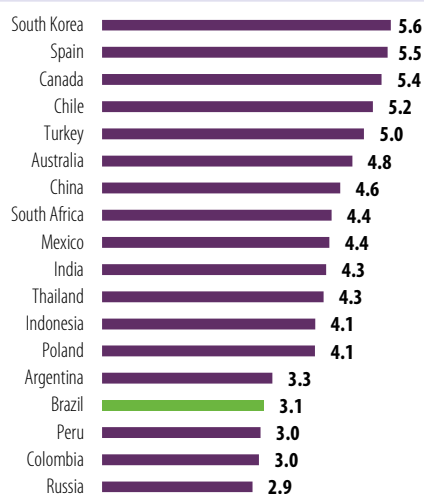
Rating on a scale of 0-100 assessed by the Institutional Investor Magazine  
Source: IMD World Competitiveness Yearbook 2017

## 6 Transport infrastructure sub-factor



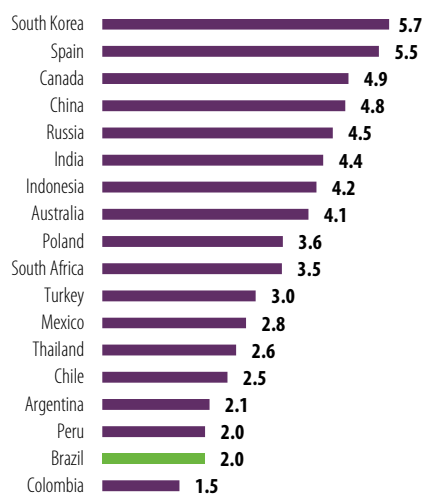
Source: CNI  
Note: Average scores (0 = worst performance; 10 = best performance)

## 6.1 Quality of roads (2016-2017 weighted average)



Variable generated from answers to the question: In your country, how is the quality (extensiveness and condition) of road infrastructure [1 = extremely poor-among the worst in the world; 7 = extremely good-among the best in the world]  
Source: The Global Competitiveness Report 2017-2018, World Economic Forum

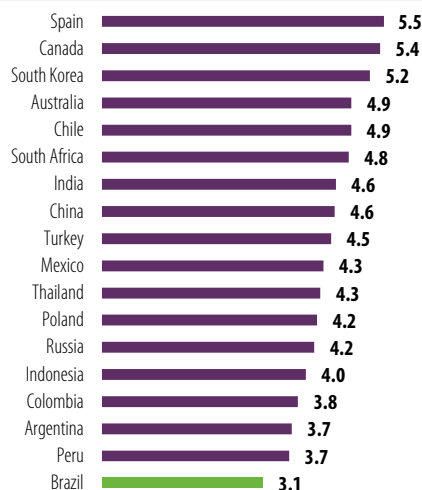
## 6.2 Quality of railroad infrastructure (2016-2017 weighted average)



Variable generated from answers to the question: In your country, how is the quality (extensiveness and condition) of the railroad system [1 = extremely poor-among the worst in the world; 7 = extremely good-among the best in the world]  
Source: The Global Competitiveness Report 2017-2018, World Economic Forum



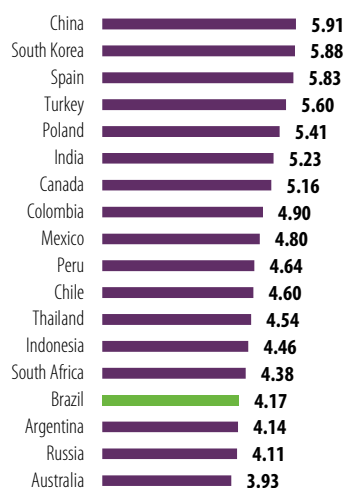
### 6.3 Quality of port infrastructure (2016-2017 weighted average)



Variable generated from answers to the question: In your country, how is the quality (extensiveness and condition) of seaports (for landlocked countries, assess access to seaports) [1 = extremely poor-among the worst in the world; 7 = extremely good-among the best in the world]

Source: The Global Competitiveness Report 2017-2018, World Economic Forum

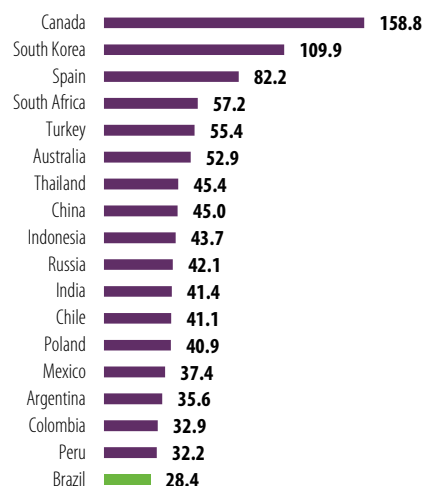
### 6.5 Quality of air transport infrastructure (2016-2017 weighted average)



Variable generated from answers to the question: In your country, how is the quality (extensiveness and condition) of airports [1 = extremely poor-among the worst in the world; 7 = extremely good-among the best in the world]

Source: The Global Competitiveness Report 2017-2018, World Economic Forum

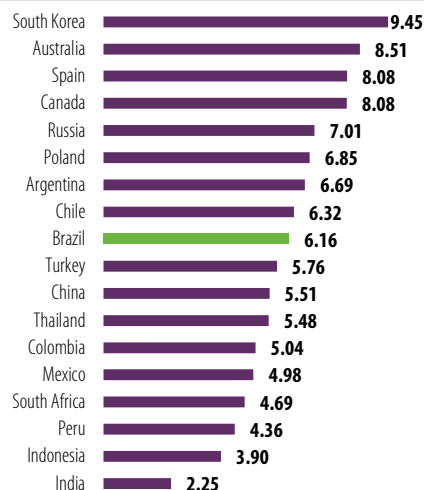
### 6.4 Liner shipping connectivity (2017)



Index generated from the average of five components: (a) the number of ships; (b) the total container-carrying capacity of those ships; (c) the maximum vessel size; (d) the number of services; and (e) the number of companies that deploy container ships on services from and to a country's ports. The base year is 2004 and the base value is the maximum value in 2004.

