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BRAZIL COMPETITIVENESS PROFILE

May 2015

PRESENTATION

This essay provides sector indicators capable of depicting Brazil's competitiveness profile. Prepared by FGV Projetos and published by the Financial Times in a special volume, it is aimed at contributing for improved comprehension of the various economic sectors in the country.

The study is the first of a series that will be prepared every year and opened for consultation by experts, governments and interested investors.

We hope that this unique and impartial work can be an actual contribution for Brazil's economic and social development.

Enjoy the Reading!

Cesar Cunha Campos
Director
FGV Projetos

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Content

TECHNICAL NOTE

Authorship

This report has been coordinated and elaborated by FGV Projetos and presents the first results of a major, ongoing collaborative effort between FGV and the Financial Times. It provides the base for the implementation of a worldwide multiplatform initiative on the **BRAZIL COMPETITIVENESS PROFILE** that includes live events and a Financial Times Special Report.

Stated Purpose

This report presents first results of an innovative approach to competitiveness which allows for the dynamic comparison of the competitiveness of different localities and productive sectors in Brazil. The facts and figures presented and discussed in this report and in differing formats in the future, are meant to guide foreign investors in making the right choices to optimize

productivity and ease investment risks, while allowing Brazilian policy and decision-makers to track their progress over time and make the necessary choices that will keep the country on a sustainable growth path.

Analytical Focus

The report is centered on two main lines of analysis:

Analytical Focus I: 558 Microregions

The competitiveness of the 558 Brazilian microregions is measured based on a comprehensive set of 224 indicators structured across 14 dimensions and 6 vectors of competitiveness.

Analytical Focus II: 56 Productive Sectors

It is analyzed the influence of two major macroeconomic variables – exchange rate and fiscal burden – on the competitiveness of 56 productive sectors.

Data Sources

The analysis is based on data from the latest statistics, obtained

from public and private institutions. The 224 indicators are described in detail in the annex of this report.

Presentation of Data

Analytical Focus I: 558 Microregions

In order to shed light on the complexity and dynamics of regional competitiveness, data is organized and presented in a wide variety of ways and on a range of levels.

The microregions are ranked in an aggregated index and in accordance to their score per individual dimension and vector. For each case, the Top 20 highest scoring regions accompanied by a heat map are presented. Furthermore, the Top 10 most competitive microregions are profiled in order to understand which factors account for their outstanding performance.

For selected indicators, data is presented at the level of the 26 Brazilian states and the Federal District. For these cases, the 5 best and the 5 worst-ranking states are listed. In addition, the 3 most competitive microregions of each state and the Federal District are identified.

In order to further enrich the analysis, interesting phenomena are highlighted, through municipal-level data analysis and cluster analysis, among others.

Analytical Focus II: 56 Productive Sectors

All information on the effects of exchange rate and fiscal burden on sectorial competitiveness are presented in the form of illustrative graphs supported by in-depth and accessible analysis.

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PART 1: INTRODUCTION

i. An Innovative Approach to Competitiveness

The **BRAZIL COMPETITIVENESS PROFILE** is a dynamic multi-level analysis of Brazilian competitiveness, built on a solid base of empirical support, methodological rigor and the latest available data.

It is a rich knowledge source that intends to go beyond common grounds, by highlighting interesting phenomena which may be further investigated through in-depth data analysis and case studies.

The main goal of the project is to draw lessons from the data and spur debate among private and public decision-makers, thus enriching the discussion about Brazil's present and future.

The project is based on a benchmarking of existing studies of global and country competitiveness, but expands on them in a number of ways, as will be detailed in the following.

Innovative Aspects of the BRAZIL COMPETITIVENESS PROFILE

1. The data set used to assess the competitiveness of different Brazilian localities is **unique in its scope and quality**. It includes 224 indicators across 14 dimensions which, for reasons of accessibility and analysis, have been organized into 6 key vectors of competitiveness.
2. Beyond the aggregated index which positions microregions according to their relative competiveness, the main breakthrough of the study lies in the **data presented for each dimension and vector of competitiveness**. It enables policymakers, investors and the general public to identify, for each microregion, those specific factors which drive and limit its competitiveness. A better understanding of the relative strengths and weaknesses of each locality helps decision-makers to make better use of comparative advantages, identify priorities for improvement, and trace strategies to encourage growth and investment across regions and sectors.
3. The dimensions and their respective indicators are tailored to reflect the issues that matter for the development of Brazil, under consideration of the **data available on a consistent basis** for the 26 states and the Federal District, as well as for the 5569 municipalities.
4. Last but not least, it is the first study of its kind that combines **macro and micro aspects of competitiveness**. On the micro-level, it measures and compares the competitiveness of 558 microregions. On the macro-level, it measures and compares the impact of fiscal burden and exchange rate on the competitiveness of 56 productive sectors. These two units of analysis will be presented in more detail on the following pages.

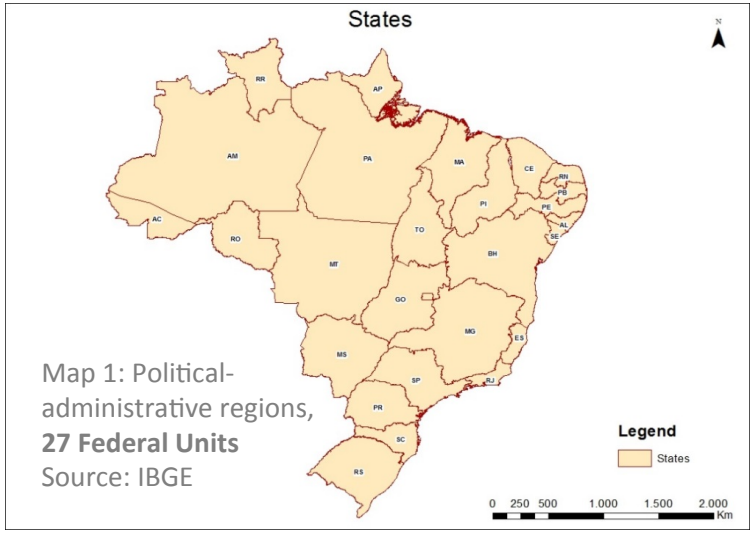
Analytical Focus I: 558 Microregions

In today's global economy, countries, regions and cities are constantly being watched. Monitoring, benchmarking, and measurement of “performance” and “best practices” have assumed key significance for policymakers and analysts, as well as international organizations such as the World Bank, the IMF and the OECD. More recently, emphasis has been placed on regional competitiveness, mirroring a growing evidence that many of the factors that raise economic productivity are generated at sub-national scales.

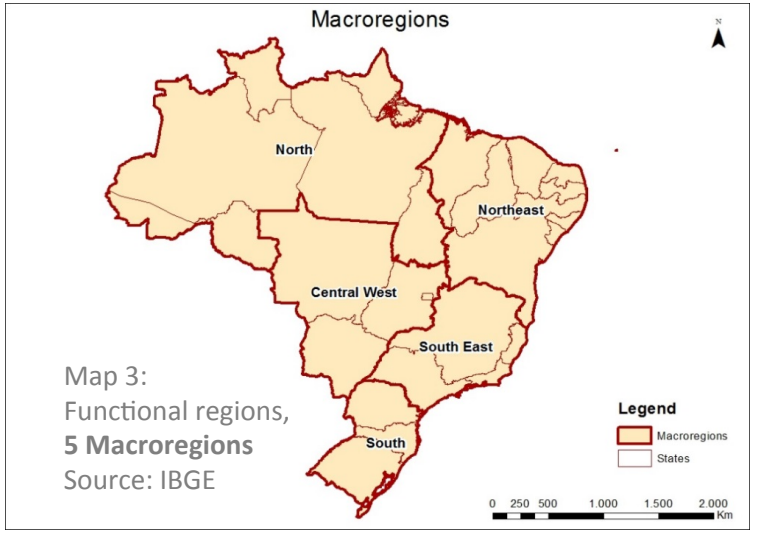
In a continent-sized country like Brazil, a regional comparative approach to competitiveness is particularly useful. However, a comprehensive analysis of Brazilian competitiveness across sub-national scales is lacking.

The BRAZIL COMPETITIVENESS PROFILE seeks to fill this gap, by assessing how different localities in Brazil are developing across different dimensions of competitiveness.

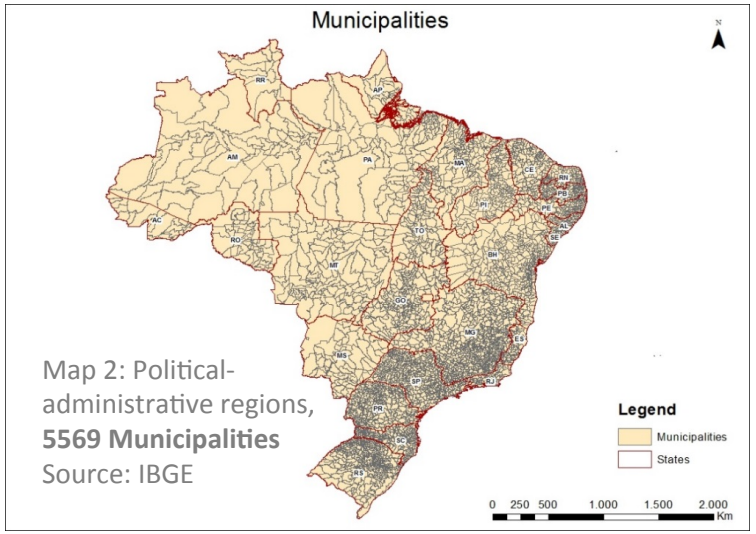
The analysis has been done for each of the 5569 Brazilian municipalities and then aggregated at the level of its 558 microregions. A closer look at the territorial division of Latin America's largest country (8,514,000 square kilometers) explains this methodological choice: Brazil is divided into 27 federal units and 5569 municipalities (or political-administrative regions, see Maps 1 and 2 on the following page) as well as 5 macroregions and 558 microregions (or functional regions, see Maps 3 and 4 on the following page).



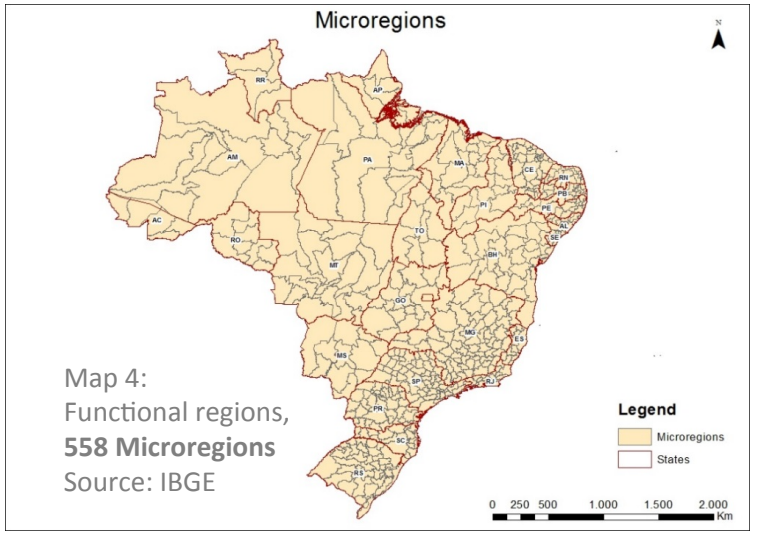
Map 1: Political-administrative regions, **27 Federal Units**
Source: IBGE



Map 3: Functional regions, **5 Macroregions**
Source: IBGE



Map 2: Political-administrative regions, **5569 Municipalities**
Source: IBGE



Map 4: Functional regions, **558 Microregions**
Source: IBGE

Each microregion is formed by a group of adjacent municipalities and has been defined by IBGE (the national statistics institute) according to similar characteristics regarding the production structures and social strata of its municipalities. This fact makes the microregion a more interesting and relevant unit of analysis for foreign and Brazilian investors, as compared to municipalities (which are defined for political reasons rather than socioeconomic logic) or federal units. The latter would render the regional competitiveness analysis less accurate, as they include localities that differ substantially in socioeconomic characteristics. The second part of this report (PART 2: MEASURING THE COMPETITIVENESS OF BRAZIL'S 558 MICROREGIONS) presents the research approach and first results in the form of maps, rankings and supporting analysis. The microregions are ranked in an aggregated index and in accordance to their score per individual dimension and selected component.

Each map is accompanied by a list of the 20 highest ranking microregions. In order to enrich the analysis, the 26 Brazilian states and the federal district are ranked according to individual indicators. For these cases, the 5 best and 5 worst-ranking states are listed.

Analytical Focus II: 56 Productive Sectors

Brazil is among the countries with the highest business tax burden in the world. According to the OECD, the total commercial tax, as a percentage of its profits, amounted to 69% in 2014. The business tax burden imposed by Brazil's international and regional competitors China and Mexico are lower (64,6% and 52% respectively) and significantly lower in other Latin American countries, such as Chile (28%). A second factor which considerably influences Brazil's international competitiveness is the exchange rate. According to the Open Market Index of the International Chamber of Commerce,

Brazil ranked 67 out of 75 countries in 2013. On the other hand, some of its products have recently been integrated into global value chains and contribute to expand import and export volumes. This environment generates a lot of debate about the optimum exchange rate.

In order to advance this debate, the third part of this report (MACROECONOMIC VARIABLES AND SECTOR COMPETITIVENESS) provides investors and policymakers with a comprehensive analysis of the influence of exchange rate and taxes on the competitiveness of 56 productive sectors of Brazil. All information will be presented in the form of illustrative graphs supported by accessible analysis.

All in all, the BRAZIL COMPETITIVENESS PROFILE offers international and Brazilian investors a source of qualified insights into which regions, states and sectors offer the best opportunities, both overall and in specific areas. At the same time, Brazilian policymakers find solid evidence for weaknesses, strengths as well as underlying trends of development which will, hopefully, be transformed into sustainable policy action and more sound investment decisions.

Before presenting first results for each of the two units of analysis, the concept of competitiveness which guides the analysis will be discussed briefly.

ii. Disclosing the Concept of Competitiveness

There have been many definitions for the term “competitiveness” over the years. At face value, it implies a potential, a latent ability to compete, but also the presence of circumstances that enable such a capacity to be actualized. This notion of a meeting between a potential and the conditions for its actualization unlocks a common thread along ideas that risk otherwise being linked only by a slight elusive move.

Take the dual issues of exchange rate and tax rate differentials, featured throughout this report: on their own, these could be symptoms of what Paul Krugman diagnosed in 1994 as the “dangerous obsession” of competitiveness – one that could displace sound macroeconomic policy. By the same token, however, obsessive measures to increase potential productivity, while important and particularly urgent in Brazil, are only as effective as the macroeconomic environment will allow, as an often-overvalued Real, an uncommonly heavy tax burden and

a generally unfavorable business environment pile on effective costs and prices.

Competitiveness is often contrasted with simple competition by highlighting the commonality of mediating factors across firms. This is not always clear-cut, as even firms competing within a nation prosper together as the business environment and markets evolve. Usually, however, such terms are used to evoke a wider set of common constraints. For example, classical, now-discredited "secular underdevelopment" theories argued that terms of trade were structurally biased against industrial sectors in Latin America, making competitiveness a pure matter of policy. An opposite, extreme "open economy" view would argue that differentials in productivity drive international trade and prices, thus occupying "competitiveness" wholly, regardless of mediating constraints. Actual macroeconomic dynamics aside, these contrasts between extreme views further drive the point that "competitiveness" lies neither entirely in the structural realm of potential productivity, nor in the economic imbalances that would profit from "table-tilting" policies. This is probably also true for a new context in which "competitiveness" has become a popular analytical category: regional economics.

In Focus: Regional Competitiveness

Harvard professor Michael Porter, noted author on territorial competitiveness, has argued for an "endowment"-oriented approach that closely mirrors the Potential-enabling concept presented above. Porter's split between inherited (or exogenous) endowments, such as agricultural and energy resources, and advanced (or endogenous) endowments such as institutions, technology and knowledge translates into a partition between factors that enable production to compete, and factors that determine latent productivity.

In fact, Porter's theory of advanced endowments allows to zoom into the dynamics of latent productivity. Firstly, counting technological innovation as endowment enables to see productivity growth as a slow accrual – one that can be driven by pro-business policies, but not jilted by short-term government intervention. Secondly, Porter's characterization of these endowments as "endogenous" connects the competitiveness debate back to growth theory and post-1980s models with endogenous technology, R&D and spillover effects from human capital. In a multi-regional context, it also raises the question of labor mobility and quality of life differentials.

The nature of Porter's "exogenous factors" is also instructive. This report has mentioned macroeconomic issues that might generate an uneven playing field among agents with the same potential productivity. Porter's emphasis on the particular features of the natural environment of a given locality translates, in a more general context, into an emphasis on the structural constraints that would shape the long-term profile of the economy. This also harkens back to macroeconomics, namely comparative advantage and Heckscher-Ohlin Theory.

The Open-endedness of Competitiveness

These links from terms that are both rhetorically charged and highly abstract – such as "competitiveness" – back to closely-specified economic theory have clarifying virtues: it is known what is oversimplified about Heckscher-Ohlin theory (for one, purchasing power parity applies in exchange rates). Linking back to endogenous growth theory also highlights the role of human capital (as in Paul Romer's work) and institutions (as, for example, in Acemoglu, Robinson and North). Ultimately, the fact that such clarifying links have to be teased out from the rhetoric highlights an aspect that is both a weakness and a core strength

of competitiveness as an analytical concept: its open-endedness.

On the down side, competitiveness is a vague enough notion that it risks various kinds of abuse as ad hoc justification for poorly-thought policy, particularly where no metrics are being taken and followed through. At the same time, however, competitiveness is a concept that is closer to actual, concrete questions – particularly at the policy level and investor decision making level – than to abstract considerations that could make it logically whole.

What makes sectors and regions succeed in a competitive situation? Why does a city or a microregion attract high-value economic activity rather than its neighbors? Why are certain industries relatively robust in a country (like Brazil) while others fail to get started? While competitiveness is the whole of the development puzzle, it is a very significant piece at the core of the matter, and often a very mysterious one.

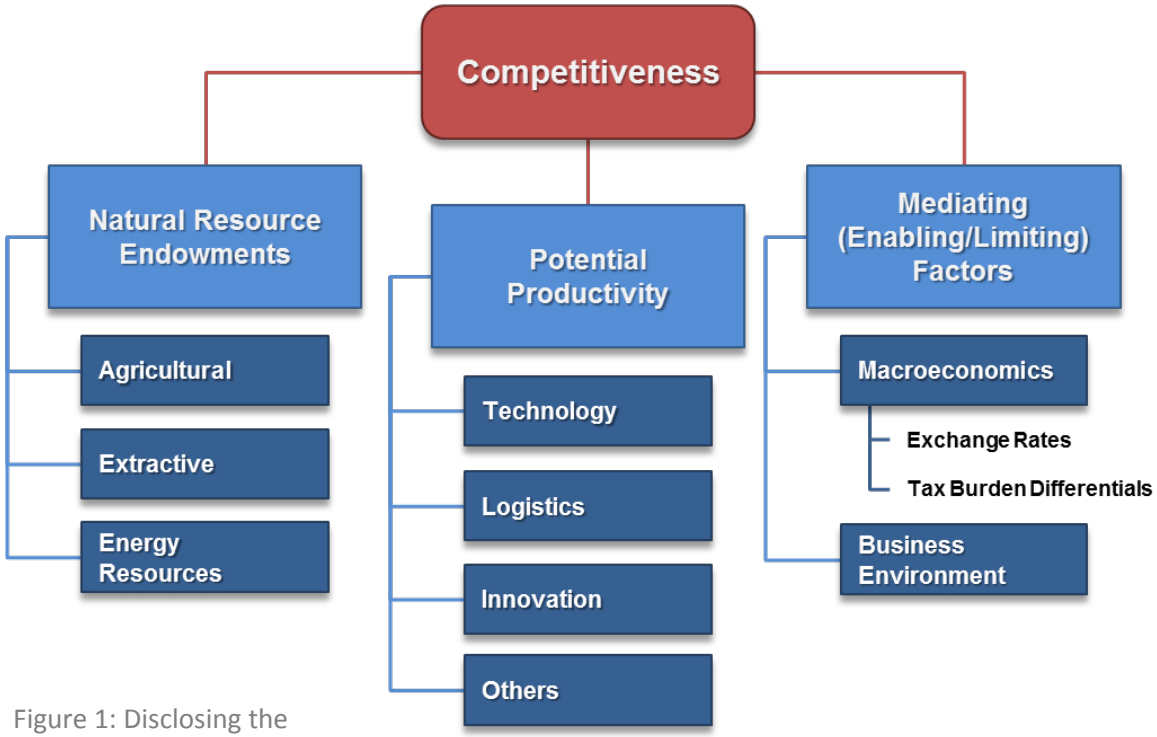


Figure 1: Disclosing the Concept of Competitiveness

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PART 2:
MEASURING THE COMPETITIVENESS OF BRAZIL'S 558 MICROREGIONS

i. Methodological Note

The BRAZIL COMPETITIVENESS PROFILE is based on an innovative methodology which permits to analyze the Brazilian competitiveness from a dynamic point of view, across different levels and dimensions. To define the scope of analysis, identify the dimensions of competitiveness, and construct the indicator data set, the researchers held thematic meetings in the months between August and December 2014. Internal studies and on-going consultations with the project leaders ensured data quality monitoring.

The framework underpinning the assessment of the competitiveness of the 558 Brazilian microregions consists of 14 dimensions which have been grouped into 6 vectors and comprise a comprehensive set of 224 indicators.

The assessment framework will be described in more detail on the following pages.

ii. Assessment Framework

14 Dimensions and 6 Vectors

The **14 dimensions** are considered key drivers of competitiveness in Brazil and have been defined based on economic theory, analysis of existing competitiveness indexes and the unique features of the Brazilian economy. Since economic competitiveness is determined by a number of interrelated factors, policies, and institutional capabilities, the 14 dimensions are highly dependent and tend to reinforce each other. For a complete list, see the following page.

The **6 vectors** group the dimensions according to macro-enablers of economic competitiveness: institutions, human capital, markets, business environment, natural resources as well as quality of life, a concept that has gained momentum in the more recent debate on the relation between competitiveness and social and environmental sustainability. Dimensions and vectors are displayed on the following page.

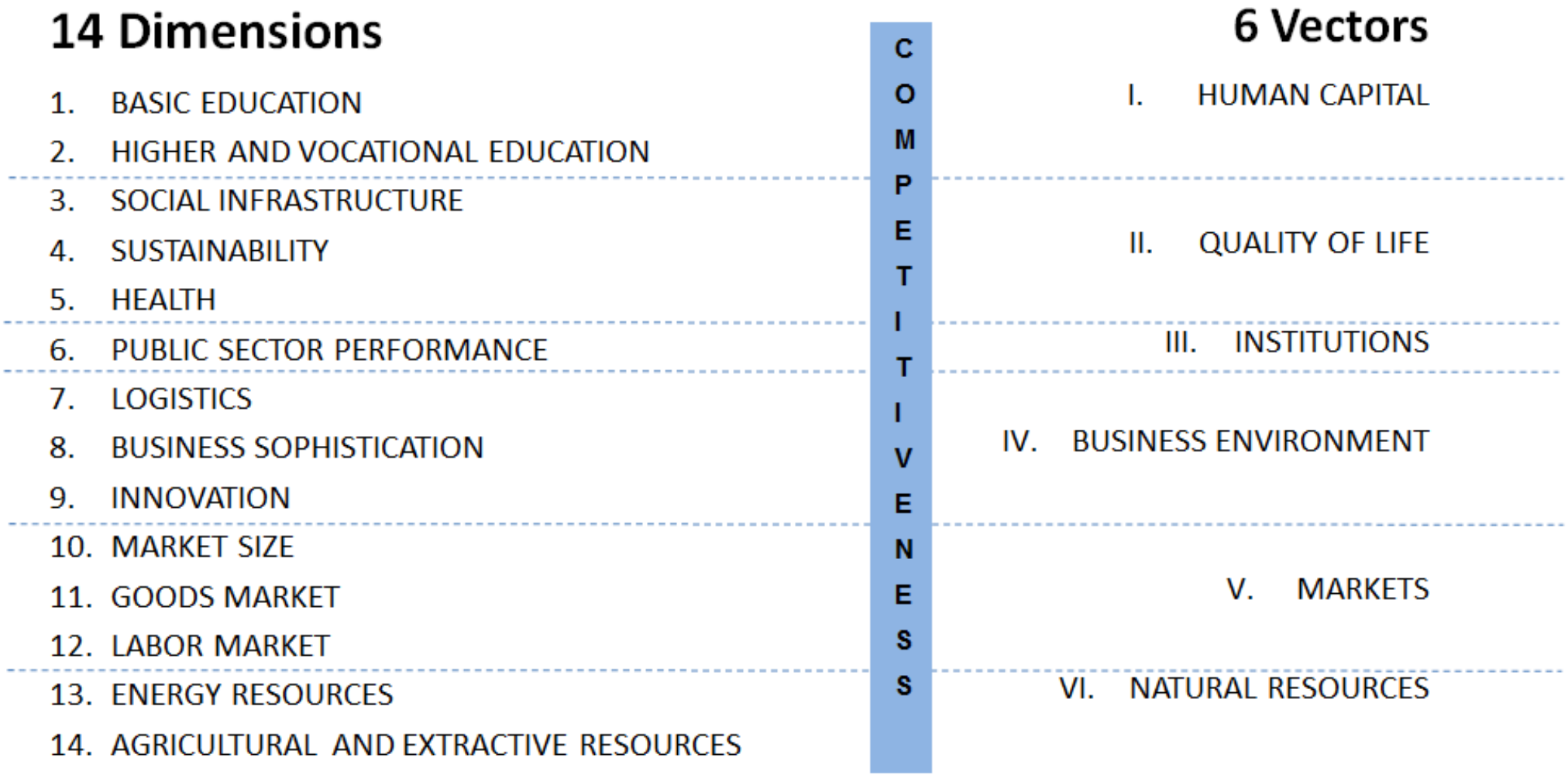


Figure 2:
Dimensions and Vectors of Brazil's Competitiveness

ii. Assessment Framework

224 Indicators

For each of the 14 dimensions, a varying number of indicators has been identified which, jointly, capture the ability of each microregion to utilize economic, institutional, social and environmental factors to increase productivity, based on quantitative as well as qualitative measures.

In total, the BRAZIL COMPETITIVENESS PROFILE comprises **224 indicators** which have been carefully selected according to the following guidelines:

- Data is freely available from public or private institutions;
- Data is sufficiently up-to-date and can be updated frequently;
- Data is comparable at the local (state or municipal) level; and
- Data stems from certified sources, thus meeting analytical and statistical requirements.

ii. Assessment Framework

Aggregation Procedure

In order to aggregate the massive amount of regional data collected for the different dimensions of competitiveness into a set of scores and rankings, data science techniques based on Principal Component Analysis were employed, thus using economic logic to help evaluate and calibrate numerical results.

Regional Aggregation

Each of the 224 indicators was aggregated to the microregional level, using either municipality population, gross domestic product or area as the weighting factor. It is important to note that each Brazilian microregion corresponds to, on average, 10 municipalities. This level of aggregation proved to give a satisfactory balance, providing substantial smoothing of outliers and grouping municipalities that individually had insufficient data, while preserving a very good amount of heterogeneity.

For indicators with only state-level data available, the state's value was taken as representative for all of its microregions.

Dimension Aggregation

In order to produce aggregate scores for each of the 14 dimensions, the microregion-level indicators were individually transformed to fit continuous and symmetric distributions as much as possible. These variables were then normalized to mean 0 and variance 1 (*z-score*) and then averaged together, either with algorithmically assigned weights (using Principal Component Analysis, or PCA) or with equal weights (simple mean), depending on the statistical and analytical properties of the PCA results. The detailed aggregation procedure is described in the Annex of this report.

Score Aggregation

An important final result of this framework was to produce a global competitiveness score for Brazil's microregions, including all 14 dimensions. This score is calculated as a weighed average of the (normalized) scores for each dimension, once more using Principal Component Analysis to assign weights.

For simplicity and ease of understanding, the aggregation of scores for the 6 vectors of competitiveness was performed as a simple mean of dimension scores for each vector's dimensions. The details of this calculation procedure, as well as a detailed list of all indicators descriptions, can be found in the Annex of this report.

In the following, the results of the competitiveness assessment will be presented for different levels and dimensions.

iii. Results

In order to shed light on the dynamics of Brazilian competitiveness, the main results of the assessment will be presented at different levels, in the following order:

- **Results per Dimensions**:

  RANKING PER MICROREGION: Which are the 20 most competitive regions when all indicators of the dimension are considered?

  RANKING PER STATE: Which are the 5 most and least competitive states when looking at individual indicators?

  INTERESTING PHENOMENA: What interesting phenomena can be observed?

- **Results per Vector**: Which are the 20 most competitive regions when all dimensions included in the vector are considered?
- **Final Result:** Which are the 20 most competitive microregions when all 224 indicators are aggregated? Which are the success factors of the Top 10? And which are the 3 most competitive regions of each of the 26 states and the Federal District?

Results per dimension

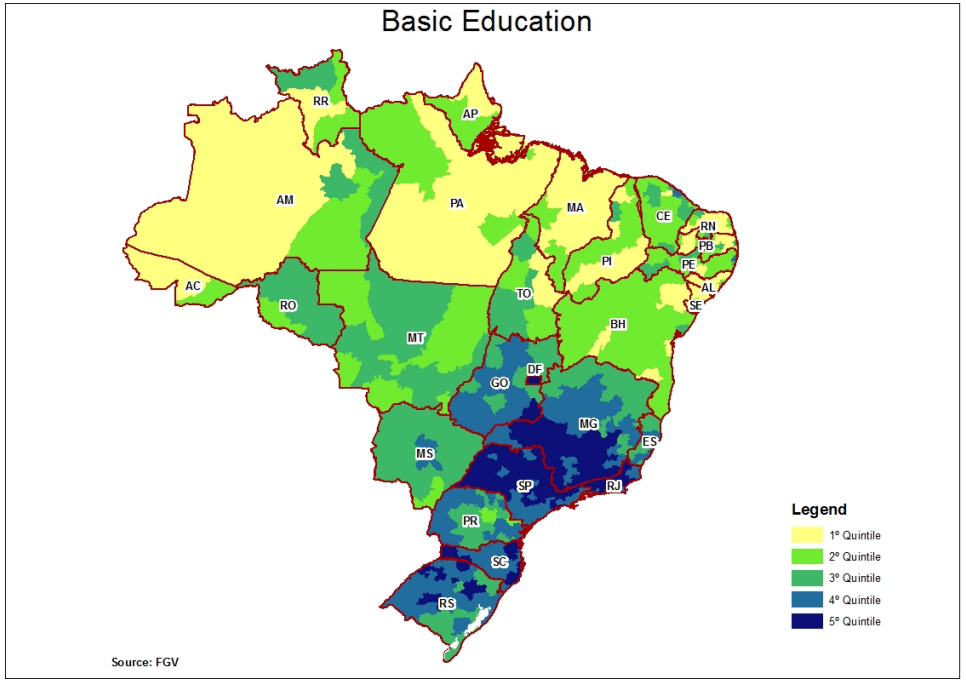
1. **BASIC EDUCATION**
2. HIGHER AND VOCATIONAL EDUCATION
3. SOCIAL INFRASTRUCTURE
4. SUSTAINABILITY
5. HEALTH
6. PUBLIC SECTOR PERFORMANCE
7. LOGISTICS
8. BUSINESS SOPHISTICATION
9. INNOVATION
10. MARKET SIZE
11. GOODS MARKET
12. LABOR MARKET
13. ENERGY RESOURCES
14. AGRICULTURAL AND EXTRACTIVE RESOURCES

The quality of **basic education** received by the population of each microregion is an important indicator for its ability to be competitive in the global knowledge economy, as it enables individuals to efficiently participate in the labor market and reduces social inequalities. A low level of basic education can become a constraint on business development, with firms finding it difficult to move up the value chain by producing more sophisticated products. This dimension includes **12 indicators**, which measure the following aspects considered crucial for a competitive basic education system:

- Primary and secondary school performance
- Class size
- College preparedness
- Literacy
- Youth in school at critical age

RANKING PER MICROREGION: All indicators

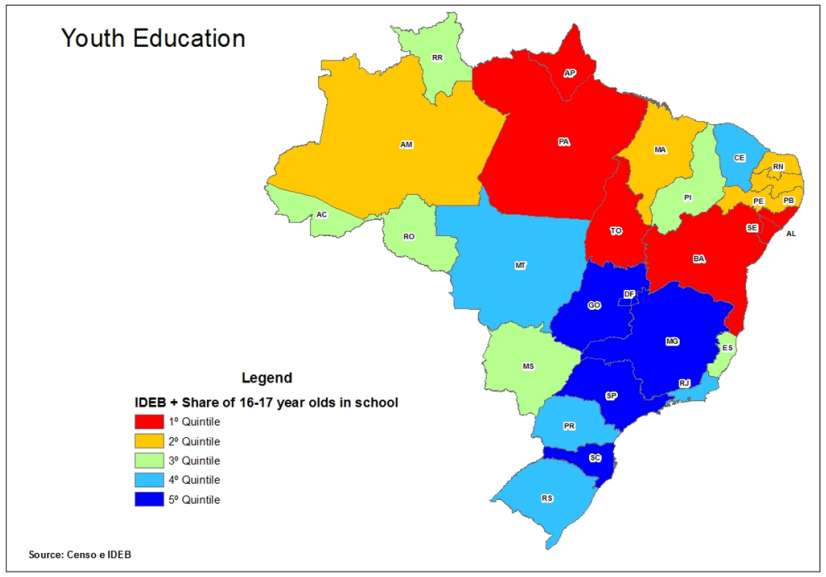
Approximately 75% of the Top 20 microregions in the field of basic education are located in the state of São Paulo, indicating a highly efficient education system. The highest ranking microregion is Fernandópolis. Among the Southern States, the good quality of its basic education system provides a competitive edge for the state of Minas Gerais. Microregions in Pernambuco and Ceará are among the most competitive of the Northeast.



RANK	MICROREGION	STATE
1	Fernandópolis	SP
2	Marília	SP
3	Jundiaí	SP
4	São Carlos	SP
5	Jales	SP
6	Araçatuba	SP
7	Conselheiro Lafaiete	MG
8	São José dos Campos	SP
9	Bauru	SP
10	São José do Rio Preto	SP
11	Barbacena	MG
12	Juiz de Fora	MG
13	Catanduva	SP
14	Campinas	SP
15	Itajubá	MG
16	São João da Boa Vista	SP
17	Nova Friburgo	RJ
18	Limeira	SP
19	Guaratinguetá	SP
20	Piracicaba	SP

RANKING PER STATE: Youth Education

When looking at the specific area of youth education*, now at state-level, São Paulo and Minas Gerais continue to show the best performances, but the Federal District, Goiás e Santa Catarina are very competitive as well. Six states, from Sergipe, Alagoas and Bahia all the way northwest through Tocantins and Pará until Amapá, are seriously lagging behind in their capacity to educate youth capable of determining the economic future and competitiveness.

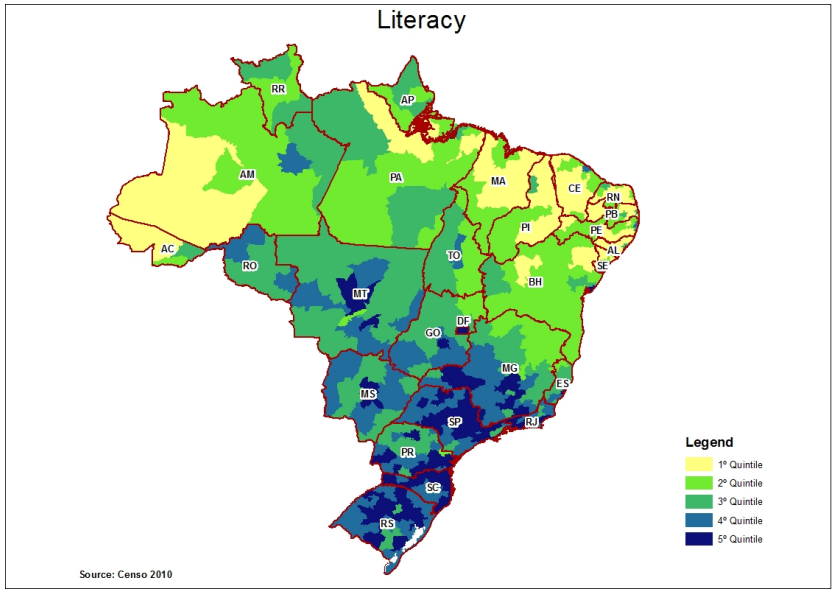


RANK	STATE
1	São Paulo (SP)
2	Minas Gerais (MG)
3	Federal District (DF)
4	Goiás (GO)
5	Santa Catarina (SC)
...	
23	Sergipe (SE)
24	Amapá (AP)
25	Pará (PA)
26	Alagoas (AL)
27	Tocantins (TO)

*Data comes from the Basic Education Development Index (IDEB) which monitors student achievement and progression flows at primary and lower secondary education (4th and 8th grade), as well as the share of 16 and 17 year olds in school

RANKING PER STATE: Literacy

Literacy* is crucial for the competitiveness of Brazil´s microregions, as it directly impacts upon the labor market potential of the population. The map shows a gradual deterioration in literacy skills from the Southern to the Northeastern regions, with a heterogeneous Central-West region and some bright stars, such as the region around Manaus in the otherwise under-performing state of Amazonas. The Federal District is leading the ranking followed by the Southern State of Santa Catarina and Rio de Janeiro in the Southeast. Surprisingly, São Paulo occupies a mere 4th place.

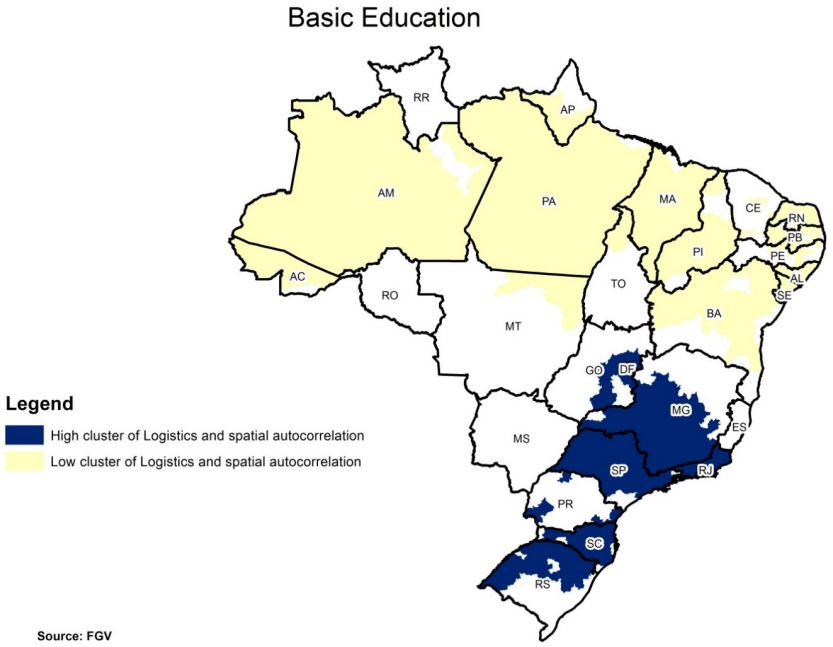


*Measured as the percentage of the population older than 5 able to read and write.

RANK	STATE
1	Federal District (DF)
2	Santa Catarina (SC)
3	Rio de Janeiro (RJ)
4	São Paulo (SP)
5	Rio Grande do Sul (RS)
...	
23	Rio Grande do Norte (RN)
24	Paraíba (PB)
25	Maranhão (MA)
26	Piauí (PI)
27	Alagoas (AL)

INTERESTING PHENOMENON: Cluster Analysis

For a more qualitative analysis of the data, clusters per state are analyzed using Spatial Autocorrelation Analysis, or SAA (see note below). The cluster of microregions with the best basic education provision is located mostly across states of the Southern and Southeastern regions, however it notably omits certain areas of these states. There is an opposing cluster of low basic education encompassing most of the Northern and Northeastern states.



About the method:

Spatial Autocorrelation Analysis, or SAA, helps to understand the degree to which one object is similar to other nearby objects. Moran's Index measures spatial autocorrelation and is classified as positive, negative and no spatial auto-correlation.

The question that guides the analysis is as follows: In which microregions or states are the clusters with the best (and worst) values located?

The map should be read as follows:

- The blue spots indicate microregions with high or positive values of the variable, which have neighbors with high values that are of statistical significance. These clusters have the best values.
- The yellow spots are the microregions with low or negative values of the variable with statistical significance. These clusters present the worst values.

INTERESTING PHENOMENON

Shining stars in basic education provision

Some interesting facts and figures emerge when the basic education indicators are analyzed and compared on the municipal level. Firstly, let's look at school quality:

- Of the top 100 municipalities in terms of school quality, some 40% come from the Southeastern state of Minas Gerais;
- The municipality of Tocos do Moji in Minas Gerais is placed 3784th in per capita income, but 13th in school quality ranking;
- Goiás is an emerging state, yet also ranking at the top with strongly performing municipalities like São Luiz do Norte, Ituaçu and Três Ranchos
- Ceará, in the Northeast, is one of the poorest Brazilian states, yet ranks high in terms of school quality (e.g. Mucambo, Sobral, Jericoacoara);

Secondly, a look at mathematics skills:

- 6 of the top 10 municipalities in this category come from the Southeastern State of Minas Gerais, however, the most competitive municipality is Palmeira in Santa Catarina followed by São João da Mata and Itaguara in Minas Gerais;
- Cocal dos Alves, in the state of Piauí (ranking second-last in literacy, see page 29), occupies a brilliant 6th place in average Mathematics scores.

WHAT ARE THESE MUNICIPALITIES DOING DIFFERENTLY?

Results per dimension

1. BASIC EDUCATION
2. **HIGHER & VOCATIONAL EDUCATION**
3. SOCIAL INFRASTRUCTURE
4. SUSTAINABILITY
5. HEALTH
6. PUBLIC SECTOR PERFORMANCE
7. LOGISTICS
8. BUSINESS SOPHISTICATION
9. INNOVATION
10. MARKET SIZE
11. GOODS MARKET
12. LABOR MARKET
13. ENERGY RESOURCES
14. AGRICULTURAL AND EXTRACTIVE RESOURCES

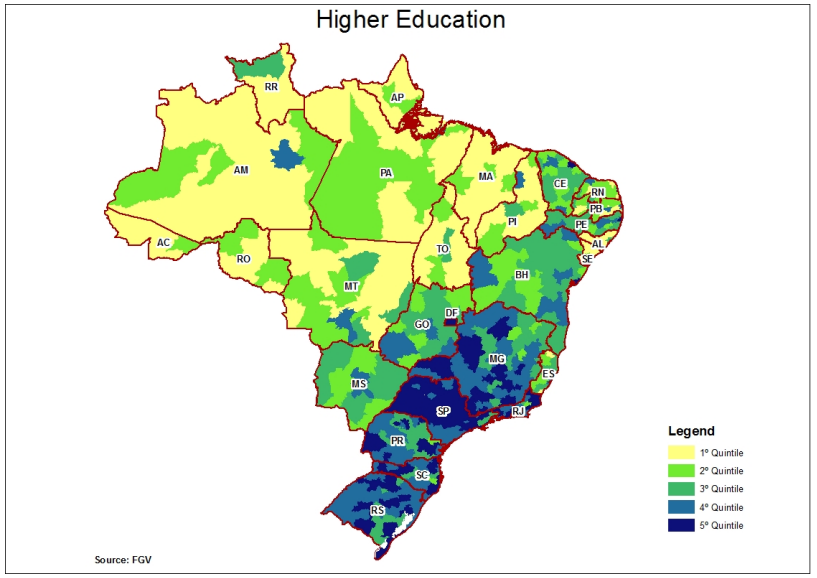
Higher and vocational education of adequate quality is crucial for economies that want to move up the value chain beyond simple production processes and products. It is a major requisite to regional competitiveness, as it produces well-educated workers which are able to adapt to the evolving needs of the production system.

This dimension evaluates the higher and vocational education provision of each microregion, including the quality of its technical, undergraduate and postgraduate courses, based on a comprehensive set of **42 indicators** which cover three crucial factors for competitiveness:

- Highly skilled labor
- Quality of academic training
- Ability to attract talent

RANKING PER MICROREGION: All indicators

Just as with basic education, 75% of the Top 20 regions in higher and vocational education provision are located in São Paulo, making the state Brazil´s powerhouse of human capital generation. Once again, Manaus appears as a shining star in the otherwise poorly performing North. Interestingly, ten microregions* of the Top 20, all located in the state of São Paulo, also rank in the Top 20 of the basic education ranking, possibly indicating how good quality of primary and secondary schooling positively affects vocational and higher education performance.

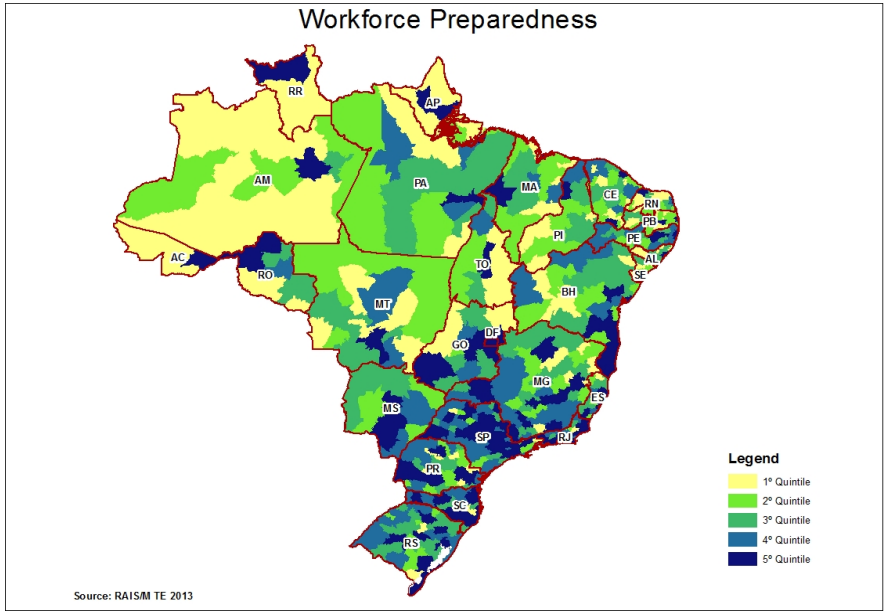


RANK	MICROREGION	STATE
1	São Paulo	SP
2	Jundiaí	SP
3	Campinas	SP
4	São José dos Campos	SP
5	Sorocaba	SP
6	Brasília	DF
7	Osasco	SP
8	Marília	SP
9	Belo Horizonte	MG
10	Fernandópolis	SP
11	Limeira	SP
12	Santa Maria	RS
13	Porto Alegre	RS
14	São Carlos	SP
15	Rio de Janeiro	RJ
16	São José do Rio Preto	SP
17	Piracicaba	SP
18	Votuporanga	SP
19	Bauru	SP
20	Ribeirão Preto	SP

*Fernandópolis, Marília, Jundiaí, São Carlos, São José dos Campos, Bauru, Campinas, Limeira, São José do Rio Preto and Piracicaba.