Source: UNCTAD, Division on Technology and Logistics

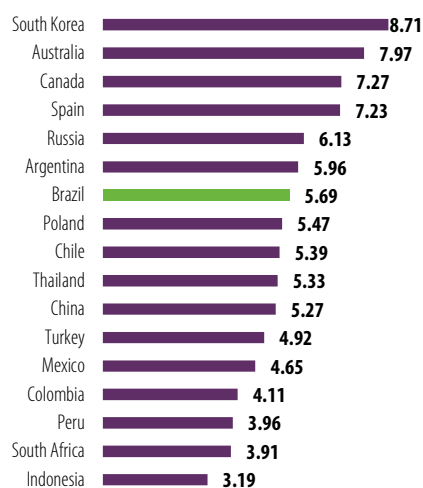
### 7 Telecommunications infrastructure sub-factor



Source: CNI

Note: Average scores (0 = worst performance; 10 = best performance)

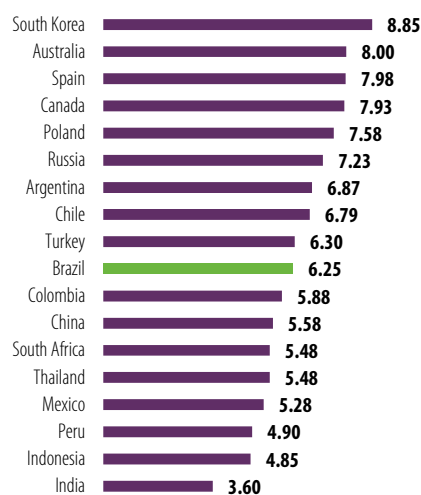
### 7.1 ICT Use (2017)



Aggregation of the weighted values of three indicators: (1) percentage of individuals using the Internet; (2) fixed (wired)-broadband Internet subscriptions per 100 inhabitants; (3) active mobile-broadband subscriptions per 100 inhabitants.

Source: International Telecommunication Union (ITU)

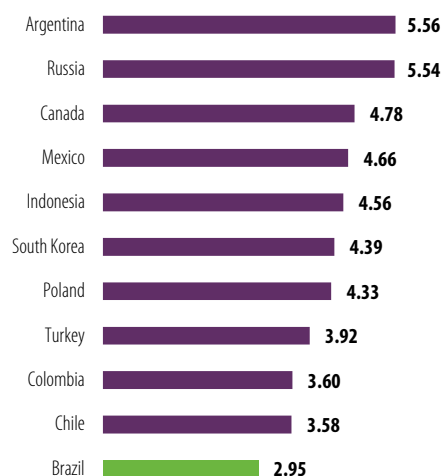
### 7.2 ICT Access (2017)



Aggregation of the weighted values of five indicators: (1) fixed telephone subscriptions per 100 inhabitants; (2) mobile cellular telephone subscriptions per 100 inhabitants; (3) international Internet bandwidth (bit/s) per Internet user; (4) percentage of households with a computer; and (5) percentage of households with Internet access.

Source: International Telecommunication Union (ITU)

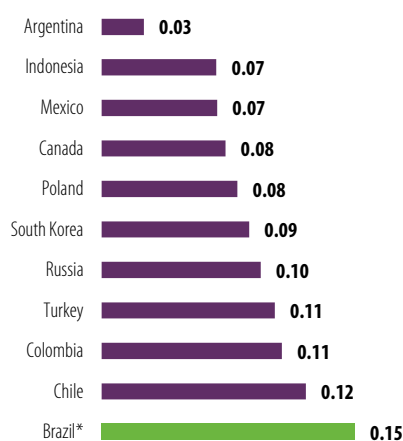
### 8 Energy infrastructure sub-factor



Source: CNI

Note: Average scores (0 = worst performance; 10 = best performance)

### 8.1 Electricity costs for industrial clients (2016)



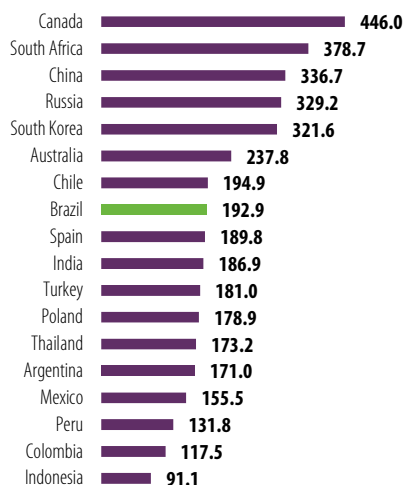
US\$ per kWh

Source: IMD World Competitiveness Yearbook 2017

Note: Canada (2015)

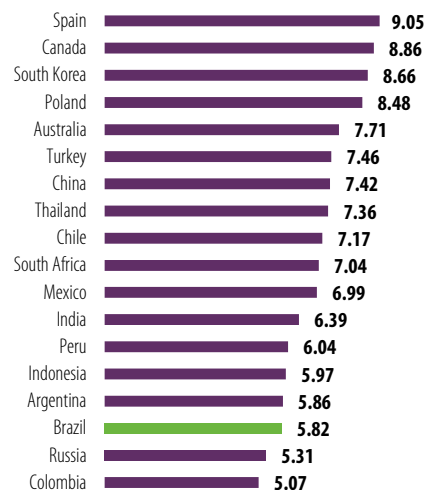
\*CNI estimate based on data provided by ANEEL and by Central Bank of Brazil

## 8.2 Availability of electricity (2014)



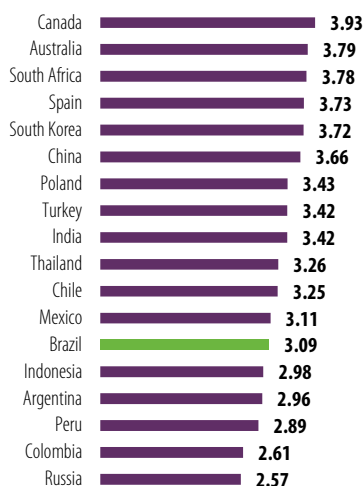
Ratio between electricity output and GDP, expressed in TWh/US\$ trillion.  
Source: CNI estimated based on data by IEA

## 9 International logistics sub-factor



Source: CNI  
Note: Average scores (0 = worst performance; 10 = best performance)

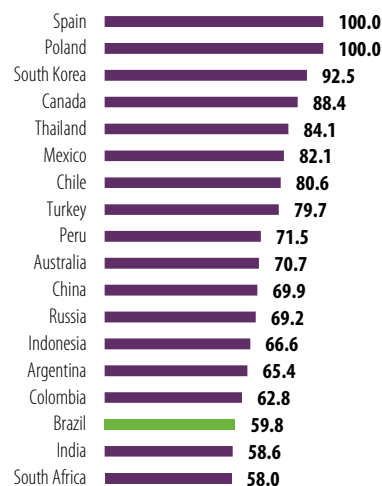
## 9.1 Logistic Performance Index (LPI) (2016)



Aggregation of the values (1-5 scale) of six components: (1) the efficiency of customs and border management; (2) the quality of trade and transport infrastructure; (3) the ease of arranging competitively priced shipments; (4) the competence and quality of logistics services; (5) the ability to track and trace consignments; (6) the frequency with which shipments reach consignees within scheduled or expected delivery times.

Source: Connecting to Compete 2016. Trade Logistics in the Global Economy, World Bank, 2016

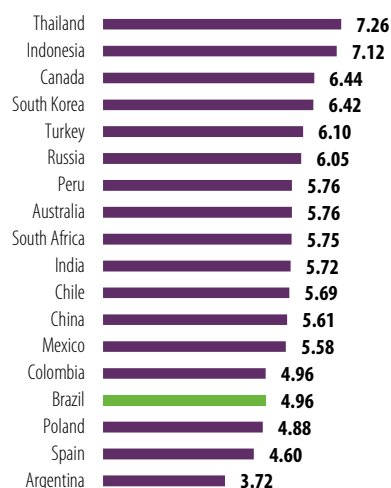
## 9.2 Time and cost to export and import (2017)



Distance to frontier (0-100 scale). Simple average of scores in eight indicators: (1) time and cost for documentary compliance when exporting; (2) time and cost for border compliance when exporting; (3) time and cost for documentary compliance when importing; (4) time and cost for border compliance when importing.

Source: Doing Business 2018, World Bank

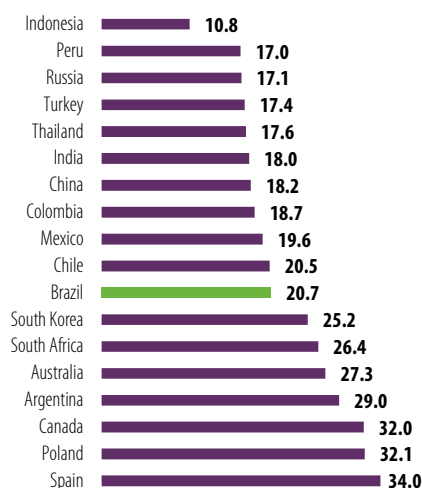
### 10 Taxes sub-factor



Source: CNI

Note: Average scores (0 = worst performance; 10 = best performance)

### 10.1 Collected total tax revenues (2015)

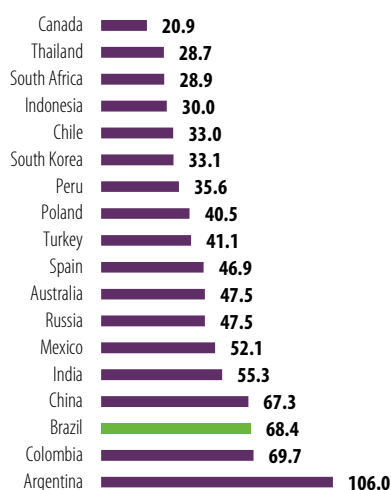


Percentage of GDP

Source: IMD World Competitiveness Yearbook 2017

Note: Mexico (2013); India and Poland (2014).

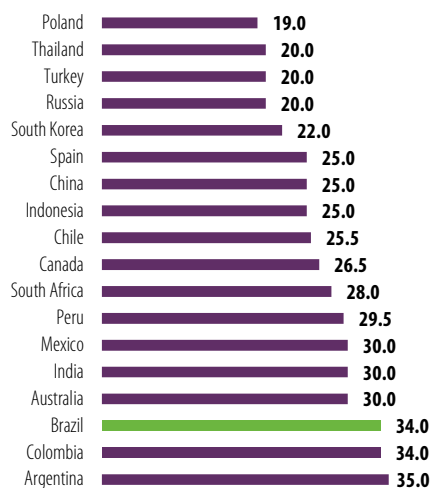
### 10.2 Total tax rate (% of profit) (2017)



Total taxes paid by a company as a percentage of its profits (the profit or corporate income tax, social contributions and labor taxes paid by the employer, property taxes, property transfer taxes, dividend tax, capital gains tax, financial transactions tax, waste collection taxes, vehicle and road taxes, and any other small taxes or fees).

Source: Doing Business 2018, World Bank

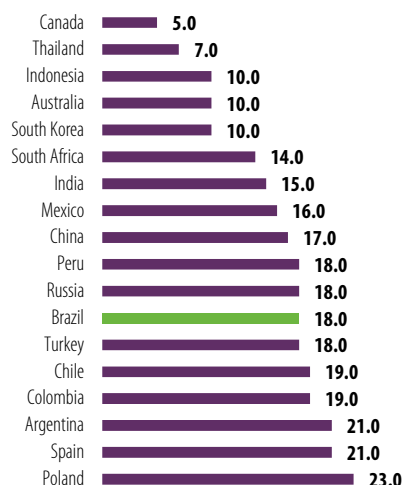
### 10.3 Corporate tax rates (2017)



Corporate tax rates

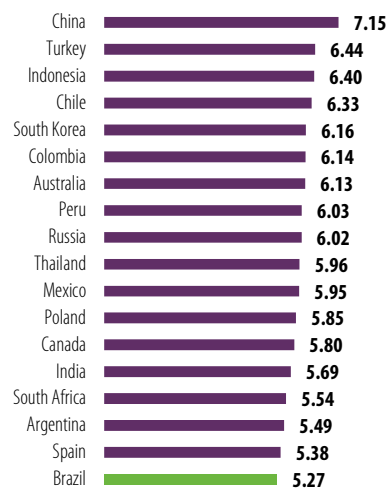
Source: Taxes Rates Online, KPMG

### 10.4 Indirect tax rates (2017)



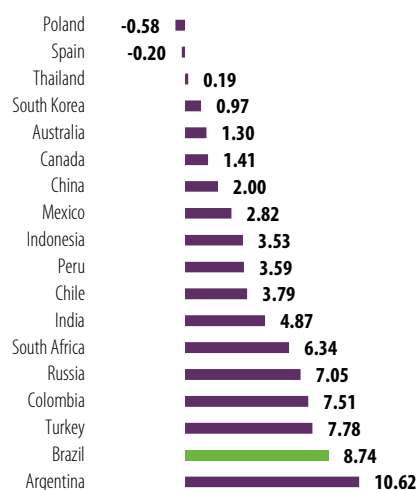
Indirect tax rates  
Source: Taxes Rates Online, KPMG