RANKING PER STATE: Workforce Preparedness

In terms of workforce preparedness*, a rather heterogeneous pattern can be observed. Although the overall ranking sees the Southeastern states on top, some surprises can be observed. The north of Roraima (rank 25th) close to the border of Venezuela, the Rio Branco region in Acre (24th) and the central region of Amapá (26th) are home to competitive workforces. Another "bright spot" is the region around Manaus in the state of Amazonas. At the same time, some regions in Southern states of Rio Grande do Sul (6th) and Paraná (5th) rank well below average.

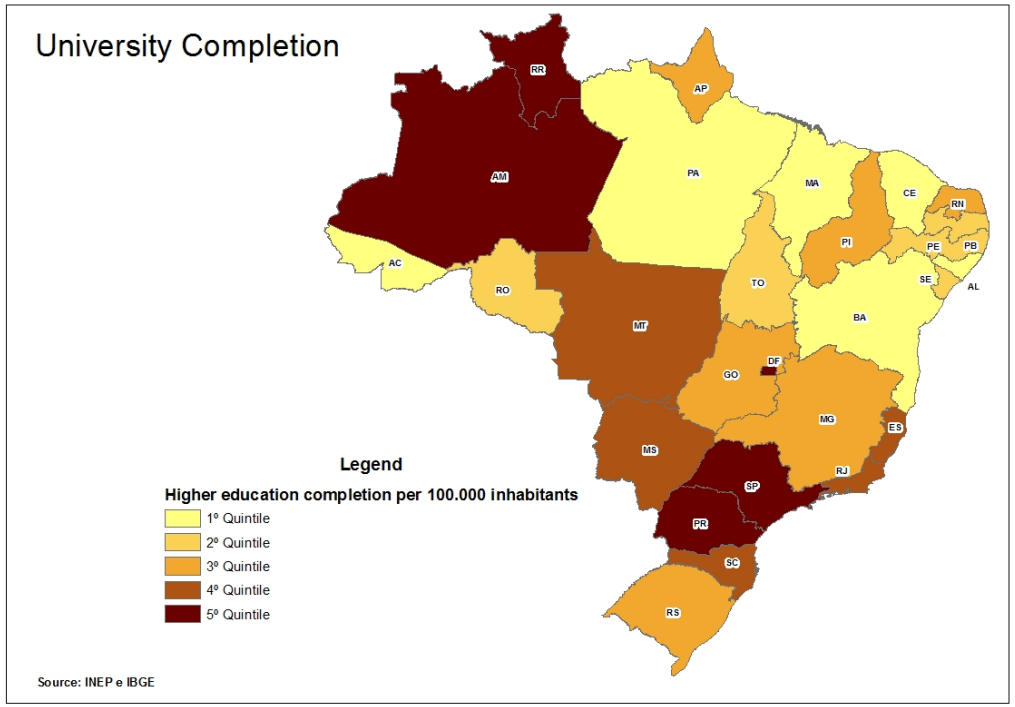


*Measured as workforce aged 25 to 64 with college degree.

RANK	STATE
1	Rio de Janeiro (RJ)
2	São Paulo (SP)
3	Federal District (DF)
4	Minas Gerais (MG)
5	Paraná (PR)
…	
23	Maranhão (MA)
24	Acre (AC)
25	Rondônia (RO)
26	Amapá (AP)
27	Tocantins (TO)

RANKING PER STATE: University Completion

As expected, the Federal District and the state of São Paulo have the highest numbers of higher education graduates per 100.000 inhabitants. Two states surprise: Roraima in the far North occupies an excellent 3rd place, while the high rank of the state of Amazonas (5th) can probably be attributed to its relatively low population density. Rio Grande do Sul, although performing well in the overall higher education ranking, is only average for university completion.



RANK	STATE
1	Federal District (DF)
2	São Paulo (SP)
3	Roraima (RR)
4	Paraná (PR)
5	Amazonas (AM)
...	
23	Acre (AC)
24	Alagoas (AL)
25	Ceará (CE)
26	Pará (PA)
27	Maranhão (MA)

INTERESTING PHENOMENON

States prioritizing engineering studies

In the global economy, countries and regions rely on Science, Technology, Engineering and Mathematics (STEM) skills to deliver world-class competitiveness. In Brazil, a lack of technical and practical engineering skills is the major cause of skill-related problems and it is crucial to build up these skills on the regional and state level. The following rank lists the 5 states which are most successful in prioritizing engineering studies*:

1. Santa Catarina (SC)
2. Minas Gerais (MG)
3. São Paulo (SP)
4. Rio de Janeiro (RJ)
5. Paraná (PR)

*Measured as engineering students as share of total students.

Results per dimension

1. BASIC EDUCATION
2. HIGHER & VOCATIONAL EDUCATION
3. **SOCIAL INFRASTRUCTURE**
4. SUSTAINABILITY
5. HEALTH
6. PUBLIC SECTOR PERFORMANCE
7. LOGISTICS
8. BUSINESS SOPHISTICATION
9. INNOVATION
10. MARKET SIZE
11. GOODS MARKET
12. LABOR MARKET
13. ENERGY RESOURCES
14. AGRICULTURAL AND EXTRACTIVE RESOURCES

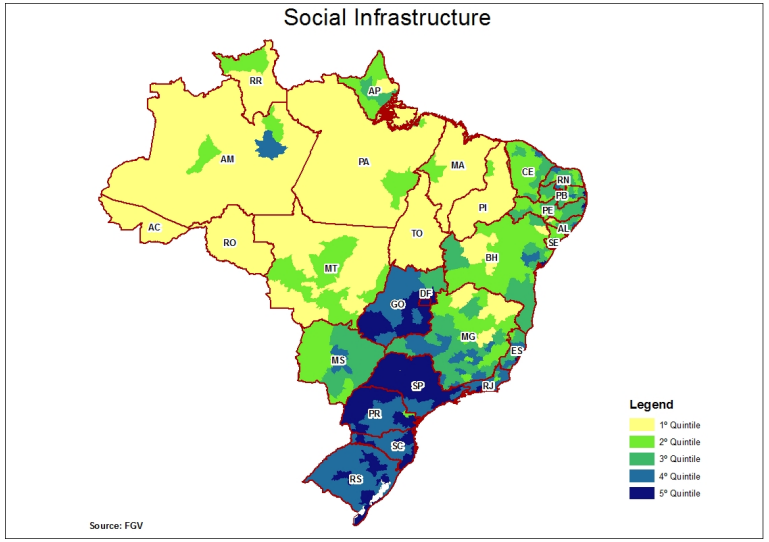
A well-developed **social infrastructure** is an important factor in determining the location of economic activity, thus increasing productivity, job creation and attractive investment opportunities in Brazil's microregions. At the same time, adequate infrastructure contributes to a reduction of societal inequalities, as it enable individuals and businesses to access crucial services and embark on more sustainable income-generating activities. The dimension includes a set of **17 indicators**, which measure the following aspects:

- Access to information and communication technology
- Access to and affordability of electricity
- Quality of urban transport

Given the critical importance of a well developed transport network in a continental and export-dependent country like Brazil, the quality and availability of roads, ports, airports and airways are covered separately in dimension 7: LOGISTICS.

RANKING PER MICROREGION: All indicators

Microregions in the South and Southeast have better ICT* networks, electricity supply and transport systems than Northern regions. Infrastructure development can be highly uneven within states, while the urban areas are benefitting considerably more than the rural areas. The microregion of Brasília, Brazil's capital city, appears to offer the best social infrastructure to its citizens, followed by São Paulo, Brazil's biggest city. All in all, an impressive 15 of the 20 most competitive microregions in this dimension are based in the state of São Paulo.

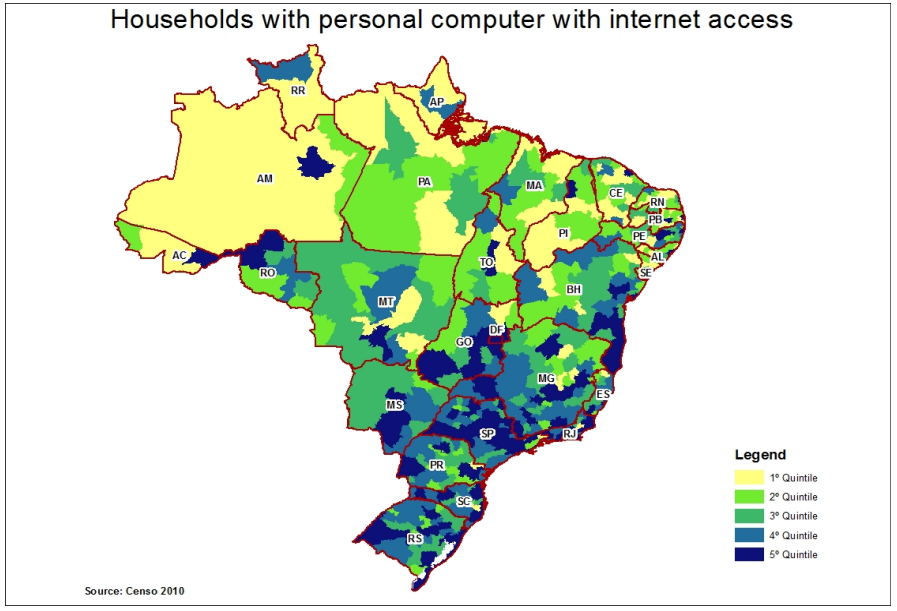


RANK	MICROREGION	STATE
1	Brasília	DF
2	São Paulo	SP
3	Campinas	SP
4	Florianópolis	SC
5	Curitiba	PR
6	Santos	SP
7	Maringá	PR
8	Jundiaí	SP
9	Londrina	PR
10	São José dos Campos	SP
11	São Carlos	SP
12	Bauru	SP
13	Ribeirão Preto	SP
14	Rio Claro	SP
15	Osasco	SP
16	Piracicaba	SP
17	Sorocaba	SP
18	São José do Rio Preto	SP
19	Guarulhos	SP
20	Marília	SP

*Information and Communications Technology.

RANKING PER STATE: Households with personal computer with internet access

Country-wide internet penetration is a requirement for the participation in global value chains and a generator of economic growth. This impact is more robust for emerging economies than for industrialized countries*. Brazil´s most populous states, São Paulo, Rio de Janeiro and Minas Gerais are among the Top 5 when it comes to the number of households with internet access. Generally, penetration rates are higher in urban areas.

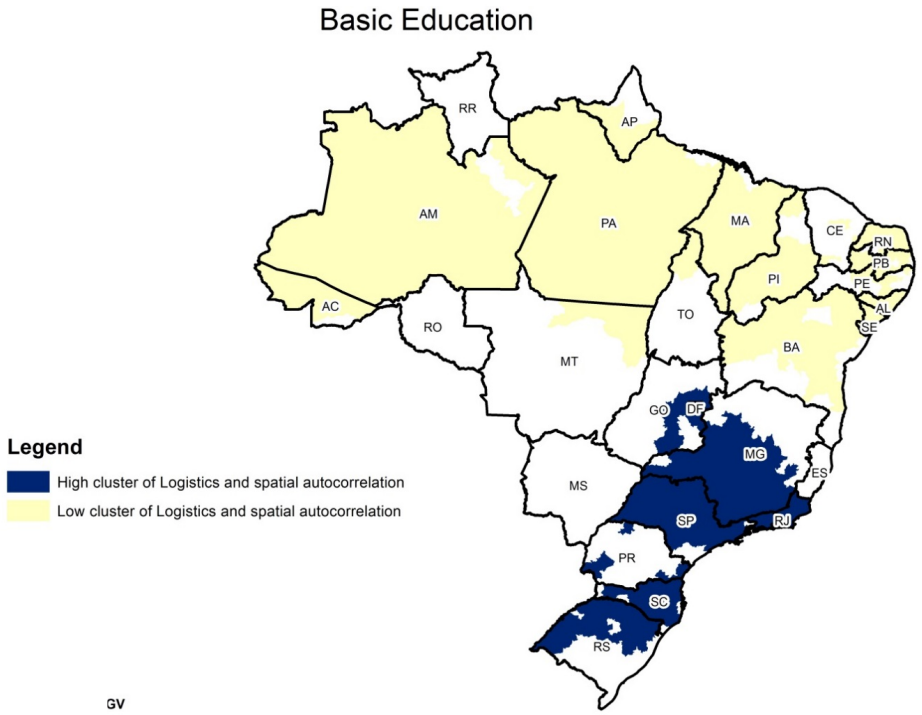


RANK	STATE
1	Rio de Janeiro (RJ)
2	São Paulo (SP)
3	Federal District (DF)
4	Rio Grande do Sul (RS)
5	Minas Gerais (MG)
…	
23	Piauí (PI)
24	Amapá (AP)
25	Acre (AC)
26	Roraima (RR)
27	Tocantins (TO)

*World Bank, Report on Information and Communication for Development, 2009.

INTERESTING PHENOMENON: Cluster Analysis

For a more qualitative analysis of the data, clusters per state are analyzed using Spatial Autocorrelation Analysis, or SAA (see note on page 30). As highlighted by the map below, there is a high concentration of social infrastructure in the South, mainly the states of São Paulo, Paraná, Santa Catarina, Rio Grande do Sul and Goiás. Clusters of low social infrastructure prevail in the Northern states and the western Northeast (Maranhão and Piauí), as well as major parts of Mato Grosso and the Northeast of the state of Minas Gerais.



Results per dimension

1. BASIC EDUCATION
2. HIGHER & VOCATIONAL EDUCATION
3. SOCIAL INFRASTRUCTURE
4. **SUSTAINABILITY**
5. HEALTH
6. PUBLIC SECTOR PERFORMANCE
7. LOGISTICS
8. BUSINESS SOPHISTICATION
9. INNOVATION
10. MARKET SIZE
11. GOODS MARKET
12. LABOR MARKET
13. ENERGY RESOURCES
14. AGRICULTURAL AND EXTRACTIVE RESOURCES

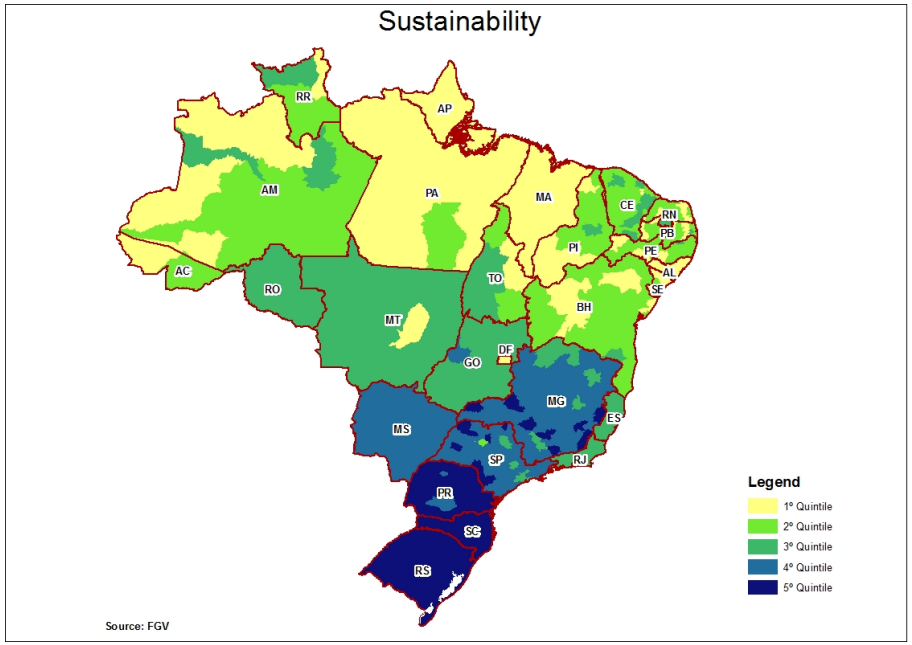
The question of sustainable and inclusive growth is an important one for Brazil in view of its rapid urbanization, population growth, unskilled youth and vast natural resources. There is a clear political need to assure access to adequate housing at reasonable prices for low-wage workers, and improve the quality of public services, without jeopardizing the ecosystem on which human life depends.

This dimension includes **14 indicators** and evaluates each microregion in accordance with the following criteria of social sustainability and environmental stewardship:

- Income inequality/Poverty
- Affordability and quality of housing
- Basic sanitation
- Quality of public services
- Biodiversity protection

RANKING PER MICROREGION: All indicators

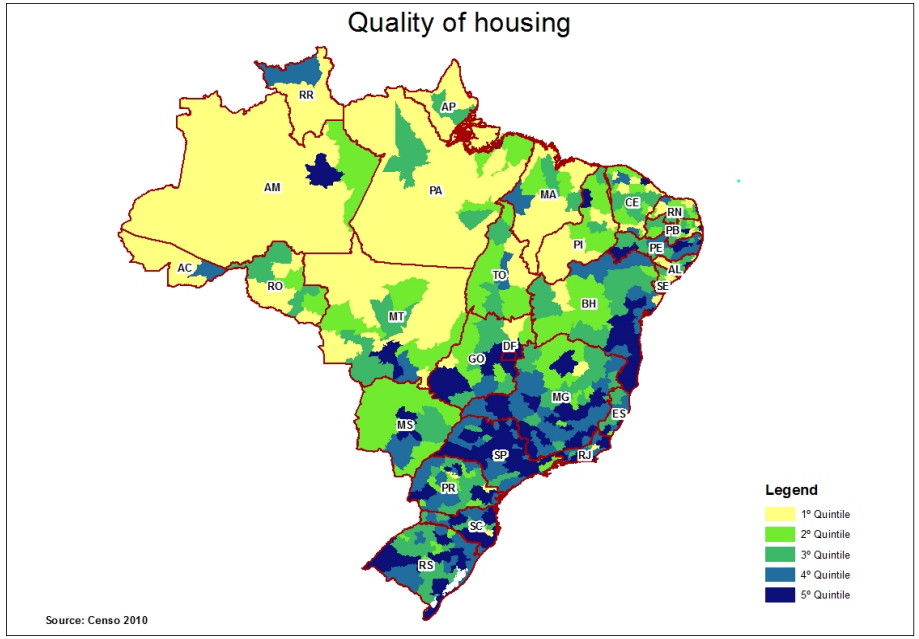
All Top 20 microregions in this dimension are located in Rio Grande do Sul, showing that Brazil´s most Southern state is outperforming the rest of the country in terms of income equality, housing conditions, public services and environmental stewardship. The Northern and Northeastern states exhibit unimpressive progress, with Pará, Maranhão, Amapá, Amazonas and Acre exhibiting particularly low performances.



RANK	MICROREGION	STATE
1	Jaguarão	RS
2	Serras de Sudeste	RS
3	Cachoeira do Sul	RS
4	Santiago	RS
5	São Jerônimo	RS
6	Campanha Central	RS
7	Lajeado-Estrela	RS
8	Erechim	RS
9	Vacaria	RS
10	Campanha Meridional	RS
11	Campanha Ocidental	RS
12	Cerro Largo	RS
13	Caxias do Sul	RS
14	Santo Angelo	RS
15	Sananduva	RS
16	Não-Me-Toque	RS
17	Santa Rosa	RS
18	Montenegro	RS
19	Guaporé	RS
20	Litoral Lagunar	RS

RANKING PER STATE: Quality of housing*

Adequate housing is a crucial aspect of social sustainability as it affects health status, access to jobs, and general inclusion in society. Housing conditions tend to be better in the big urban centers of Brazil, and are above average in the states of Rio de Janeiro, São Paulo and the Federal District. The whole North and much of the Northeastern and Central-Western regions perform low. Those Northern regions over-performing in higher education and internet access also stand out in the provision of adequate shelter.

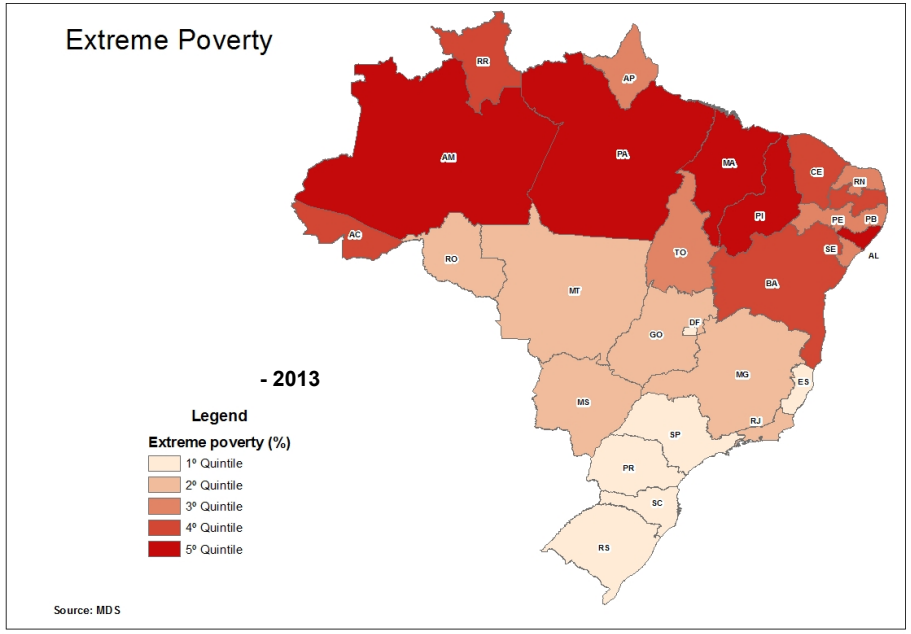


*Measured as those housing conditions evaluated as suitable as opposed to unsuitable.

RANK	STATE	
1	Rio de Janeiro	RJ
2	São Paulo	SP
3	Federal District	DF
4	Rio Grande do Sul	RS
5	Minas Gerais	MG
...		
23	Roraima	RR
24	Tocantins	TO
25	Acre	AC
26	Amapá	AP
27	Rondônia	RO

RANKING PER STATE: Extreme poverty

Although Brazil has managed to reduce extreme poverty – the number of people living on less than $ 1 a day – by 75% between 2001 and 2012*, ten million Brazilians (5,5% of the population) continue to live in extreme poverty. The issue is clearly dividing the country with the South, Southeast and Central-West reporting the lowest, and the North and Northeast the highest figures for extreme poverty. Three interesting phenomenons related to poverty and income inequality will be displayed on the following pages.