### 11 Macroeconomic indicators sub-factor



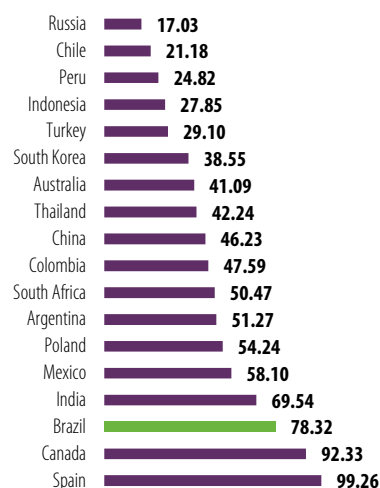
Source: CNI  
Note: Average scores (0 = worst performance; 10 = best performance)

### 11.1 Inflation (2016 or most recent year available)



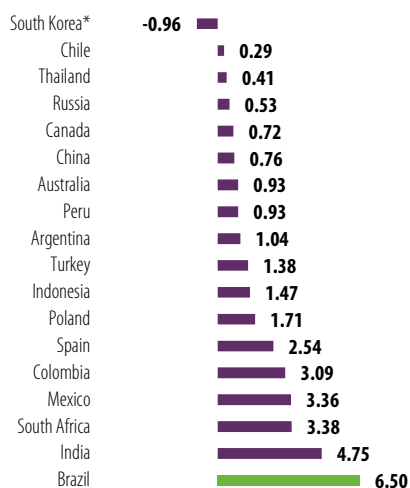
Annual percent change in consumer price index (year average)  
Source: The Global Competitiveness Report 2017-2018, World Economic Forum  
Note: Argentina (2013)

### 11.2 General government debt (2016)



Percentage of GDP.  
Source: The Global Competitiveness Report 2017-2018, World Economic Forum

### 11.3 General government net debt interest payments (% GDP) (2016)

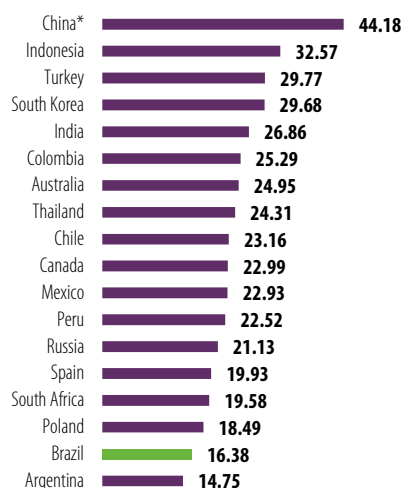


Interest payments on government debt, obtained by the difference between General government net lending/borrowing and General government primary net lending/borrowing. Percentage of GDP.

Source: CNI estimated based on data by World Economic Outlook Database, Oct. 2017, IMF

\*Interest revenues

### 11.4 Gross fixed capital formation (2016)

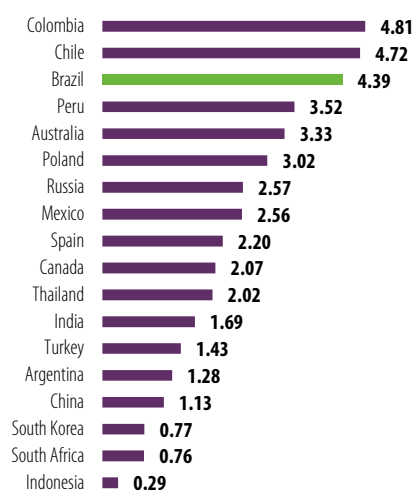


Percentage of GDP.

Source: IMD World Competitiveness Yearbook 2017

\*The Source is World Economic Outlook Database, Oct. 2017, IMF.

### 11.5 Direct investment flows inward (2016)

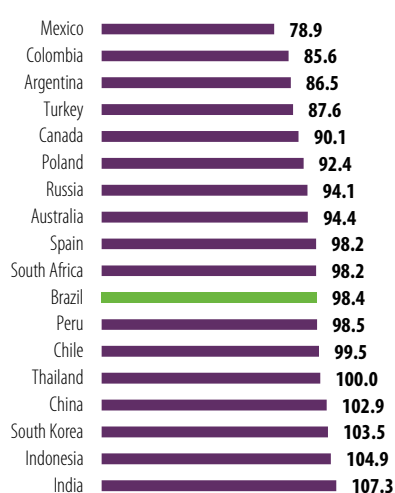


Percentage of GDP.

Source: IMD World Competitiveness Yearbook 2017

Note: India (2015)

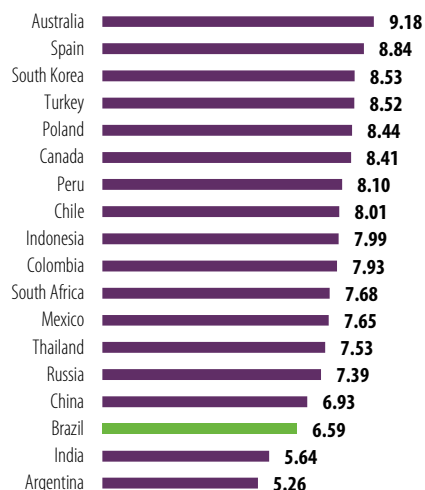
### 11.6 Real effective exchange rate (dec/2016)



Real effective exchange rate (monthly average) on the reference date, expressed as a percentage of the arithmetic average of the monthly rates observed from January 2012 to December 2016.

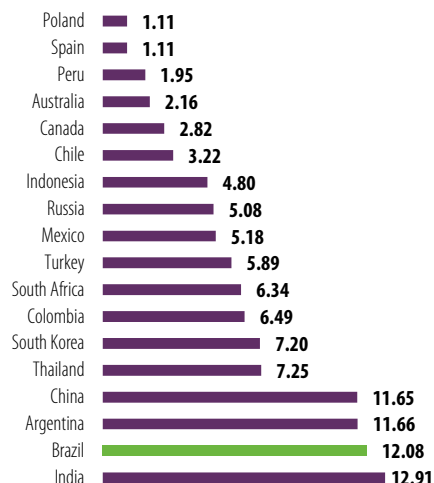
Source: Prepared by CNI, based on the real exchange rate estimated by the Bank for International Settlements (BIS).