*Hunger Map 2014, Food and Agriculture Organization of the United Nations.

RANK	STATE	
1	Maranhão	MA
2	Piauí	PI
3	Amazonas	AM
4	Alagoas	AL
5	Pará	PA
...		
23	Rio Grande do Sul	RS
24	Paraná	PR
25	São Paulo	SP
26	Federal District	DF
27	Santa Catarina	SC

INTERESTING PHENOMENON

Affordability of housing in metropolitan regions

While the state of São Paulo does not struggle with extreme poverty, its metropolitan region has the worst rent to income ratios of all metropolitan regions in Brazil, indicating housing market dysfunctions and, possibly, policy failures. Shelter is a major cost in most family budgets and housing costs affect disposable income, access to jobs, health status and general inclusion in society.

1. São Paulo
2. Rio de Janeiro
3. Federal District
4. Rio Grande do Norte
5. Bahia

Income inequality

Social disparities are generally higher in the poorest states, but they are greatest in the nation's capital Brasília where income at the top is 22 times higher than income at the bottom of the pyramid. In the next most unequal states the difference is 16-19.

INTERESTING PHENOMENON: Worst metropolitan public transport systems

Quality of public transport systems – Metropolitan Areas

The low quality and increasing price of public transport was one of the main issues that brought the Brazilian population to the streets in 2013. Thus, it is interesting to compare how the population of Brazil´s metropolitan areas perceives the public transport provision.

Worst	Best
1. Federal District	1. Curitiba
2. Belém	2. Porto Alegre
3. Salvador	3. Fortaleza
4. São Paulo	4. Recife
5. Goiânia	5. Rio de Janeiro

*Measured by share of population with good perception of transport system (as opposed to bad or non-existent system).

Indicators per dimension

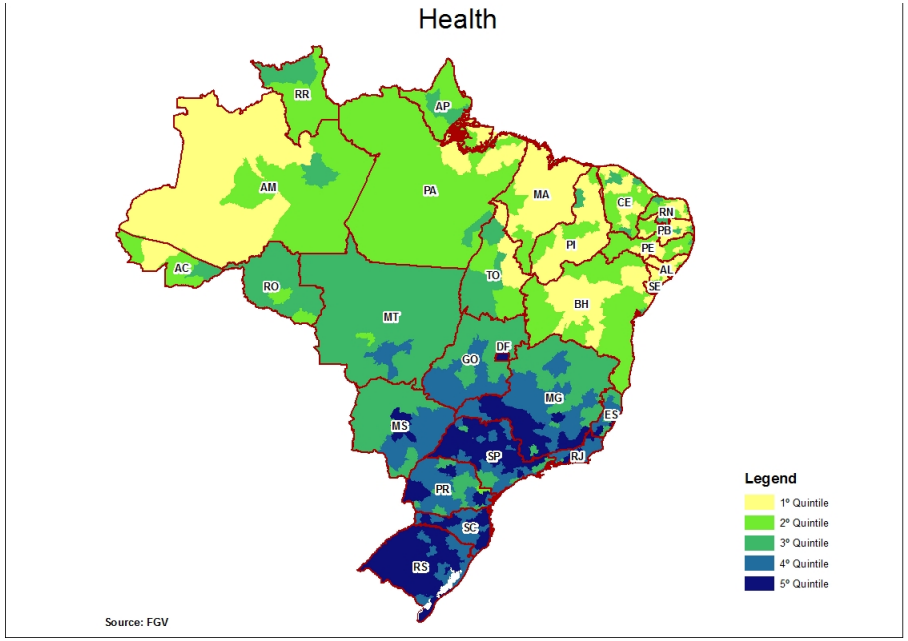
1. BASIC EDUCATION
2. HIGHER & VOCATIONAL EDUCATION
3. SOCIAL INFRASTRUCTURE
4. SUSTAINABILITY
5. **HEALTH**
6. PUBLIC SECTOR PERFORMANCE
7. LOGISTICS
8. BUSINESS SOPHISTICATION
9. INNOVATION
10. MARKET SIZE
11. GOODS MARKET
12. LABOR MARKET
13. ENERGY RESOURCES
14. AGRICULTURAL AND EXTRACTIVE RESOURCES

A healthy workforce which is able to work at maximum levels of efficiency is a requisite for the productivity of companies, whereas sick and therefore weak or absent workers can cause significant costs to businesses. In the IMD World Competitiveness Yearbook of 2014, Brazil ranked number 59 out of 60 countries for the health infrastructure indicator. In order to shed light on the issue, this dimension measures the accessibility and quality of public health services based on a set of **15 indicators** related to the following aspects:

- Access to health services
- Quality of public health services
- Self-rated health

RANKING PER MICROREGION: All indicators

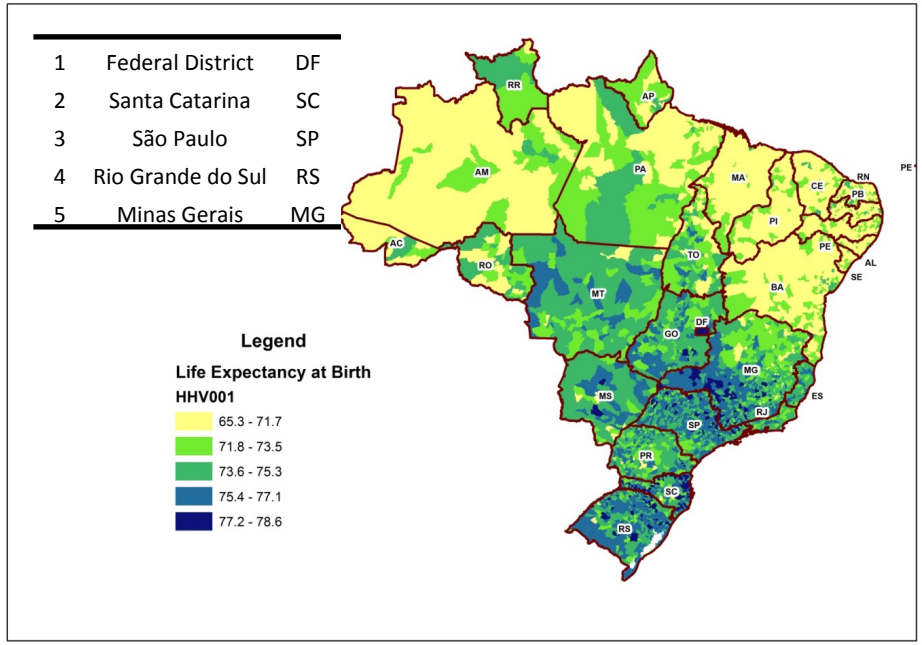
Just as with poverty, a sharp divide can be observed between the South and North of the country. The microregions which offer the best health services are based in the two most populous states: São Paulo and Minas Gerais. Rio Grande do Sul also performs well. The states of Amazonas, Maranhão, Bahia and Piauí seriously underperform.

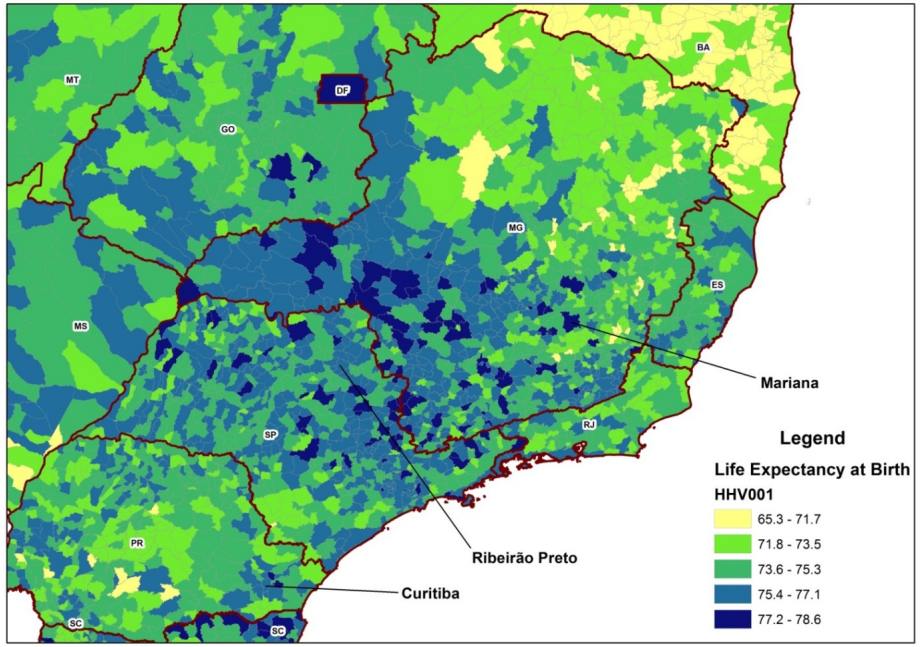


RANK	MICROREGION	STATE
1	Barretos	SP
2	Tupã	SP
3	Passo Fundo	RS
4	Barbacena	MG
5	Jaú	SP
6	São João da Boa Vista	SP
7	Moji Mirim	SP
8	Marília	SP
9	Porto Alegre	RS
10	Uberlândia	MG
11	Piuí	MG
12	Blumenau	SC
13	Passos	MG
14	Sananduva	RS
15	Serrana	RJ
16	Cruz Alta	RS
17	Ijuí	RS
18	Cerro Largo	RS
19	Botucatu	SP
20	Florianópolis	SC

RANKING PER STATE: Life Expectancy

The map on the left displays life expectancy at birth per state, where the South and North report the highest and lowest average life expectancy, respectively. The map on the right zooms into the Southeastern region, showing that the states of São Paulo and especially Minas Gerais acccount with a relatively high life expectancy. However, people live longest, on average, in the Federal District and in Santa Catarina. Interestingly, the five cities with the highest life expectancy are to be found in Santa Catarina: Blumenau, Brusque, Balneário Camboriú, Rio do Sul and Rancho Queimado.





INTERESTING PHENOMENON

Medical hubs of Brazil

Two of Brazil's poorest states, Rondônia in the North and Piauí in the Northeast region, are among those with the highest number of hospital beds per population. Rio Grande do Sul leads the ranking, followed by Rio de Janeiro, Goiás and the Federal District.

1. Rio Grande do Sul
2. Rio de Janeiro
3. Goiás
4. Federal District
5. Rondônia/Piauí

Depressed states

The poorest states have smaller incidence of depression. Based on the perception of 55 to 65 year-old Brazilian citizens, people in Amapá, Acre, Alagoas, Pará and Maranhão are less depressed than those living in the well-off states of Rio Grande do Sul, Santa Catarina, Minas Gerais, Paraná and Goiás. The Medical Hub – Rio Grande do Sul – is most depressed.

1. Rio Grande do Sul
2. Santa Catarina
3. Minas Gerais
4. Paraná
5. Goiás

Results per dimension

1. BASIC EDUCATION
2. HIGHER & VOCATIONAL EDUCATION
3. SOCIAL INFRASTRUCTURE
4. SUSTAINABILITY
5. HEALTH
6. **PUBLIC SECTOR PERFORMANCE**
7. LOGISTICS
8. BUSINESS SOPHISTICATION
9. INNOVATION
10. MARKET SIZE
11. GOODS MARKET
12. LABOR MARKET
13. ENERGY RESOURCES
14. AGRICULTURAL AND EXTRACTIVE RESOURCES

Proper **public sector management** is critical for ensuring trust in a microregion's business environment, thus determining its competitiveness. It crucially influences investment decisions and the organization of production and plays a key role in the ways in which societies distribute the benefits and bear the costs of development strategies and policies.

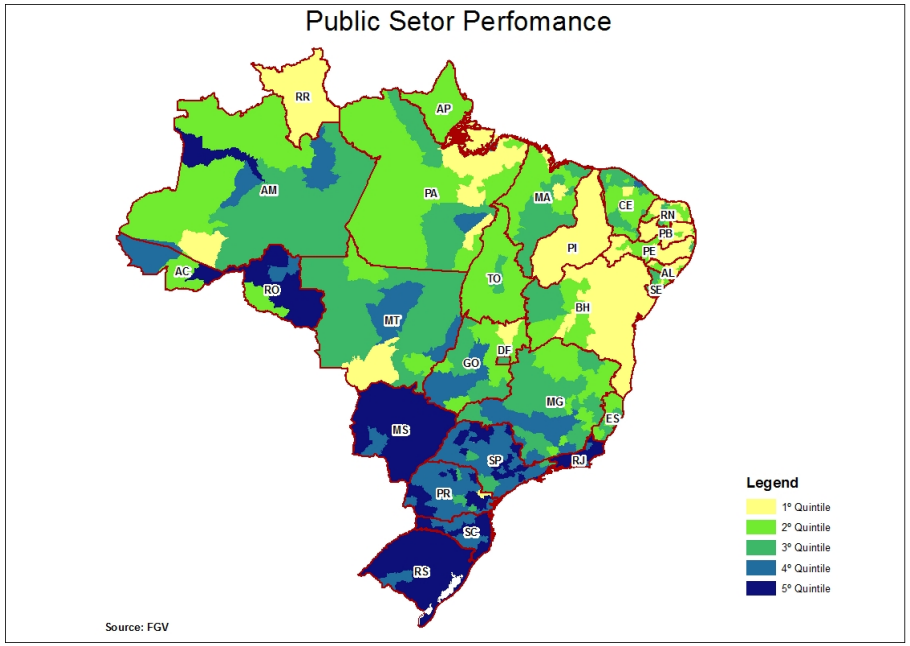
This dimension measures the ability of the government of each region to provide a legal and administrative framework within which individuals, firms, and governments interact effectively to generate and distribute wealth, while promoting the security of the population.

The dimension includes a set **9 indicators**, which measure the following aspects:

- Management of public finances
- Judicial system performance
- Public safety conditions

RANKING PER MICROREGION: All indicators

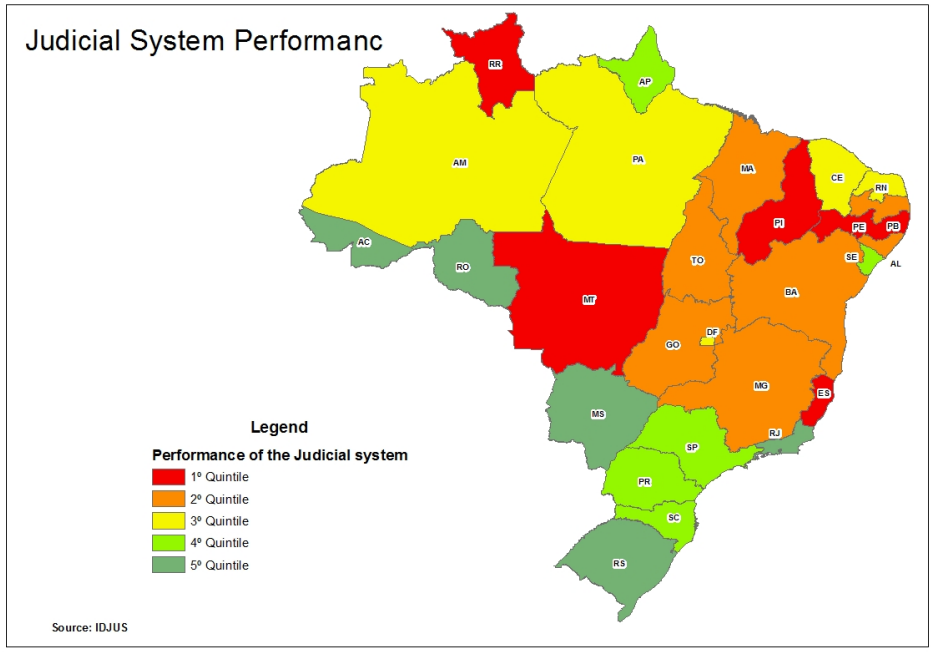
Eighteen of the Top 20 microregions with the best public sector performance are located in either Rio Grande do Sul (13) or Rio de Janeiro (5). Although they do not appear among the best 20 microregions, Mato Grosso do Sul and, surprisingly, Rondônia show strong overall performances. Noteworthy are the bright spots in the states of Amazonas, Acre and in the region of Fortaleza in Ceará.



RANK	MICROREGION	STATE
1	Caxias do Sul	RS
2	Bacia de São João	RJ
3	Guaporé	RS
4	Sananduva	RS
5	Erechim	RS
6	Montenegro	RS
7	Campo Grande	MS
8	Passo Fundo	RS
9	Macaé	RJ
10	Ijuí	RS
11	Gramado-Canela	RS
12	Campanha Meridional	RS
13	Santa Maria	RS
14	Jaguarão	RS
15	Cassilândia	MG
16	Santa Rosa	RS
17	Barra do Piraí	RJ
18	Santiago	RS
19	Vale do Paraíba Fluminense	RJ
20	Itaguaí	RJ

RANKING PER STATE: Judicial System Performance

An important component of the overall ranking is the performance of the judicial system*: Rio Grande do Sul is leading the index and Rio de Janeiro occupies a good third place. Mato Grosso do Sul is second. Overall, the map shows a heterogeneous picture with some surprises. Acre, Rondônia and Amapá are highly competitive, whereas Espírito Santo, Mato Grosso and also Minas Gerais show low performances.



*Measured by budget management, resource management and procedural efficiency.

RANK	STATE	
1	Rio Grande do Sul	RS
2	Mato Grosso do Sul	MS
3	Rio de Janeiro	RJ
4	Acre	AC
5	Rondônia	RO
...		
23	Mato Grosso	MT
24	Espírito Santo	ES
25	Pernambuco	PE
26	Roraima	RR
27	Piauí	PI

Results per dimension

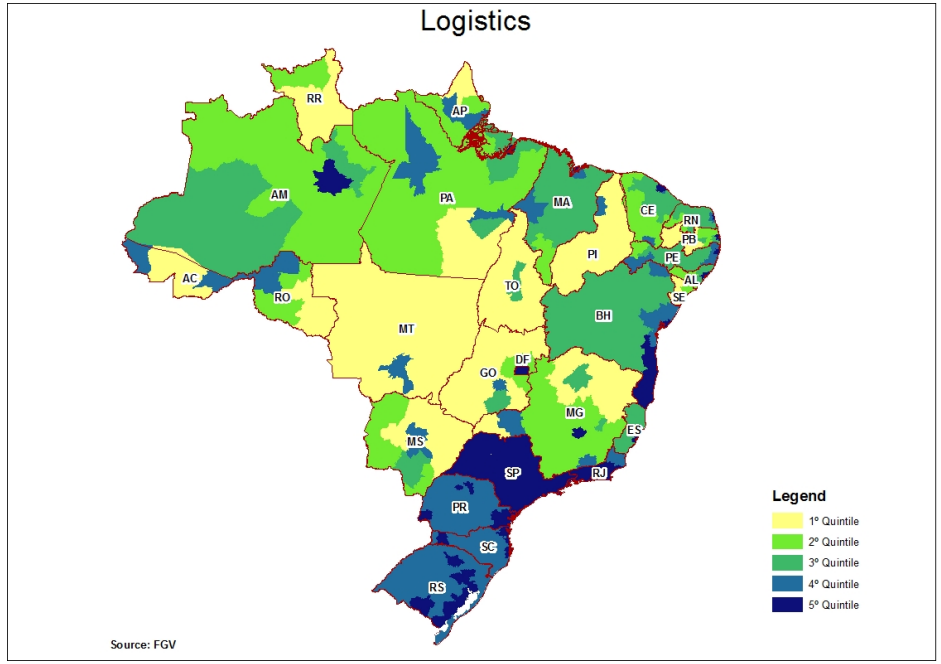
1. BASIC EDUCATION
2. HIGHER & VOCATIONAL EDUCATION
3. SOCIAL INFRASTRUCTURE
4. SUSTAINABILITY
5. HEALTH
6. PUBLIC SECTOR PERFORMANCE
7. **LOGISTICS**
8. BUSINESS SOPHISTICATION
9. INNOVATION
10. MARKET SIZE
11. GOODS MARKET
12. LABOR MARKET
13. ENERGY RESOURCES
14. AGRICULTURAL AND EXTRACTIVE RESOURCES

Brazil's production structure is extremely sensitive to **logistics** and the low quality of its transport infrastructure is one of the major challenges to sustained competitiveness. Removing the infrastructure bottleneck and reducing costs would help to connect markets and diversify external trade, thus strengthening overall economic performance. There is an important connection with dimension 3: SOCIAL INFRASTRUCTURE, as countries that invest in ICT, electricity and transport infrastructure crucially improve the flow of goods and services. This dimension is based on a set of **17 indicators** which measure the following aspects:

- Quality of paved roads
- Total length of railroad lines
- Port capacity
- Airport capacity
- Lengths of waterways
- Trade flows

RANKING PER MICROREGION: All indicators

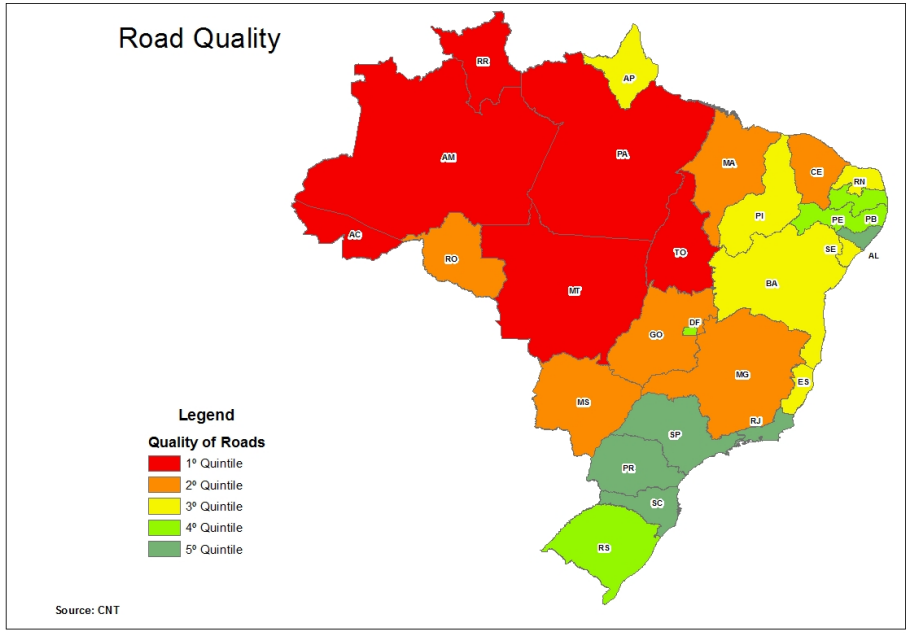
The score of the logistics dimension is atypical, showing first and foremost the importance of access to logistics hubs (mostly ports and airports), as well as the detrimental effects of poor road and railway coverage. Unsurprisingly, coastal areas perform well, as well as states with a long history of agricultural or industrial production. Interestingly, some regions of Northern states (i.e. Belém and Manaus) perform above average.



RANK	MICROREGION	STATE
1	Guarulhos	SP
2	Rio de Janeiro	RJ
3	Campinas	SP
4	Porto Alegre	RS
5	Salvador	BA
6	São Paulo	SP
7	Curitiba	PR
8	Recife	PE
9	Fortaleza	CE
10	Belém	PA
11	Brasília	DF
12	Florianópolis	SC
13	Belo Horizonte	MG
14	Natal	RN
15	Foz do Iguaçu	PR
16	Ribeirão Preto	SP
17	Manaus	AM
18	São José do Rio Preto	SP
19	Presidente Prudente	SP
20	Bauru	SP

RANKING PER STATE: Road Quality

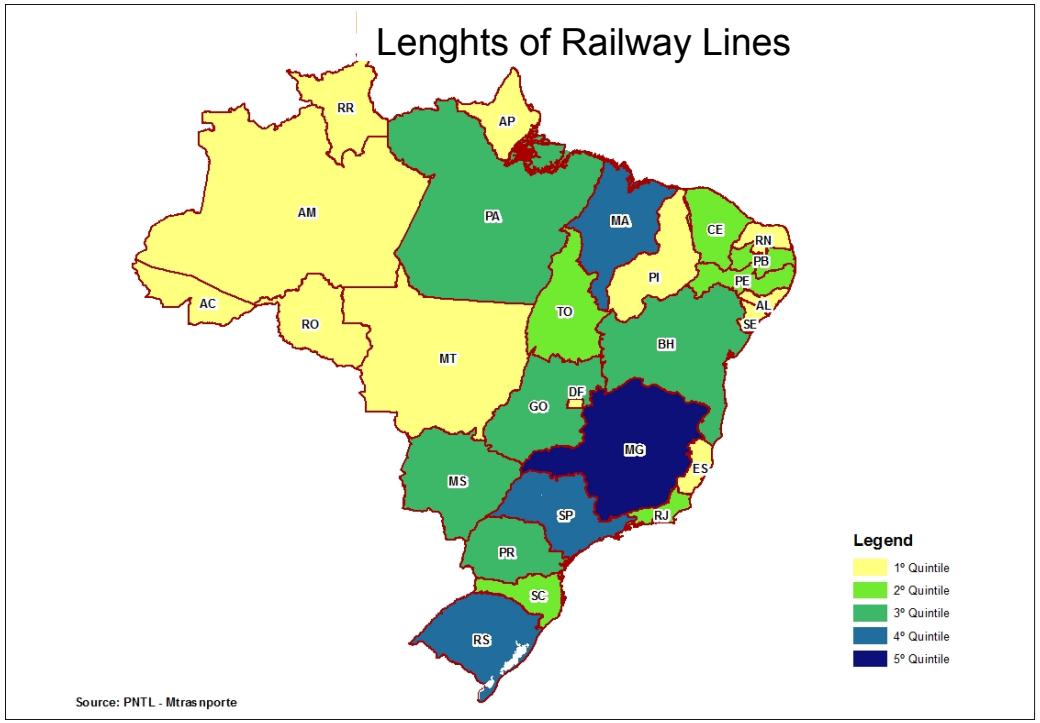
The availability of good-quality paved roads determines the likelihood of new firms entering a given location. Relatively stagnating performances have been typical in road infrastructure improvement especially in the Northern states, which are clearly outperformed by the Southern and Southeastern states. The roads of São Paulo, Rio de Janeiro and, surprisingly, Alagoas are evaluated best, while Pará, Amazonas and Acre show serious deficits in their road infrastructure.



RANK	STATE	
1	São Paulo	SP
2	Rio de Janeiro	RJ
3	Alagoas	AL
4	Paraná	PR
5	Santa Catarina	SC
...		
23	Tocantins	TO
24	Roraima	RR
25	Pará	PA
26	Amazonas	AM
27	Acre	AC

RANKING PER STATE: Railway extension

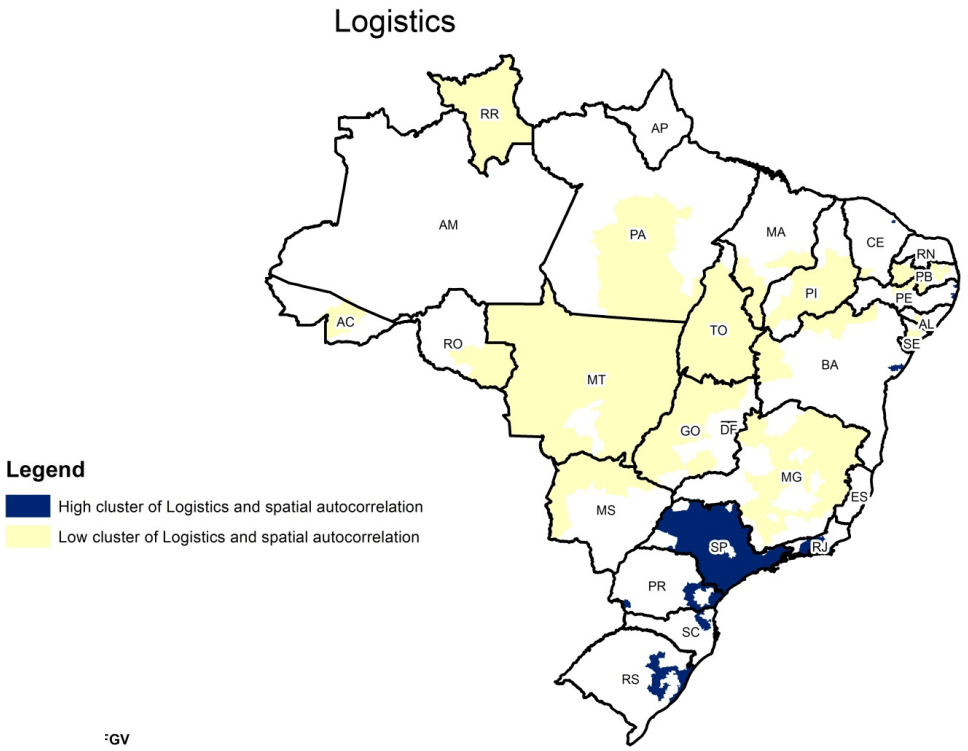
An inadequate railroad network raises the costs of doing business and may result in an overuse of road transport. Minas Gerais is the shining star, followed by São Paulo, Rio Grande do Sul and Maranhão. Railway extension provides a competitive edge for Pará within the Northern region. Although sizable, Mato Grosso ranks among the least competitive states when it come to the lenghts of its railway lines.



RANK	STATE	
1	Minas Gerais	MG
2	São Paulo	SP
3	Rio Grande do Sul	RS
4	Maranhão	MA
5	Paraná	PR
...		
23	Federal District	DF
24	Rondônia	RO
25	Amazonas	AM
26	Acre	AC
27	Roraima	RR

INTERESTING PHENOMENON: Cluster Analysis

For a more qualitative analysis of the dimension, clusters per state are analyzed using Spatial Autocorrelation Analysis, or SAA (see note on page 30). As the map indicates, there are two logistics cluster: one in São Paulo, the country's undisputed logistics center (although there are important offshoots around the port areas in many coastal states), the second, less significant, in Rio Grande do Sul. The low-performance cluster is centered on a strip around the most central states, but stretches also to northeastern Minas Gerais, Roraima and other regions.



Results per dimension

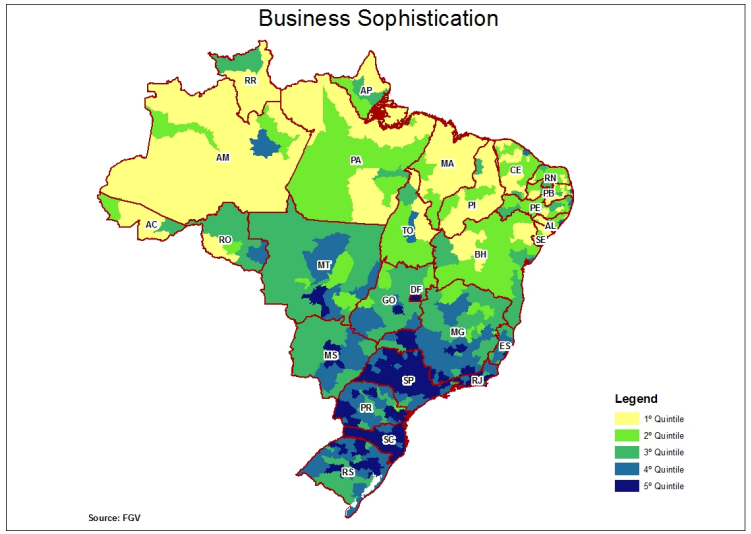
1. BASIC EDUCATION
2. HIGHER & VOCATIONAL EDUCATION
3. SOCIAL INFRASTRUCTURE
4. SUSTAINABILITY
5. HEALTH
6. PUBLIC SECTOR PERFORMANCE
7. LOGISTICS
8. **BUSINESS SOPHISTICATION**
9. INNOVATION
10. MARKET SIZE
11. GOODS MARKET
12. LABOR MARKET
13. ENERGY RESOURCES
14. AGRICULTURAL AND EXTRACTIVE RESOURCES

Business Sophistication is understood as the skillfulness of a microregion's workforce, in terms of its capacity to handle sophisticated business practices and complex production processes. When highly skilled workers are interconnected in geographically proximate groups, efficiency in the production of goods and services is heightened and greater opportunities for innovation are created. The effective use of information and communication technologies (ICTs) has become an important driver of competitiveness. The technology does not need to be produced within national borders if the workforce is sufficiently skilled to successfully adopt and use it to enhance productivity and enable innovative processes. The dimension includes a set of **4 indicators** which measure the following aspects:

- Skilled human resources in management
- Skilled human resources in advanced manufacturing
- Skilled human resources in ICT

RANKING PER MICROREGION: All indicators

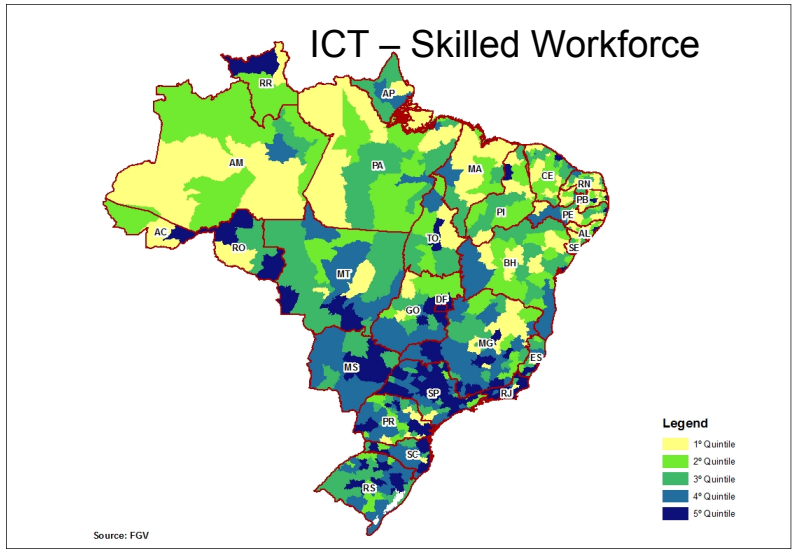
Unsurprisingly, the state of São Paulo offers the most skilled workforce when it comes to advanced manufacturing, ICT and management, with 11 of the Top 20 microregions located within the state. Less expectedly, the city of São Paulo ranks only 3rd, after Jundiaí and Osasco. Three of the 10 most competitive regions for business sophistication come from Santa Catarina. Once more, Manaus appears as a competitive business hub in the otherwise underperforming North. The same is true for Fortaleza in the Northeast. As the map illustrates, there are wide cross-country divergenc



RANK	MICROREGION	STATE
1	Jundiaí	SP
2	Osasco	SP
3	São Paulo	SP
4	Campinas	SP
5	Florianópolis	SC
6	Blumenau	SC
7	Joinville	SC
8	Brasília	DF
9	Curitiba	PR
10	Bauru	SP
11	Maringá	PR
12	Criciúma	SC
13	Porto Alegre	RS
14	Caxias do Sul	RS
15	Guarulhos	SP
16	Sorocaba	SP
17	São José dos Campos	SP
18	São Carlos	SP
19	Ribeirão Preto	SP
20	Limeira	SP

RANKING PER STATE: ICT-skilled workforce

A workforce* that is able to effectively use and produce information and communication technologies (ICTs) to gain access to advanced knowledge is an important driver of economic productivity. Interestingly, the state of São Paulo is outperformed by the Federal District (1st) and the state of Rio de Janeiro (2nd) in this dimension. Although the typical North-South divide is apparent, a number of Northern and Northeastern regions are highly competitive when it comes to ICT skills, while some regions of Paraná and Minas Gerais, among others, underperform.



RANK	STATE	
1	Federal District	DF
2	Rio de Janeiro	RJ
3	São Paulo	SP
4	Rio Grande do Sul	RS
5	Santa Catarina	SC
...		
23	Amazonas	AM
24	Pará	PA
25	Piauí	PI
26	Alagoas	AL
27	Maranhão	MA

*Measured as percentage of workers employed in Communications and Information Technology as share of total employment.

Results per dimension

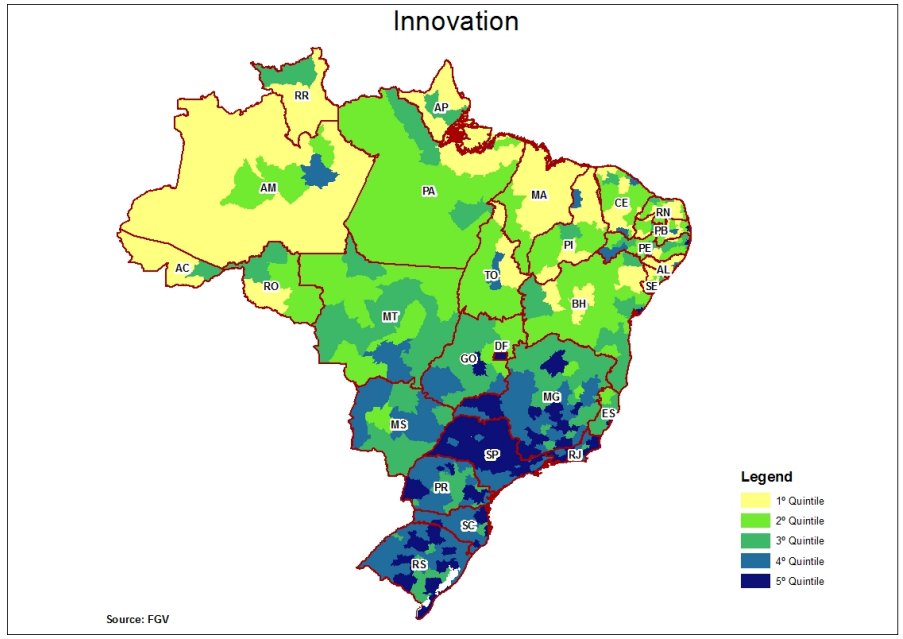
1. BASIC EDUCATION
2. HIGHER & VOCATIONAL EDUCATION
3. SOCIAL INFRASTRUCTURE
4. SUSTAINABILITY
5. HEALTH
6. PUBLIC SECTOR PERFORMANCE
7. LOGISTICS
8. BUSINESS SOPHISTICATION
9. **INNOVATION**
10. MARKET SIZE
11. GOODS MARKET
12. LABOR MARKET
13. ENERGY RESOURCES
14. AGRICULTURAL AND EXTRACTIVE RESOURCES

Innovation is at the basis of many of the productivity gains that economies experience. Brazil has some well-known innovative firms and is at the forefront in high-technology fields such as deep water oil extraction. However, its long-term competitiveness depends on the ability of each region to go beyond adopting existing technologies, towards the development of cutting-edge products and higher value-added activities. Innovation is highly related to a number of other dimensions, such as institutions, infrastructure, education system, as well as the efficiency of the labor and goods markets. Based on a extensive set of **42 indicators**, this dimension looks at the following aspects considered crucial for competitiveness:

- Availability of skilled labor
- Foreign direct investment
- R&D environment
- Entrepreneurship and startup innovation

RANKING PER MICROREGION: All indicators

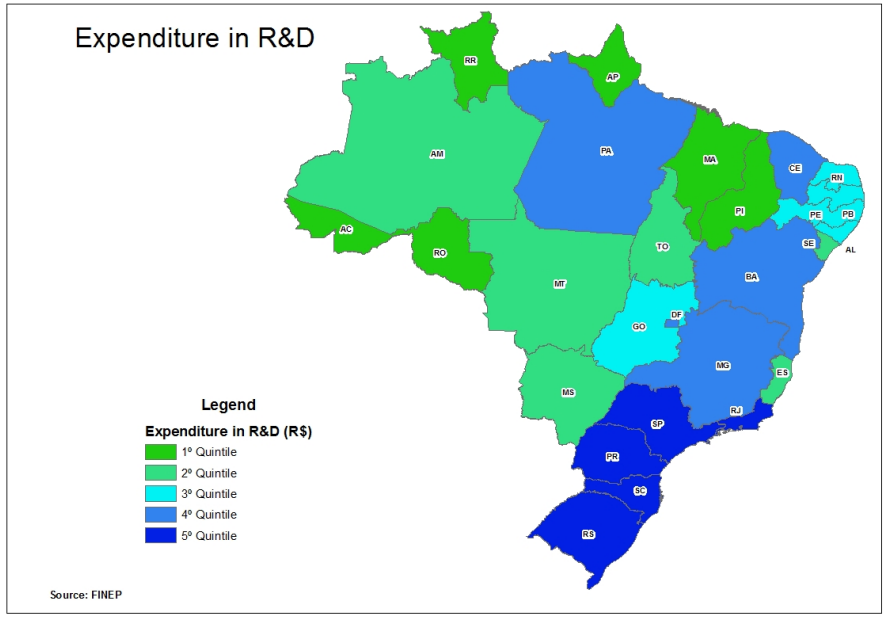
More than 75% of the twenty most competitive microregions in Brazil are located in São Paulo, with the city of São Paulo leading the ranking. Rio de Janeiro is significantly lagging behind, with only two microregions – Macaé (5th) and the capital city of Rio de Janeiro (11th) – among the Top 20. Despite an overall lack in competitiveness in the North and Northeast, the map shows a number of regional innovation hubs in Amazonas, Piauí, Ceará, Pernambuco, Tocantins, among others.



RANK	MICROREGION	STATE
1	São Paulo	SP
2	Campinas	SP
3	São Carlos	SP
4	São José dos Campos	SP
5	Macaé	RJ
6	Ribeirão Preto	SP
7	Jundiaí	SP
8	Botucatu	SP
9	Florianópolis	SC
10	Osasco	SP
11	Rio de Janeiro	RJ
12	Piracicaba	SP
13	Itapecerica da Serra	SP
14	Moji Mirim	SP
15	Guarulhos	SP
16	Bauru	SP
17	Rio Claro	SP
18	Belo Horizonte	MG
19	São José do Rio Preto	SP
20	Sorocaba	SP

RANKING PER STATE: Expenditure in R&D*

The development of cutting-edge products and higher value-added activities requires adequate financial assistance from state agencies. São Paulo and Rio de Janeiro are the states which most benefit from R&D funding, a fact that might explain their good performance in the overall innovation ranking. The map highlights that Pará, Ceará and Bahia receive decisively more financial assistance than many of their neighbor states in the North and Northeast, such as Amapá, Acre and Rondônia, which is ranking last.



RANK	STATE	
1	São Paulo	SP
2	Rio de Janeiro	RJ
3	Rio Grande do Sul	RS
4	Santa Catarina	SC
5	Paraná	PR
...		
23	Piauí	PI
24	Roraima	RR
25	Amapá	AP
26	Acre	AC
27	Rondônia	RO

*Measured as expenditure by FINEP, the major federal R&D financing agency.

INTERESTING PHENOMENON

PhDs in STEM fields

In the global economy, countries and regions rely on Science, Technology, Engineering and Mathematics (STEM) skills to deliver world-class competitiveness. The ranking below shows the five states with the highest number of PhDs in STEM fields. It reflects the overall competitiveness ranking in innovation, as well as what has been said about the volume of R&D expenditure granted to the Brazilian states by public agencies such as FINEP.

1. São Paulo
2. Rio de Janeiro
3. Minas Gerais
4. Rio Grande do Sul
5. Santa Catarina

Results per dimension

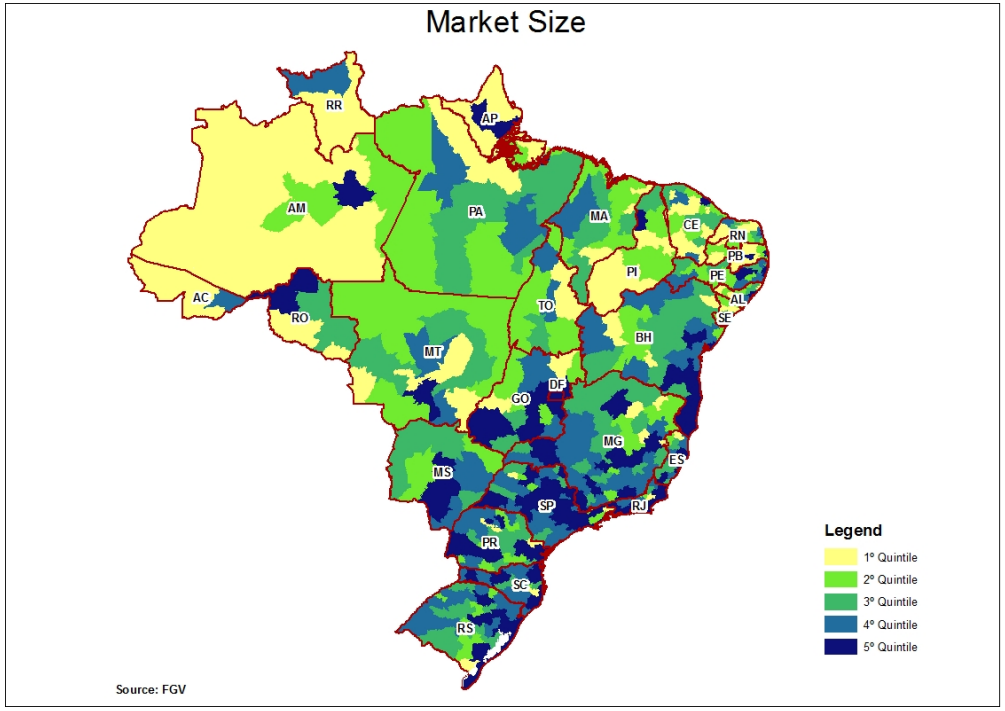
1. BASIC EDUCATION
2. HIGHER & VOCATIONAL EDUCATION
3. SOCIAL INFRASTRUCTURE
4. SUSTAINABILITY
5. HEALTH
6. PUBLIC SECTOR PERFORMANCE
7. LOGISTICS
8. BUSINESS SOPHISTICATION
9. INNOVATION
10. **MARKET SIZE**
11. GOODS MARKET
12. LABOR MARKET
13. ENERGY RESOURCES
14. AGRICULTURAL AND EXTRACTIVE RESOURCES

The size of the market is a crucial aspect of a region's competitiveness and productivity, since large markets provide investors with economic opportunities and allow firms to exploit economies of scale and scope. According to The Global Competitiveness Report 2014-2015, published by the World Economic Forum, Brazil's main global competitive advantage lies in its growing domestic market: Brazil is ranked 9th out of 133 economies. Brazil's economy is among the largest and most dynamic in the world and markets in almost all states are expanding, offering attractive investment and development opportunities. This dimension measures the **market size** of each microregion, based on a set of **5 indicators** covering the following aspects:

- Size of the local economy
- Population
- Firm size
- Distance between markets
- Weighted market size

RANKING PER MICROREGION: All indicators

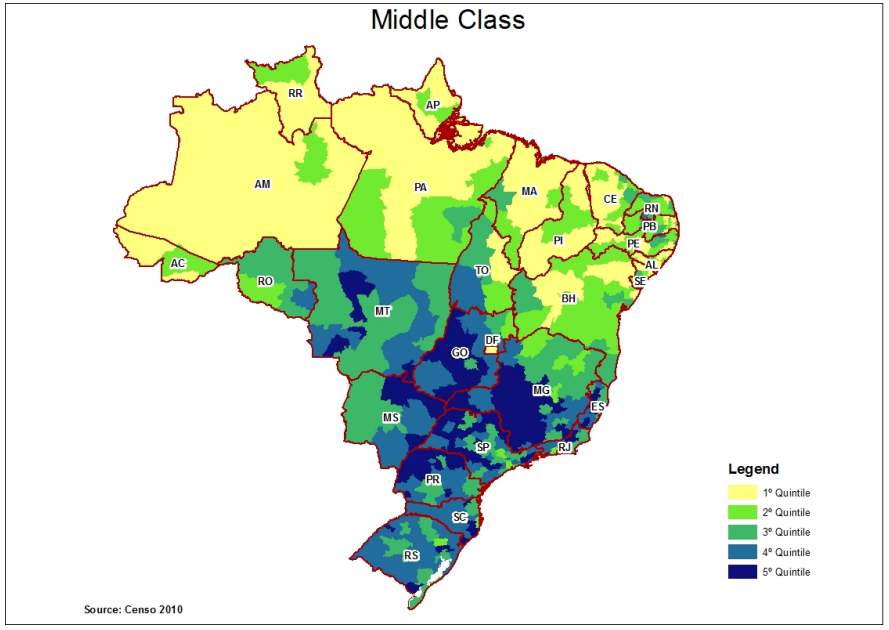
The geographical distribution for this dimension may well be the most heterogeneous, showing few clear patterns. This reflects the substantial populations of large and mid-sized cities even in Brazil's poorest regions, as well as the substantial driving power of agribusiness and mining to make some regions prominent in population and economic importance.