### 12 Competition sub-factor



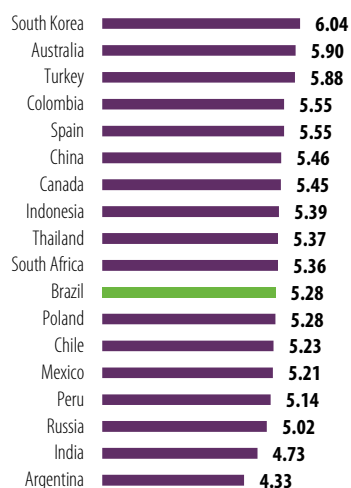
Source: CNI  
Note: Average scores (0 = worst performance; 10 = best performance)

### 12.1 Trade tariffs (2016 or most recent year available)



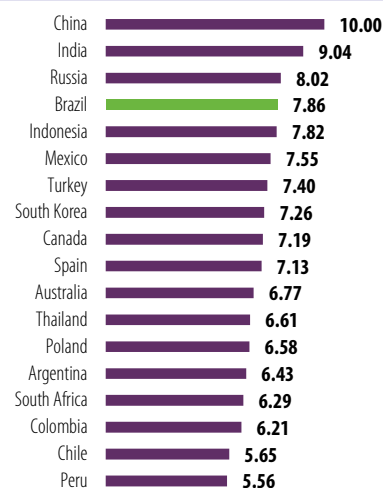
Trade-weighted average tariff rate. The weights are the trade patterns of the importing country's reference group.  
Source: The Global Competitiveness Report 2017-2018, World Economic Forum  
Note: Indonesia (2013); Colombia, Mexico and Peru (2014); Chile, South Korea and Thailand (2015)

### 12.2 Intensity of local competition (2016-2017 weighted average)



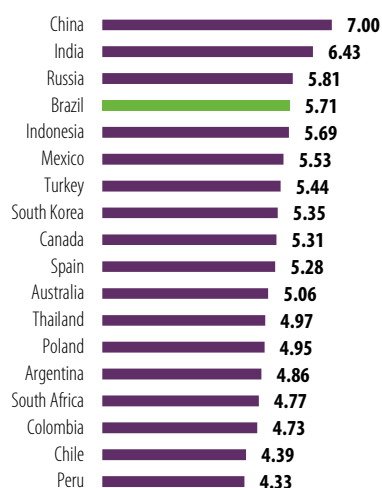
Variable generated from answers to the question: In your country, how intense is competition in the local markets? [1 = not intense at all; 7 = extremely intense].  
Source: The Global Competitiveness Report 2017-2018, World Economic Forum

### 13 Scale sub-factor



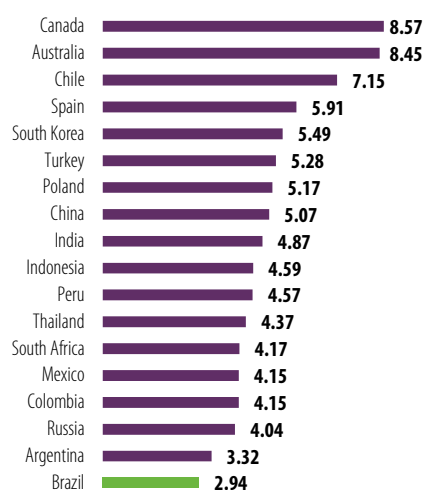
Source: CNI  
Note: Average scores (0 = worst performance; 10 = best performance)

### 13.1 Domestic market size (2016 or most recent year available)



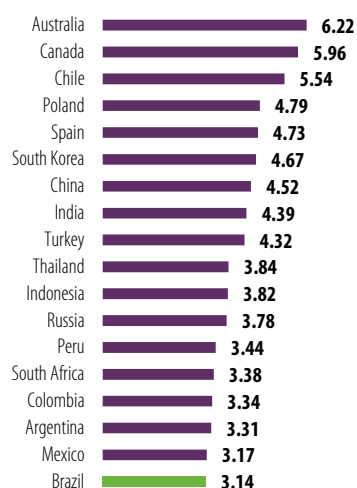
Sum of gross domestic product plus value of imports of goods and services, minus value of exports of goods and services, normalized on a 1-7 (best) scale  
Source: The Global Competitiveness Report 2017-2018, World Economic Forum

### 14 Government Efficiency sub-factor



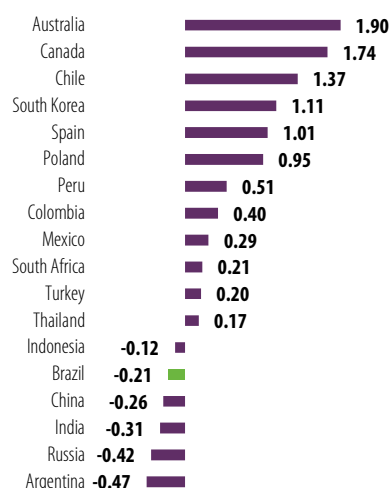
Source: CNI  
Note: Average scores (0 = worst performance; 10 = best performance)

### 14.1 Irregular payments and bribes (2016-2017 weighted average)



Variable generated from answers to the following questions: In your country, how common is it for firms to make undocumented extra payments or bribes connected with (a) imports and exports; (b) public utilities; (c) annual tax payments; (d) awarding of public contracts and licenses; (e) obtaining favorable judicial decisions? [1 = very common; 7 = never occurs]  
Source: The Global Competitiveness Report 2017-2018, World Economic Forum

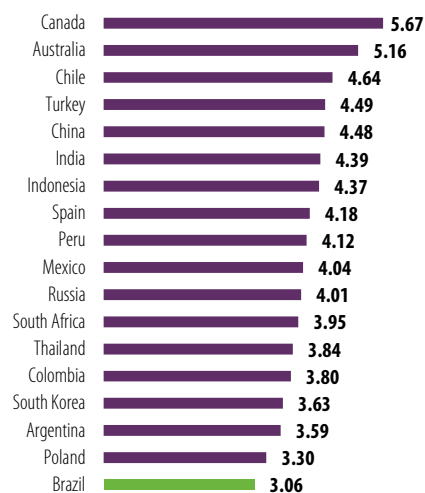
### 14.2 Regulatory Quality (2016)



Index generated based on perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development. Ranges from approximately -2.5 (weak) to 2.5 (strong) governance performance.  
Source: The Worldwide Governance Indicators, 2017