RANK	MICROREGION	STATE
1	São Paulo	SP
2	Rio de Janeiro	RJ
3	Belo Horizonte	MG
4	Curitiba	PR
5	Porto Alegre	RS
6	Campinas	SP
7	Brasília	DF
8	Salvador	BA
9	Osasco	SP
10	Recife	PE
11	Fortaleza	CE
12	Vitória	ES
13	Santos	SP
14	Goiânia	GO
15	São José dos Campos	SP
16	Guarulhos	SP
17	Sorocaba	SP
18	Mogi das Cruzes	SP
19	Florianópolis	SC
20	Ribeirão Preto	SP

RANKING PER STATE: Middle Class*

Brazil's middle class is no longer mostly concentrated in the traditional urban centers of the coast, but in the agriculture-rich inner regions. However, a look at the Federal District (placed 26th) belies this simple interpretation: most of its households earn more than the top limit for this income category. It appears that the self-defined “middle class” of the main cities would be considered rich elsewhere.

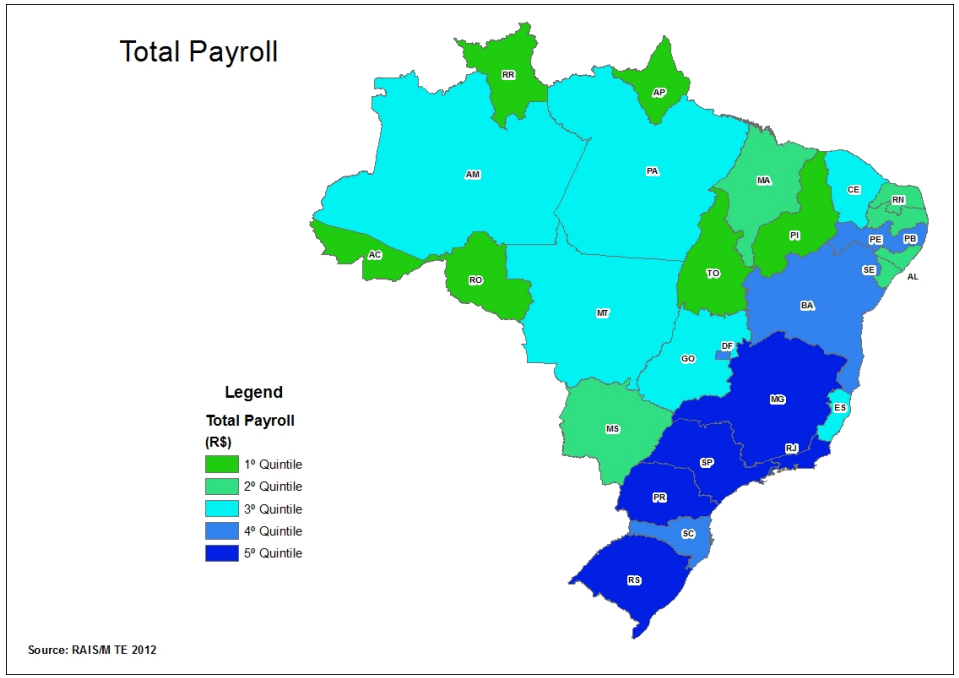


RANK	STATE	
1	Goiás	GO
2	Minas Gerais	MG
3	Paraná	PR
4	Mato Grosso do Sul	MS
5	Mato Grosso	MT
...		
23	Pará	PA
24	Alagoas	AL
25	Amazonas	AM
26	Federal District	DF
27	Maranhão	MA

* Middle class defined as per capita household income R$291 - R$1019

RANKING PER STATE: Payroll

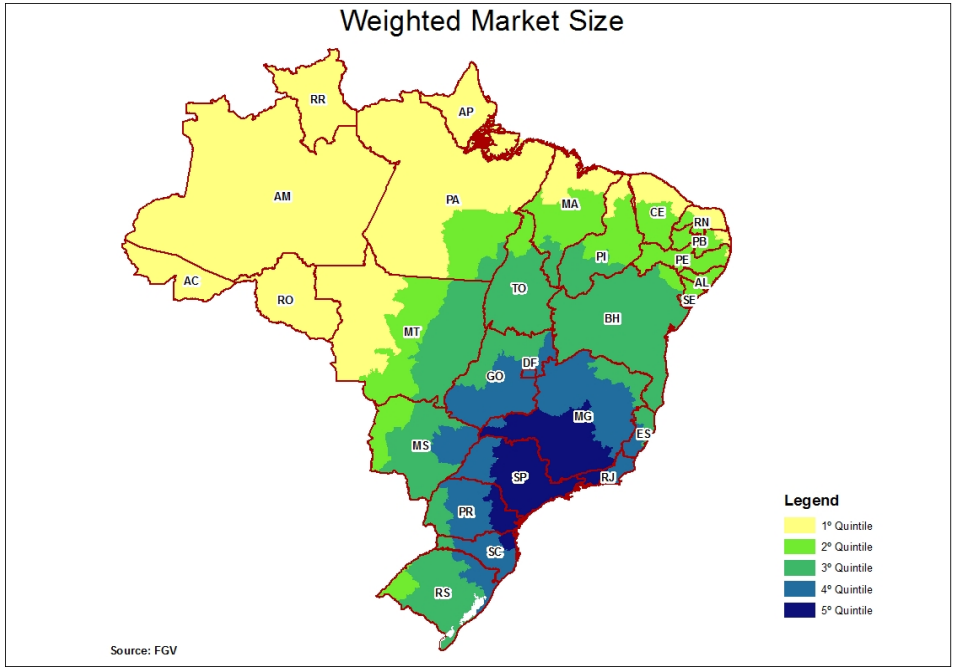
This indicator illustrates, among other aspects, the large economic weight of São Paulo. Formal labor income (in absolute numbers) is highly concentrated in the southern coastal strip going from Bahia to Rio Grande do Sul. However, even within this division, the state of São Paulo stands out on its own. Its inhabitants earn almost twice the labor income of runner-up Rio de Janeiro.



RANK	STATE	
1	São Paulo	SP
2	Rio de Janeiro	RJ
3	Minas Gerais	MG
4	Rio Grande do Sul	RS
5	Paraná	PR
...		
23	Piauí	PI
24	Tocantins	TO
25	Amapá	AP
26	Acre	AC
27	Roraima	RR

RANKING PER STATE: Weighted Market Size

This indicator measures each microregion's proximity to the country's main internal markets. The highest-performing localities are those located closest to the three major cities of the Southeast: São Paulo, Rio de Janeiro and Belo Horizonte. Isolated from these economic centers and from international trading partners, the distant localities of the Northern region appear less likely to have substantial local markets to spur regional development.

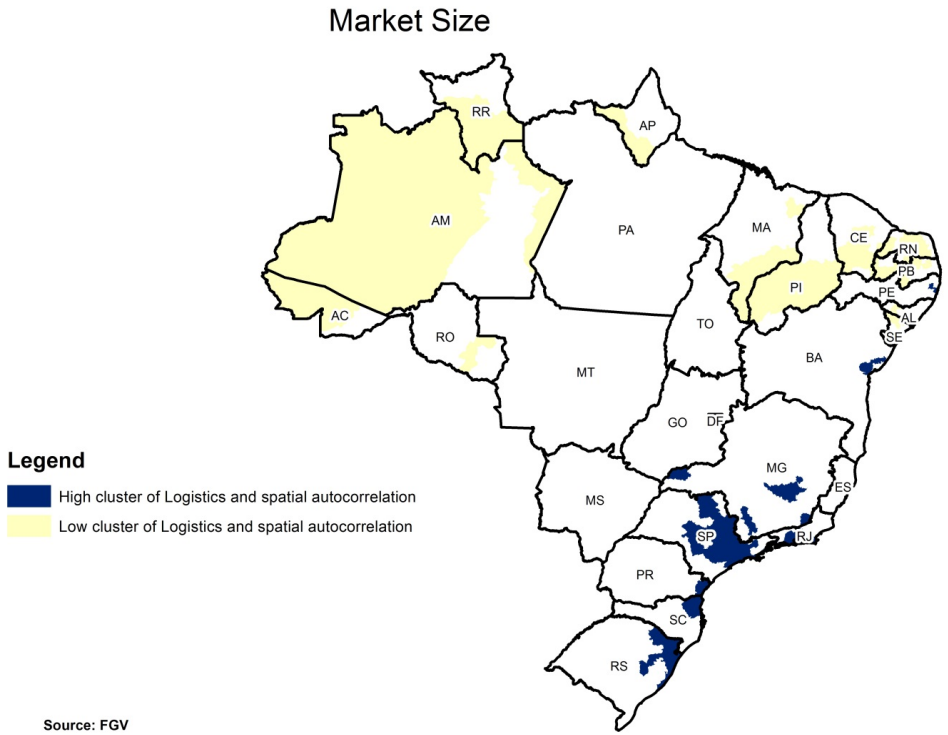


WMS[i] = soma (j ≠ i) de PIB[j] * exp(-alpha * d[i,j])

RANK	STATE	
1	São Paulo	SP
2	Minas Gerais	MG
3	Rio de Janeiro	RJ
4	Santa Catarina	SC
5	Paraná	PR
...		
23	Amapá	AP
24	Rondônia	RO
25	Amazonas	AM
26	Roraima	RR
27	Acre	AC

INTERESTING PHENOMENON: Cluster Analysis

For a more qualitative analysis of the dimension, clusters per state are analyzed using Spatial Autocorrelation Analysis, or SAA (see note on page 30). Interestingly, applying SAA to this dimension produces smaller, sparser clusters, when compared to the former examples. This indicates a higher degree of spatial heterogeneity. The method is still able to correctly identify the core economic center of the country in São Paulo, as well as economically “blank spots” in the North and Northeast.



Source: FGV

Results per dimension

1. BASIC EDUCATION
2. HIGHER AND VOCATIONAL EDUCATION
3. SOCIAL INFRASTRUCTURE
4. SUSTAINABILITY
5. HEALTH
6. PUBLIC SECTOR PERFORMANCE
7. LOGISTICS
8. BUSINESS SOPHISTICATION
9. INNOVATION
10. MARKET SIZE
11. **GOODS MARKET**
12. LABOR MARKET
13. ENERGY RESOURCES
14. AGRICULTURAL AND EXTRACTIVE RESOURCES

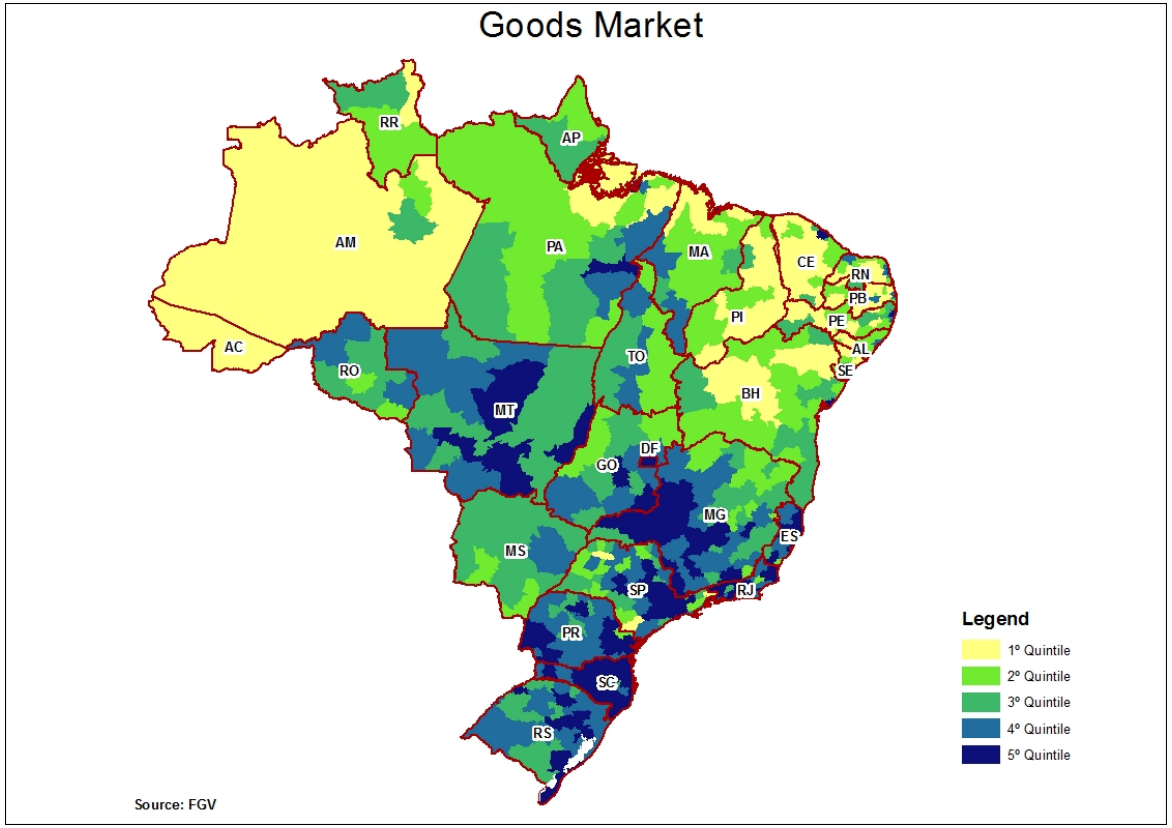
High taxes, constantly changing regulations, complex system of labor and tax codes and restrictive rules on foreign direct investment (FDI) and international trade are major obstacles to the efficient exchange of goods and tend to reduce aggregate economic activity. This dimension measures the ability of each region to create and maintain market structures in which all resources are allocated to their most appropriate and efficient uses. It also includes tax burden, an important variable affecting not only the efficient allocation of resources but also the profitability of existing and future investments.

The dimensions includes a set of **5 indicators**, related to two important aspects of a competitive goods market:

- Intensity of local competition
- Tax burden

RANKING PER MICROREGION: All indicators

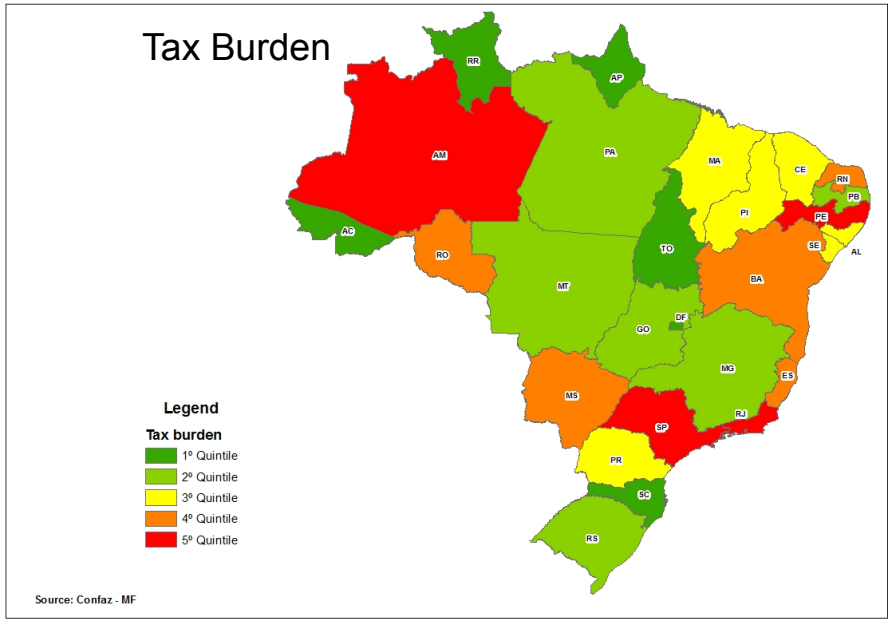
The substantially heterogeneous map below reveals the mostly exogenous impact of tax policy decisions as well as the highly variable competitive scenario prevailing in each region.



RANK	MICROREGION	STATE
1	São Paulo	SP
2	Itajaí	SC
3	Guarulhos	SP
4	Maringá	PR
5	Joinville	SC
6	Londrina	PR
7	Rio de Janeiro	RJ
8	Blumenau	SC
9	Caxias do Sul	RS
10	Itapecerica da Serra	SP
11	Campinas	SP
12	Uberlândia	MG
13	Curitiba	PR
14	Serrana	RJ
15	Piracicaba	SP
16	Vitória	ES
17	Ponta Grossa	PR
18	São Bento do Sul	SC
19	Criciúma	SC
20	Linhares	ES

RANKING PER STATE: Tax Burden

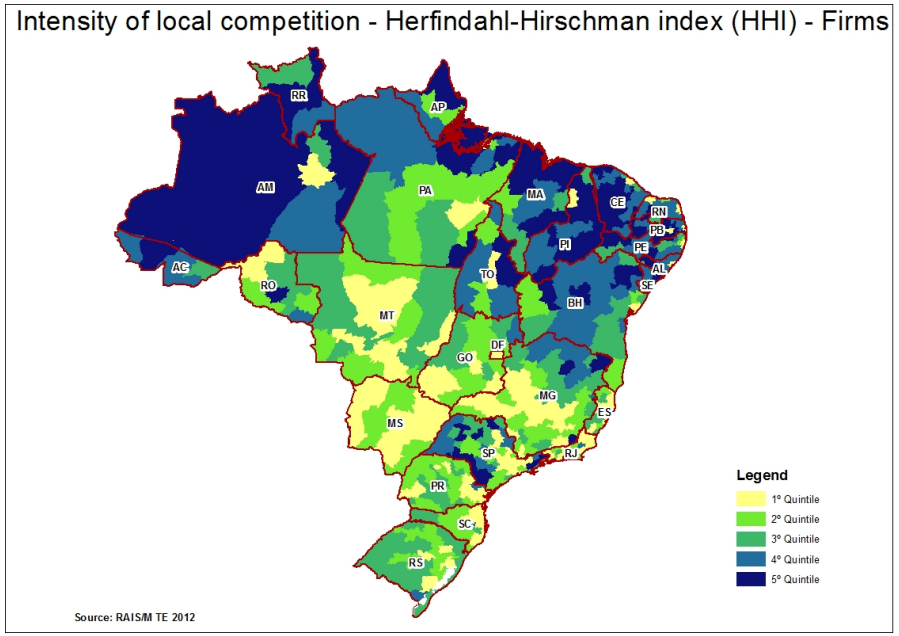
As highlighted by the map below, there is a lack of correlation between the taxes collected in a state, and that state's economic importance, indicating the degree of political discretion involved. The states of São Paulo, Rio de Janeiro and Pernambuco are grouped in the same quintile and Amazonas is singled out by the presence of Manaus' special economic zone, which apparently has contributed more to tax collections than to the state's socioeconomic growth, as evidenced by the other dimensions analyzed.



RANK	STATE	
1	São Paulo	SP
2	Rio de Janeiro	RJ
3	Pernambuco	PE
4	Amazonas	AM
5	Rondônia	RO
...		
23	Acre	AC
24	Tocantins	TO
25	Roraima	RR
26	Federal District	DF
27	Amapá	AP

RANKING PER STATE: Local Competition

A high level of competition is indicative of economic efficiency, although it may be also negatively correlated with relative sophistication of economies of scale at leading industries. All other things being equal, regions with more smaller firms (low Herfindahl-Hirschman Index, HHI) are more competitive than regions where all production is dominated by one large company (high HHI). This pattern can be clearly identified in the results below: in general, the regions with lowest HHI correspond to the country's traditional economic centers.