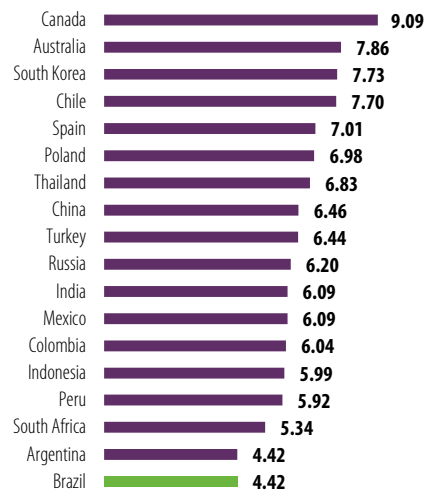


### 14.3 Transparency of government policymaking (2016-2017 weighted average)



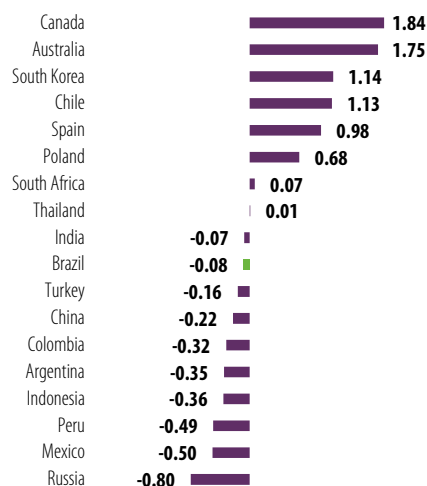
Variable generated from answers to the question: In your country, how easy is it for companies to obtain information about changes in government policies and regulations affecting their activities? [1 = extremely difficult; 7 = extremely easy]  
Source: The Global Competitiveness Report 2017-2018, World Economic Forum

### 15 Legal certainty, red tape and labor relations sub-factor



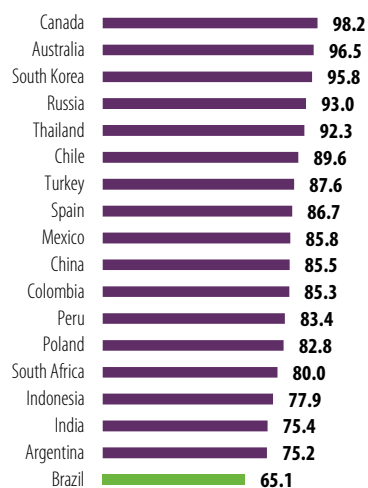
Source: CNI  
Note: Average scores (0 = worst performance; 10 = best performance)

### 15.1 Rule of Law (2016)



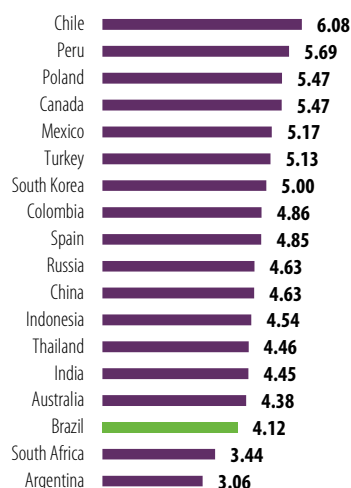
Index generated based on perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence. Ranges from approximately -2.5 (weak) to 2.5 (strong) governance performance.  
Fonte: The Worldwide Governance Indicators, 2017

### 15.2 Starting a business (2017)



Distance to frontier (0-100 scale). Simple average of scores in four indicators: (1) procedures to legally start and formally operate a company (number); (2) time required to complete each procedure (calendar days); (3) cost required to complete each procedure (percentage of per capita income); (4) paid-in minimum capital (percentage of per capita income).  
Source: Doing Business 2018, World Bank

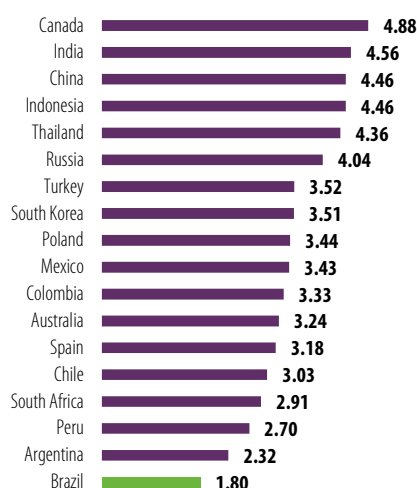
### 15.3 Flexibility of wage determination (2016-2017 weighted average)



Variable generated from answers to the question: In your country, how are wages generally set? [1 = by a centralized bargaining process; 7 = by each individual company]

Source: The Global Competitiveness Report 2017-2018, World Economic Forum

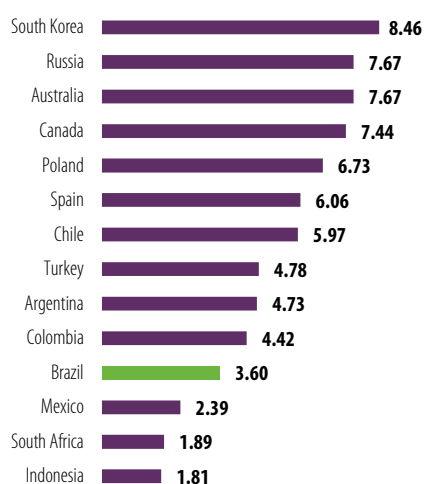
### 15.4 Hiring and firing practices (2016-2017 weighted average)



Variable generated from answers to the question: In your country, to what extent do regulations allow flexible hiring and firing of workers? [1 = not at all; 7 = to a great extent]

Source: The Global Competitiveness Report 2017-2018, World Economic Forum

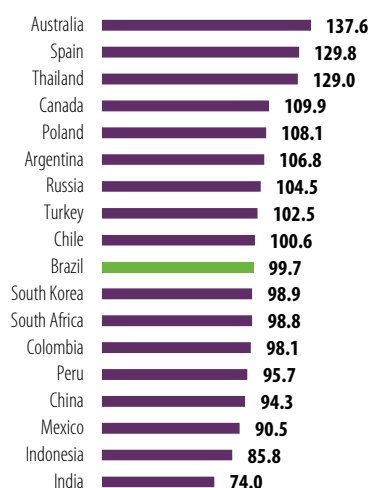
### 16 Educational attainment sub-factor



Source: CNI

Note: Average scores (0 = worst performance; 10 = best performance)

### 16.1 Gross enrolment ratio in secondary education (2015)

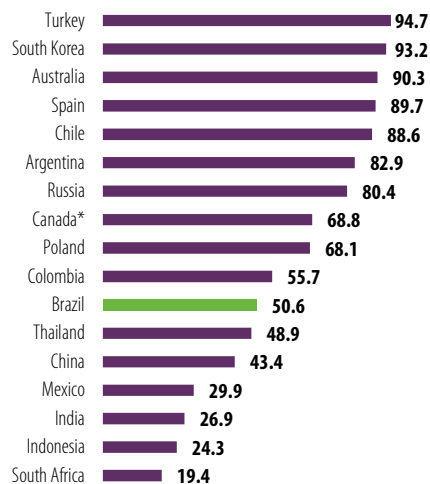


Number of students enrolled in secondary level, regardless of age, expressed as a percentage of the official school-age population corresponding to the same level of education.

Source: UNESCO Institute for Statistics

Note: Canada (2013); Argentina, Australia, Mexico, Poland and South Africa (2014).

### 16.2 Gross enrolment ratio in tertiary education (2015)



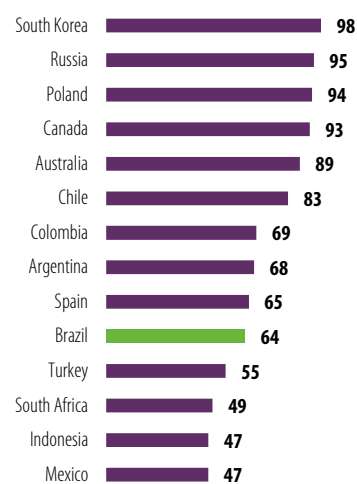
Number of students enrolled in tertiary level, regardless of age, expressed as a percentage of the official school-age population corresponding to the same level of education.

Source: UNESCO Institute for Statistics

Note: Argentina, Australia, Mexico, Poland and South Africa (2014).

\* The source is The Global Competitiveness Report 2017-2018, World Economic Forum

### 16.3 Percentage of adults who have attained at least upper secondary education (2016)

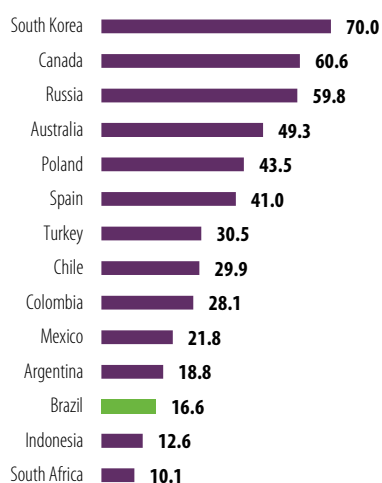


Percentage of adults aged between 25 and 34 who have attained at least upper secondary education

Source: Education at a Glance 2017, OECD

Note: Argentina (2014); Brazil, Chile, Indonesia, Russia and South Africa (2015).

### 16.4 Percentage of adults who have attained at least tertiary education (2016)



Percentage of adults aged between 25 and 34 who have attained tertiary education

Source: OECD

Note: Argentina (2014); Brazil, Chile, Indonesia, Russia and South Africa (2015).

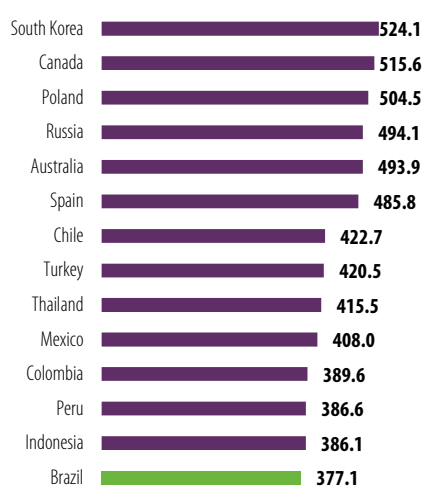
### 17 Educational assessment sub-factor



Source: CNI

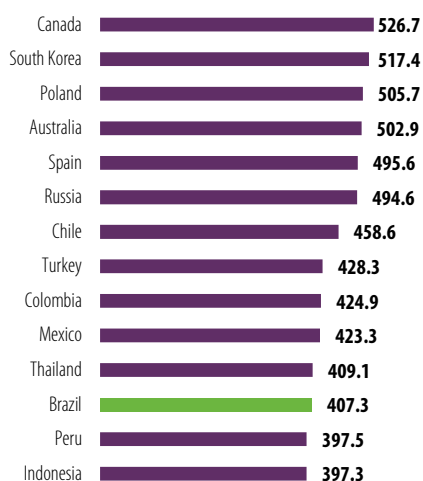
Note: Average scores (0 = worst performance; 10 = best performance)

### 17.1 Performance in mathematics (2015)



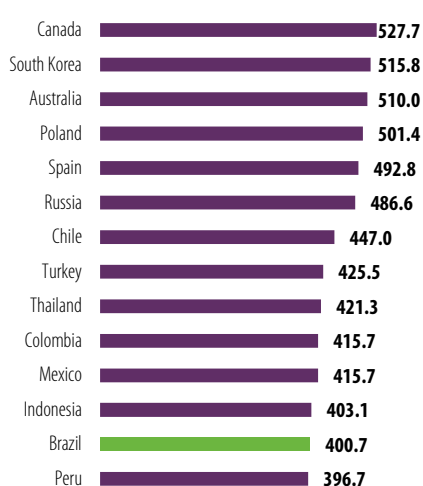
Average scores in math tests, 15-year-old students  
Source: PISA 2015, Excellence and Equity in Education, OECD.

### 17.2 Performance in reading (2015)



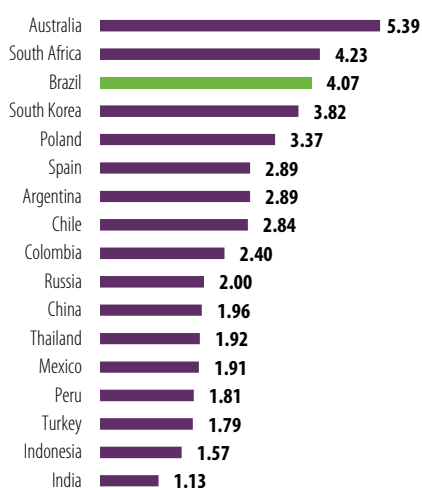
Average scores in reading tests, 15-year-old students  
Source: PISA 2015, Excellence and Equity in Education, OECD.

### 17.3 Performance in science (2015)



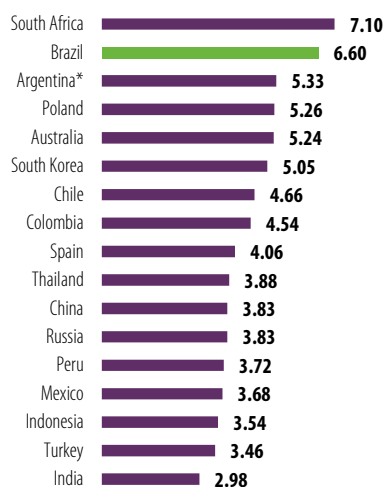
Average scores in science tests, 15-year-old students  
Source: PISA 2015, Excellence and Equity in Education, OECD.