RANK	STATE	
1	Piauí	PI
2	Maranhão	MA
3	Paraíba	PB
4	Acre	AC
5	Amazonas	AM
...		
23	Santa Catarina	SC
24	Mato Grosso do Sul	MS
25	Espírito Santo	ES
26	Rio de Janeiro	RJ
27	Federal District	DF

Results per dimension

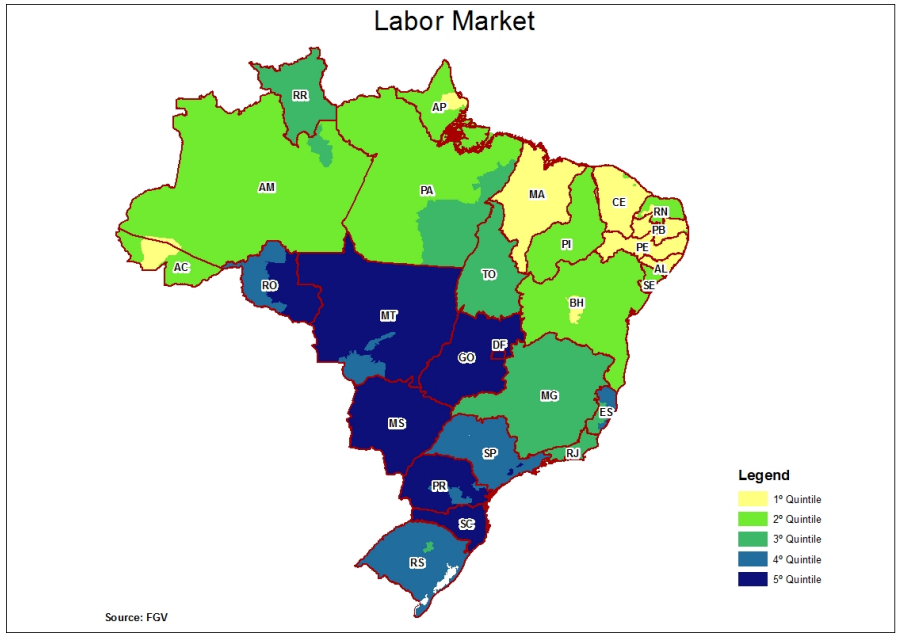
1. BASIC EDUCATION
2. HIGHER AND VOCATIONAL EDUCATION
3. SOCIAL INFRASTRUCTURE
4. SUSTAINABILITY
5. HEALTH
6. PUBLIC SECTOR PERFORMANCE
7. LOGISTICS
8. BUSINESS SOPHISTICATION
9. INNOVATION
10. MARKET SIZE
11. GOODS MARKET
12. **LABOR MARKET**
13. ENERGY RESOURCES
14. AGRICULTURAL AND EXTRACTIVE RESOURCES

An efficient labor market allocates workers to their most effective use, provides equity between women and men, and is able to attract and retain talent. On the contrary, a rigid labor market with high barriers can be an important cause of high youth unemployment. Brazil has a large labor force, but many workers are semiskilled and unskilled. This dimension includes a set of **15 indicators**, which measure the size, flexibility, and efficiency of the labor market, according to the following aspects:

- Employment rates
- Unemployment
- Capacity to attract talent
- Capacity to retain talent

RANKING PER MICROREGION: All indicators

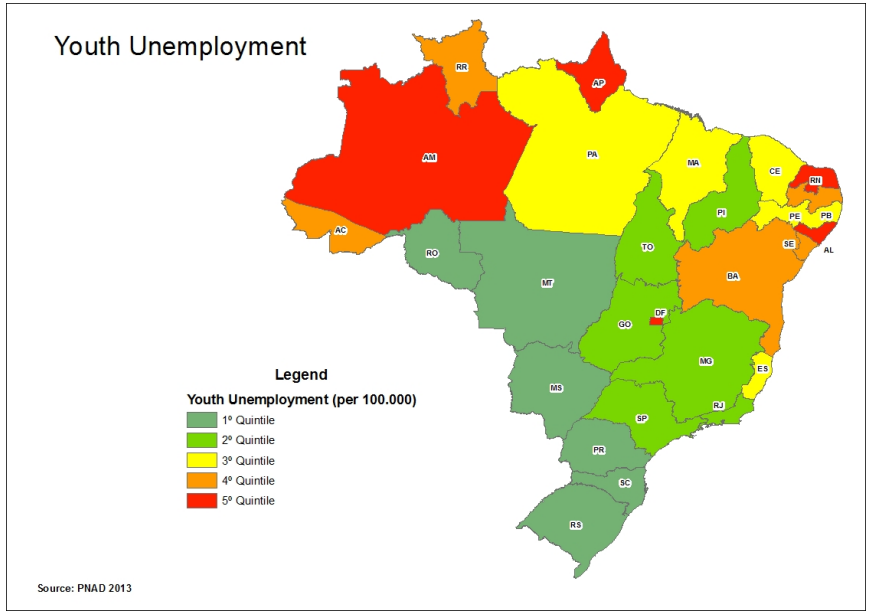
Twelve of the Top 20 microregions with the most competitive labor market are located in the Southern state of Santa Catarina, including the Top 5. The competitiveness of the labor markets of many of the Southern and Central-Western states stand in stark contrast to the less efficient labor markets of the Northeastern states of Alagoas, Pernambuco, Paraíba and Ceará. Minas Gerais and Rio de Janeiro display only average performance.



RANK	MICROREGION	STATE
1	Itajaí	SC
2	Chapecó	SC
3	Joinville	SC
4	Florianópolis	SC
5	São Miguel do Oeste	SC
6	Alto Teles Pires	MT
7	Joaçaba	SC
8	Blumenau	SC
9	Entorno de Brasília	GO
10	Alta Floresta	MT
11	Xanxerê	SC
12	Cassilândia	MS
13	Parecis	MT
14	São Bento do Sul	SC
15	Concórdia	SC
16	Sinop	MT
17	Primavera do Leste	MT
18	Arinos	MT
19	Criciúma	SC
20	Araranguá	SC

RANKING PER STATE: Youth Unemployment

An important aspect of regional labor market efficiency is the ability to keep youth unemployment to a minimum, as failing to employ the youth not only affects economic growth but will significantly hamper future growth. As evidenced by the map below, Brazil's youth unemployment rates are significantly higher in the North and Northeastern regions. Surprisingly, the Federal District suffers from one of the hightest youth unemployment rates in the country. Tocantins and Piauí appear to be highly competitive within their respective regions.



RANK	STATE	
1	Rio Grande do Norte	RN
2	Amapá	AP
3	Federal District	DF
4	Alagoas	AL
5	Amazonas	AM
...		
23	Rio Grande do Sul	RS
24	Paraná	PR
25	Mato Grosso	MT
26	Santa Catarina	SC
27	Mato Grosso do Sul	MS

INTERESTING PHENOMENON

Brazil's "Nem-Nems“

Youth Unemployment (page 78) in Brazil goes hand in hand with the phenomenon of the “Nem-Nems” (Portuguese for “Neither-Nors”): youth neither in employment nor in school. The ranking below shows the five microrregions with the highest share of “Nem-Nems”. Unsurprisingly, all are located in the North and Northeast:

1. Traipu, AL
2. Rio Negro, AM
3. Serrana do Sertão Alagoano, AL
4. Itapecuru Mirim, MA
5. Nordeste de Roraima, RR

The microregions with the lowest share of “Nem-Nems” are Blumenau (SC), Lajeado-Estrela (RS), Gramado-Canela (RS), Rio do Sul (SC) and Guaporé (RS).

Women in workforce

The states with the biggest share of women in the workforce are:

1. Roraima
2. Rio Grande do Sul
3. Tocantins
4. Acre
5. Santa Catarina

The state with the smallest share of women in employment is the Federal District, followed by Alagoas, Mato Grosso, Pará and Pernambuco.

INTERESTING PHENOMENON

Informality

The states with the biggest share of informal workers are:

1. Ceará
2. Piauí
3. Maranhão
4. Tocantins
5. Paraíba

The least informal are:

1. Santa Catarina
2. Rio Grande do Sul
3. Federal District
4. São Paulo
5. Paraná

Migrant and Magnet States

The top migrant sending states are well known:

1. Paraíba
2. Piauí
3. Alagoas

But the magnet states are not as obvious:

1. Roraima
2. Amapá
3. Goiás

Results per dimension

1. BASIC EDUCATION
2. HIGHER AND VOCATIONAL EDUCATION
3. SOCIAL INFRASTRUCTURE
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12. LABOR MARKET
13. **ENERGY RESOURCES**
14. AGRICULTURAL AND EXTRACTIVE RESOURCES

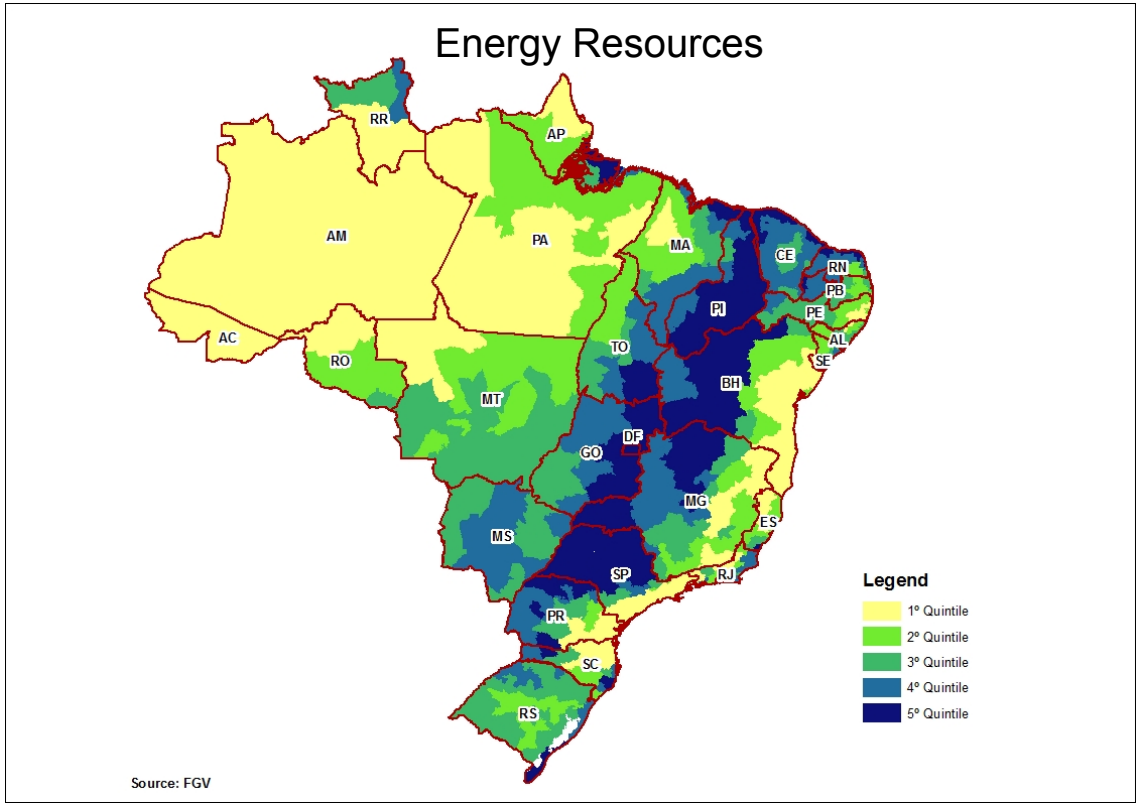
Brazil occupies an outstanding position for energy sources, with a capability to contribute to the greening of the global energy matrix. The localization and diversity of energy sources is of strategic importance for the Brazilian economy and a source of competitive advantage of its states.

This dimension looks at the availability of renewable energy resources in each microregion, understood as a factor which determines investment opportunities. The following **2 indicators** have been included in the analysis:

- Potential for solar energy
- Potential for wind energy

RANKING PER MICROREGION: All indicators

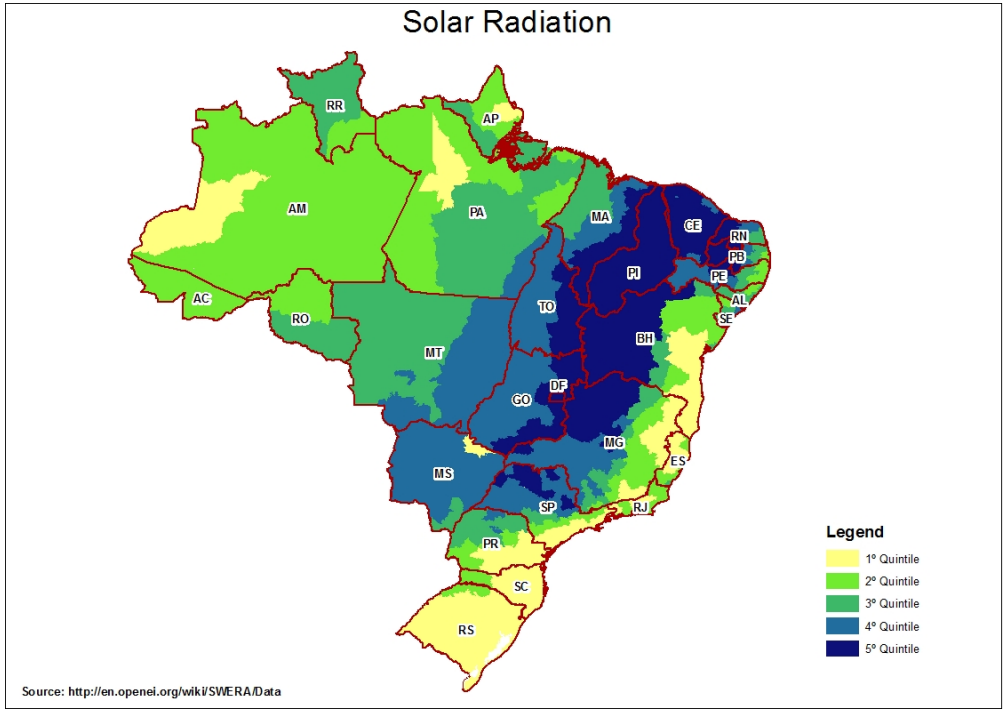
The potential for the generation of energy based on solar radiation and wind speed is highest in the microregions of Boquira (BA), Jarnaúba (MG) and Astorga (PR).



RANK	MICROREGION	STATE
1	Boquira	BA
2	Janaúba	MG
3	Astorga	PR
4	Barra	BA
5	Assis	SP
6	Ituverava	SP
7	Ibiapaba	CE
8	Litoral Lagunar	RS
9	Guanambi	BA
10	Baixo Curu	CE
11	Bom Jesus da Lapa	BA
12	Litoral de Camocim e Acaraú	CE
13	Marília	SP
14	Tupã	SP
15	Ourinhos	SP
16	Itapemirim	ES
17	Alto Médio Canindé	PI
18	Porecatu	PR
19	São Raimundo Nonato	PI
20	Montes Claros	MG

RANKING PER STATE: Potential for solar energy generation

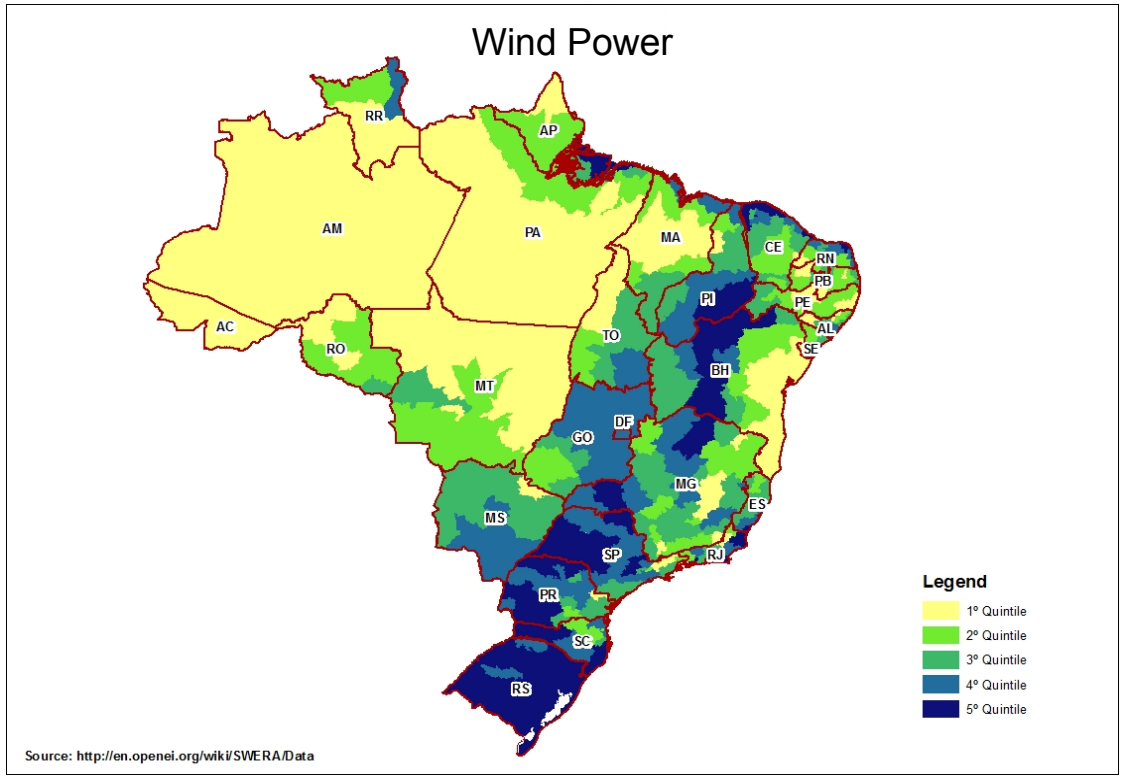
Solar energy potential is determined not only by incidence of sunlight (which most of Brazil evidently enjoys by virtue of its low latitudes), but also by terrain and cloud coverage. Therefore, the mostly flat, semiarid regions in Bahia, northern Minas Gerais and Piauí tend to fare better than (for instance) the mountainous Southern coasts or the Southernmost regions of the country.



RANK	STATE	
1	Piauí	PI
2	Federal District	DF
3	Ceará	CE
4	Goiás	GO
5	Tocantins	TO
...		
23	Espírito Santo	ES
24	São Paulo	SP
25	Paraná	PR
26	Rio Grande do Sul	RS
27	Santa Catarina	SC

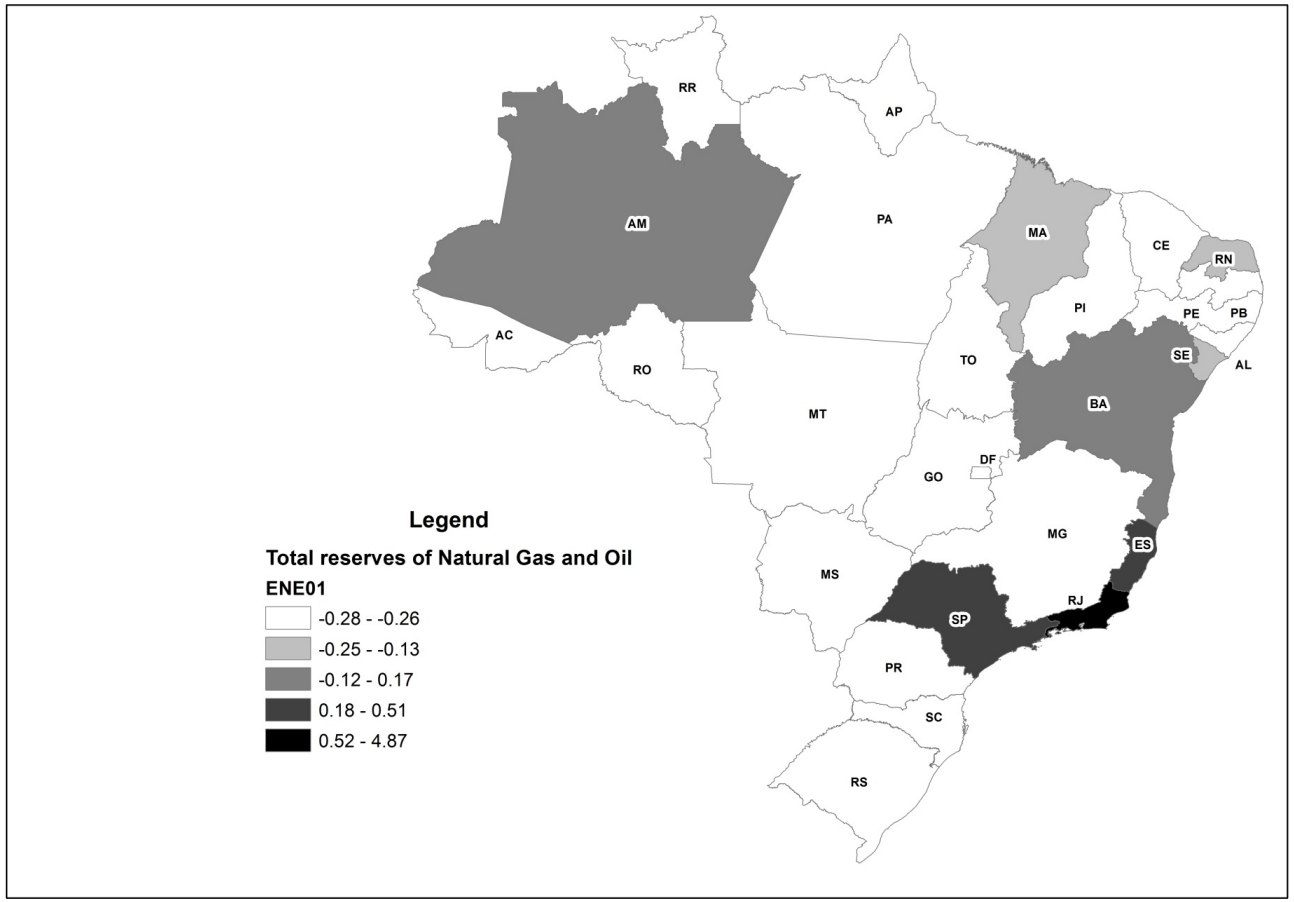
RANKING PER STATE: Potential for wind energy generation

Wind power is mostly a function of geomorphology and weather. In this aspect, Rio Grande do Sul's high potential stands out – the state is indeed the country's largest wind power producer. Many coastal regions and some favorably flat areas throughout all regions, except the North, have favorable conditions for the generation of wind energy.



RANK	STATE	
1	Rio Grande do Sul	RS
2	Santa Catarina	SC
3	São Paulo	SP
4	Paraná	PR
5	Federal District	DF
...		
23	Rondônia	RO
24	Mato Grosso	MS
25	Pernambuco	PE
26	Acre	AC
27	Amazonas	AM

INTERESTING PHENOMENON



Oil and Gas

The states with the biggest share of oil reserves and natural gas are:

1. Rio de Janeiro
2. Espírito Santo
3. São Paulo
4. Amazonas
5. Bahia

Results per dimension

1. BASIC EDUCATION
2. HIGHER AND VOCATIONAL EDUCATION
3. SOCIAL INFRASTRUCTURE
4. SUSTAINABILITY
5. HEALTH
6. PUBLIC SECTOR PERFORMANCE
7. LOGISTICS
8. BUSINESS SOPHISTICATION
9. INNOVATION
10. MARKET SIZE
11. GOODS MARKET
12. LABOR MARKET
13. ENERGY RESOURCES
14. **AGRICULTURAL AND EXTRACTIVE RESOURCES**

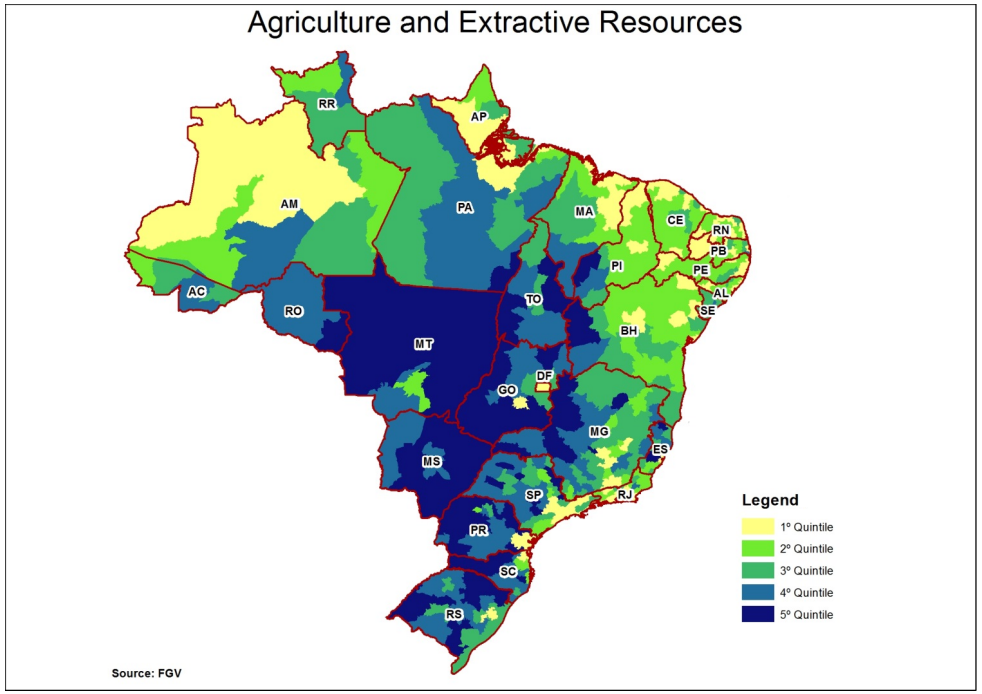
Agriculture and extractive industries are critical drivers of the Brazilian economy, a source of growth and competition and an important area of foreign investment. This dimension measures the availability and productivity of those agricultural and extractive resources which are considered crucial for the competitiveness of the Brazilian microregions namely vegetal and mineral extraction, sugar cane, cropland, livestock, timber, and fish.