### 18 Expenditure on education sub-factor



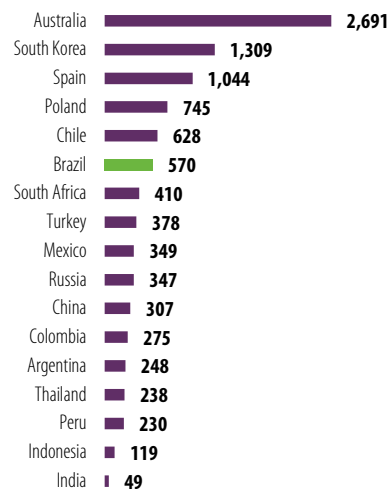
Source: CNI  
Note: Average scores (0 = worst performance; 10 = best performance)

### 18.1 Total public expenditure on education (2015)



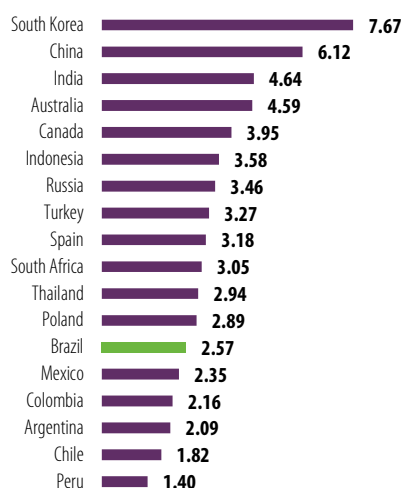
Percentage of GDP.  
Source: IMD World Competitiveness Yearbook 2017  
Note: Argentina and Poland (2014).  
\* The source is UNESCO Institute for Statistics.

### 18.2 Total public expenditure on education per capita (2015)



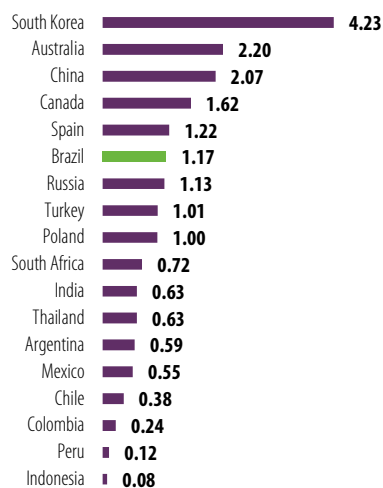
US\$ per capita  
Source: IMD World Competitiveness Yearbook 2017  
Note: South Korea (2013); Poland (2014).

### 19 Government support for innovation sub-factor



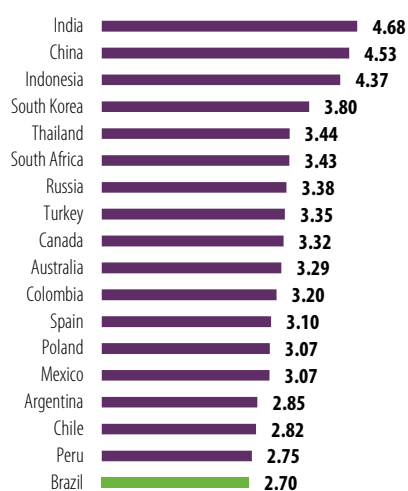
Source: CNI  
Note: Average scores (0 = worst performance; 10 = best performance)

### 19.1 Gross domestic expenditure on R&D (2015)



Percentage of GDP.  
Source: UNESCO Institute for Statistics  
Note: Australia, Indonesia and South Africa (2013); Argentina, Brazil, Canada and Turkey (2014).

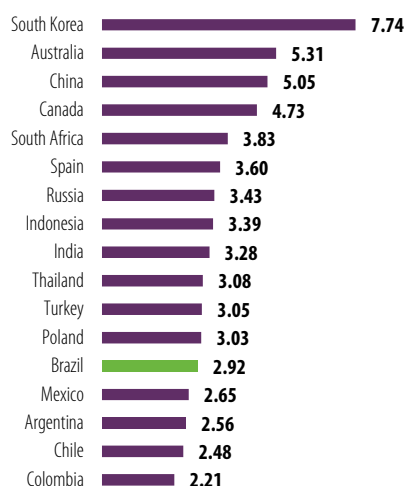
### 19.2 Government procurement of advanced tech products (2016-2017 weighted average)



Variable generated from answers to the question: In your country, to what extent do government purchasing decisions foster innovation? [1 = not at all; 7 = to a great extent]

Source: The Global Competitiveness Report 2017-2018, World Economic Forum

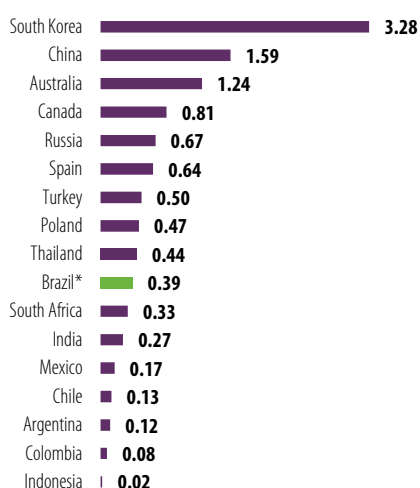
### 20 R&D and innovation in companies sub-factor



Source: CNI

Note: Average scores (0 = worst performance; 10 = best performance)

### 20.1 Gross expenditure on R&D performed by business enterprise (2015)



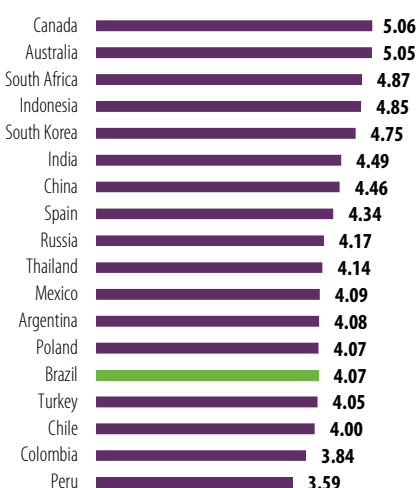
Percentage of GDP.

Source: UNESCO Institute for Statistics

Note: Australia, Indonesia and South Africa (2013); Argentina, Canada and Turkey (2014).

\* CNI estimate based on data from IBGE's National Accounts - reference year 2010.

### 20.2 Capacity for innovation (2016-2017 weighted average)



Variable generated from answers to the question: In your country, to what extent do companies have the capacity to innovate? [1 = not at all; 7 = to a great extent]

Source: The Global Competitiveness Report 2017-2018, World Economic Forum







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