The dimension includes a set of 25 indicators which measure the following key aspects of agricultural and extractive activities:

- Employed workforce
- Production volume
- Livestock

RANKING PER MICROREGION: All indicators

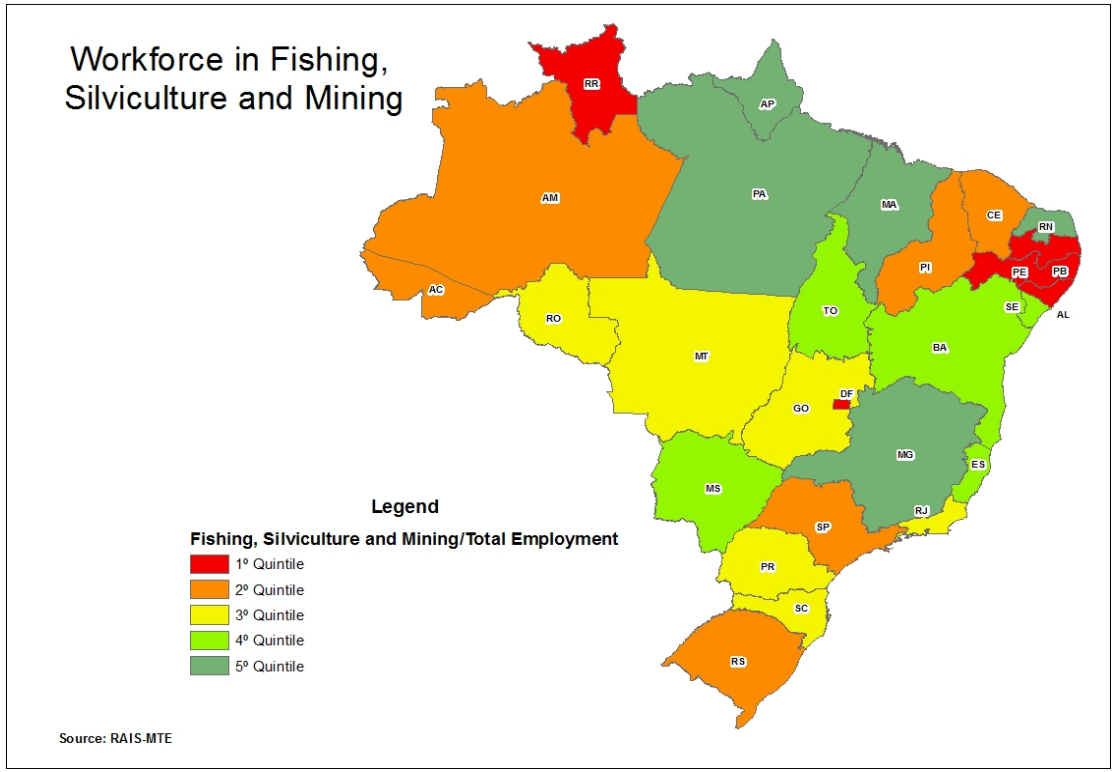
The map below illustrates powerfully the agricultural business drive into the country. The Midwest's substantial endowments are demonstrated, but strong potential production also exists in most other regions, notably the Southern states and the innermost regions of the states of São Paulo and Minas Gerais. Extractive activities in Pará and Minas Gerais are also highlighted.



RANK	MICROREGION	STATE
1	Alto Teles Pires	MT
2	Paranatinga	MT
3	Primavera do Leste	MT
4	Tesouro	MT
5	Arinos	MT
6	Parecis	MT
7	Canarana	MT
8	Sudoeste de Goiás	GO
9	Pires do Rio	GO
10	Cassilândia	MS
11	Alto Taquari	MS
12	Norte Araguaia	MT
13	Alto Araguaia	MT
14	Colorado do Oeste	RO
15	Aripuanã	MT
16	Wenceslau Braz	PR
17	Astorga	PR
18	Nhandeara	SP
19	Cianorte	PR
20	Vale do Rio dos Bois	GO

RANKING PER STATE: Employment in Fishing, Silviculture and Mining

This indicator captures the strong importance of several extractive activities in different states: for instance, mining in Pará and Minas Gerais, fishing in Rio Grande do Norte and forestry in Amapá.



RANK	STATE	
1	Pará	PA
2	Rio Grande do Norte	RN
3	Amapá	MG
4	Maranhão	AP
5	Espírito Santo	ES
...		
23	Roraima	RR
24	Paraíba	PB
25	Alagoas	AL
26	Pernambuco	PE
27	Federal District	DF

Results per Vector

I. **HUMAN CAPITAL**

II. QUALITY OF LIFE

III. INSTITUTIONS

IV. BUSINESS ENVIRONMENT

V. MARKETS

VI. NATURAL RESOURCES

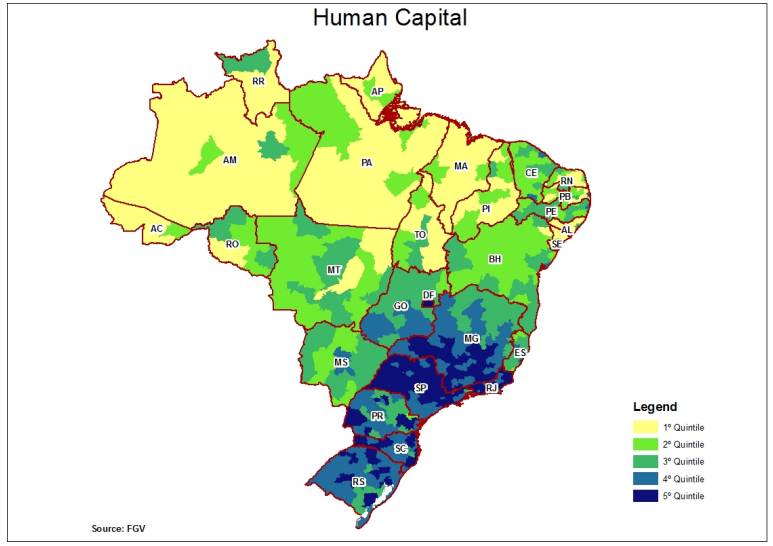
The vector HUMAN CAPITAL includes two dimensions:

- Basic Education, and
- Higher and Vocational Education.

In order to be competitive on regional and global scales, the Brazilian economy needs to move up the value chain into more advanced and diversified manufacturing and services sectors. This will require the development of a sufficiently skilled workforce that can move beyond simple production processes. In other words: only significant and immediate investments in education will enhance local, regional and national productivity and competitiveness. In this context, education will play an even more prominent role in ensuring knowledge spillovers to the domestic economy.

RANKING PER MICROREGION: Human Capital

Based on the individual rankings of basic education and higher and vocational education, it comes to no surprise that the microregion, as well as the state, of São Paulo are outperforming all other regions in human capital generation. The question that needs to be asked and may be investigated in further studies is "Why?". Why is São Paulo the most competitive in education provision? Is it literacy, is it class size, is it the qualiy of its higher education institutions? That is, what is the process that generated the rankings and what lessons can be drawn?



RANK	MICROREGION	STATE
1	São Paulo	SP
2	Jundiaí	SP
3	Campinas	SP
4	São José dos Campos	SP
5	Fernandópolis	SP
6	Marília	SP
7	Sorocaba	SP
8	São Carlos	SP
9	Limeira	SP
10	São José do Rio Preto	SP
11	Bauru	SP
12	Araçatuba	SP
13	Jales	SP
14	Piracicaba	SP
15	Brasília	DF
16	Votuporanga	SP
17	Florianópolis	SC
18	Ribeirão Preto	SP
19	Belo Horizonte	MG
20	Araraquara	SP

Results per Vector

I. HUMAN CAPITAL

II. QUALITY OF LIFE

III. INSTITUTIONS

IV. BUSINESS ENVIRONMENT

V. MARKETS

VI. NATURAL RESOURCES

The vector QUALITY OF LIFE includes three dimensions:

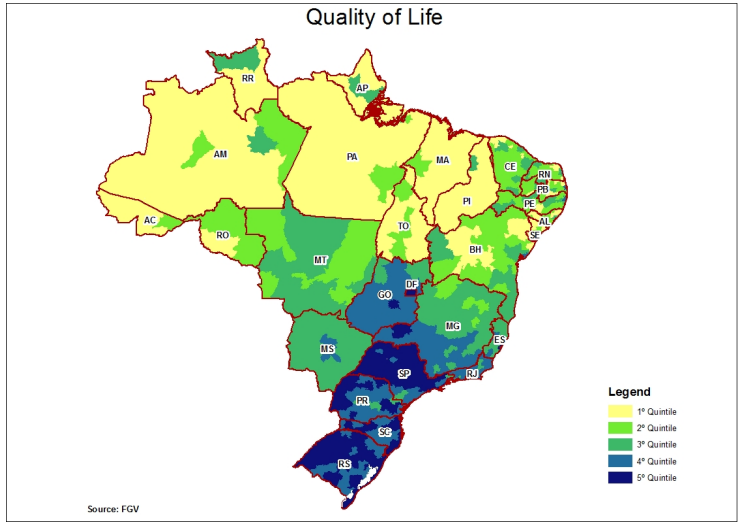
- Social Infrastructure,
- Sustainability, and
- Health.

Quality of life is here understood as those factors which guarantee and increase labor productivity, including adequate and affordable housing, clean air and public health services, access to ICTs and electricity, and an efficient transport network, among others. Over the past decade, a reduction in poverty and income inequality has been witnessed, but Brazil continues to be one of the most unequal countries in the world, and a more even distribution of income and wealth, on both an individual and a regional basis, is key for its competitive future.

In the following, will be presented the microregions which provide the highest quality of life to their population.

RANKING PER MICROREGION: Quality of Life

The map reflects what has been observed for the wide majority of dimensions and indicators: A strong polarization between the more affluent South, and the poor, sometimes underdeveloped Northern and Northeastern regions. Quality of life is worsening the more North one travels, except from a few brighter spots which indicate average living conditions. Florianópolis stands out as the microregion with the highest life quality. A topic for further investigation may be that 12 of the Top 20 regions are located in São Paulo. Which factors account for this success?



RANK	MICROREGION	STATE
1	Florianópolis	SC
2	Barretos	SP
3	São Paulo	SP
4	Curitiba	PR
5	Porto Alegre	RS
6	Maringá	PR
7	Jaú	SP
8	Campinas	SP
9	Marília	SP
10	Londrina	PR
11	Bauru	SP
12	Caxias do Sul	RS
13	Moji Mirim	SP
14	Blumenau	SC
15	São José do Rio Preto	SP
16	Botucatu	SP
17	Jundiaí	SP
18	São José dos Campos	SP
19	Brasília	DF
20	São João da Boa Vista	SP

Results per Vector

I. HUMAN CAPITAL
II. QUALITY OF LIFE
III. INSTITUTIONS
IV. BUSINESS ENVIRONMENT
V. MARKETS
VI. NATURAL RESOURCES

The vector INSTITUTIONS contains one dimension:

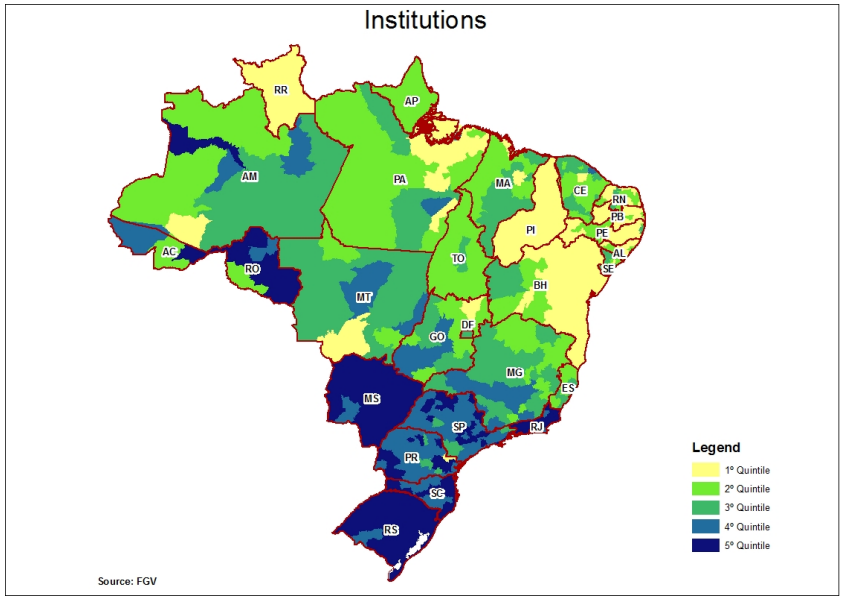
- Public Sector Performance.

A sound and fair institutional environment has a strong bearing on regional competitiveness and growth, as it translates into reduced transaction costs of all economic activity. In the World Bank's Ease of Doing Business Index of 2014, Brazil ranks 120th out of 189 countries. In comparison which other Latin American Countries, Brazil has the best regional performance in the categories “Cost to start a business”, “Getting electricity”, and “Cost (% of claim) of enforcing contracts”. On the downside, Brazil ranks lowest amongst its Latin American Counterparts in terms of “Time (days) to dealing with construction permits”; “Number of procedures for registering property”; and “Time spent (hours per year) to paying taxes (2600)”.

In the following, the most competitive microregion for institutions will be found out.

RANKING PER MICROREGION: Institutions

Caxias do Sul, in the state of Rio Grande do Sul, scores highest in the assessment of institutional quality, reflecting the competitiveness of the state. Thirteen of the Top 20 regions are located in the Southernmost state of Brazil. The states of Roraima in the far North as well as Piauí and Bahia in the Northeast are strikingly underperforming when it comes to the quality of their institutions. Interestingly, the Northern region is not performing as badly as may be expected, with several average and highly ranking regions.



RANK	MICROREGION	STATE
1	Caxias do Sul	RS
2	Bacia de São João	RJ
3	Guaporé	RS
4	Sananduva	RS
5	Erechim	RS
6	Montenegro	RS
7	Campo Grande	MS
8	Passo Fundo	RS
9	Macaé	RJ
10	Ijuí	RS
11	Gramado-Canela	RS
12	Campanha Meridional	RS
13	Santa Maria	RS
14	Jaguarão	RS
15	Cassilândia	MS
16	Santa Rosa	RS
17	Barra do Piraí	RJ
18	Santiago	RS
19	Vale do Paraíba Fluminense	RJ
20	Itaguaí	RJ

Results per Vector

I. HUMAN CAPITAL

II. QUALITY OF LIFE

III. INSTITUTIONS

IV. BUSINESS ENVIRONMENT

V. MARKETS

VI. NATURAL RESOURCES

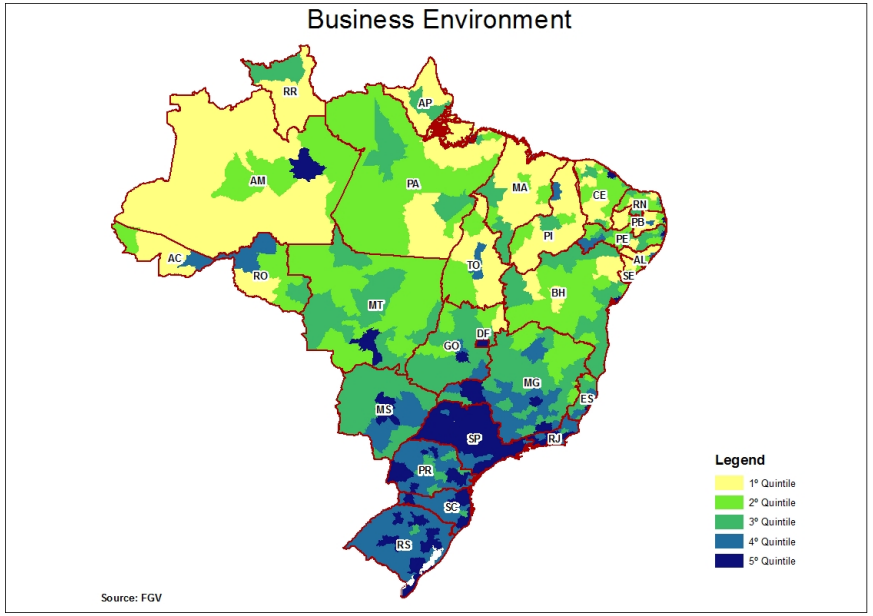
The vector BUSINESS ENVIRONMENT includes three dimensions:

- Logistics,
- Business Sophistication, and
- Innovation.

A strong business environment is critical for competitiveness, as it sets the operating framework for a strong private sector and, hence, employment creation. Successful business activities rely on the efficient flow of goods and services within and across national borders, as well as on a talent pool on which businesses can draw. In order to remain competitive, a labor force which is sufficiently skilled to successfully adopt and use technologies to enhance productivity and enable innovative processes is crucial. Moreover, sophisticated behavior of individual firms or sectors will spill over into the economy and lead to modern business processes across the state. In the following, the microregion that provides the most competitive business environment will be found out.

RANKING PER MICROREGION: Business Environment

The most favorable places to do business in Brazil are technologically advanced, innovation-prone cities, mostly in São Paulo and other Southeastern and Southern states. Notably, Brasília is also well-positioned, as are some capitals in the other regions. More surprisingly, many non-capital cities in the state of São Paulo are extremely well-ranked – especially affluent Guarulhos, conveniently located near the country's largest, busiest airport.



RANK	MICROREGION	STATE
1	Guarulhos	SP
2	Campinas	SP
3	Rio de Janeiro	RJ
4	São Paulo	SP
5	Porto Alegre	RS
6	Curitiba	PR
7	Florianópolis	SC
8	Brasília	DF
9	Jundiaí	SP
10	Osasco	SP
11	Ribeirão Preto	SP
12	Belo Horizonte	MG
13	Bauru	SP
14	Salvador	BA
15	São José dos Campos	SP
16	São José do Rio Preto	SP
17	Recife	PE
18	São Carlos	SP
19	Sorocaba	SP
20	Bragança Paulista	SP

Results per Vector

I. HUMAN CAPITAL
II. QUALITY OF LIFE
III. INSTITUTIONS
IV. BUSINESS ENVIRONMENT
V. MARKETS
VI. NATURAL RESOURCES

The vector MARKETS includes three dimensions:

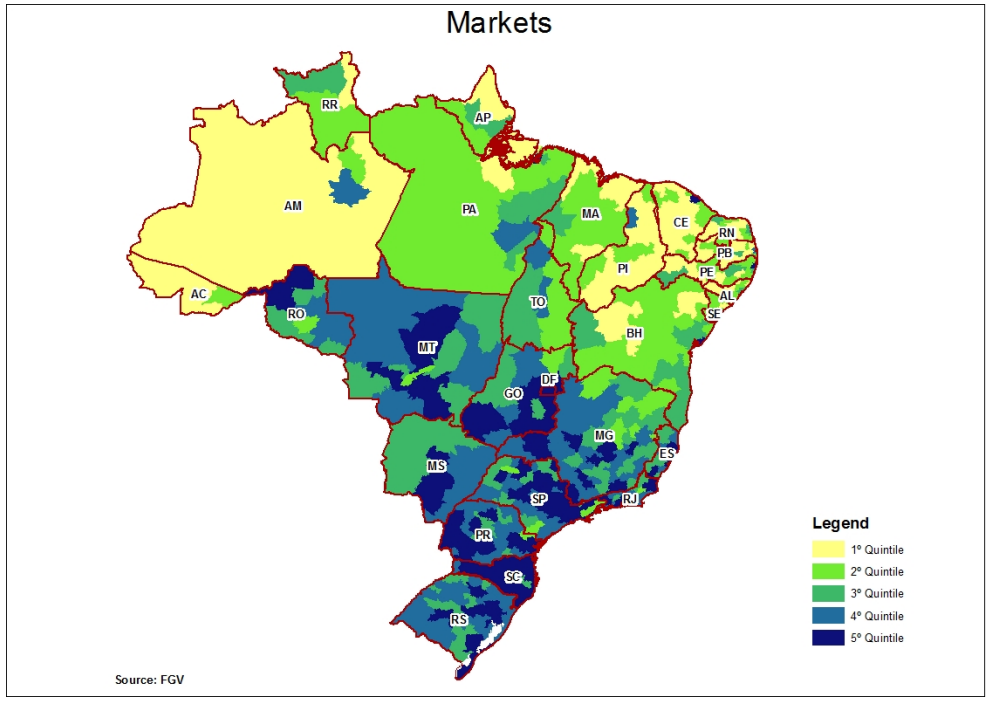
- Market Size,
- Goods Market, and
- Labor Market.

The size of the market is a crucial aspect of a region's competitiveness and productivity, since large markets provide investors with economic opportunities and allow firms to exploit economies of scale and scope. In a competitive goods market, all resources are allocated to their most appropriate use, and obstacles to the efficient exchange of goods, such as high taxes and changing regulations, are reduced to a minimum. An efficient labor market allocates workers to their most effective use, provides equity between women and men, and is able to attract and retain talent.

In the following, the microregion that provides the most competitive market environment will be found out.

RANKING PER MICROREGION: Markets

With regard to market size and efficiencies (goods and labor) the majority of the Southern regions perform well, while many regions in the North and Northeast exhibit below-average performances, indicating that Brazil's good performance at the aggregate level is skewed by a few extremely well performing economies in this vector. This fact alone is a reason for further investigation.



RANK	MICROREGION	STATE
1	São Paulo	SP
2	Brasília	DF
3	Curitiba	PR
4	Joinville	SC
5	Itajaí	SC
6	Campinas	SP
7	Florianópolis	SC
8	Blumenau	SC
9	Guarulhos	SP
10	Osasco	SP
11	Porto Alegre	RS
12	Goiânia	GO
13	Rio de Janeiro	RJ
14	Santos	SP
15	São José dos Campos	SP
16	Belo Horizonte	MG
17	Vitória	ES
18	Itapecerica da Serra	SP
19	Maringá	PR
20	Londrina	PR

Results per Vector

I. HUMAN CAPITAL
II. QUALITY OF LIFE
III. INSTITUTIONS
IV. BUSINESS ENVIRONMENT
V. MARKETS
VI. NATURAL RESOURCES

The vector NATURAL RESOURCES includes two dimensions:

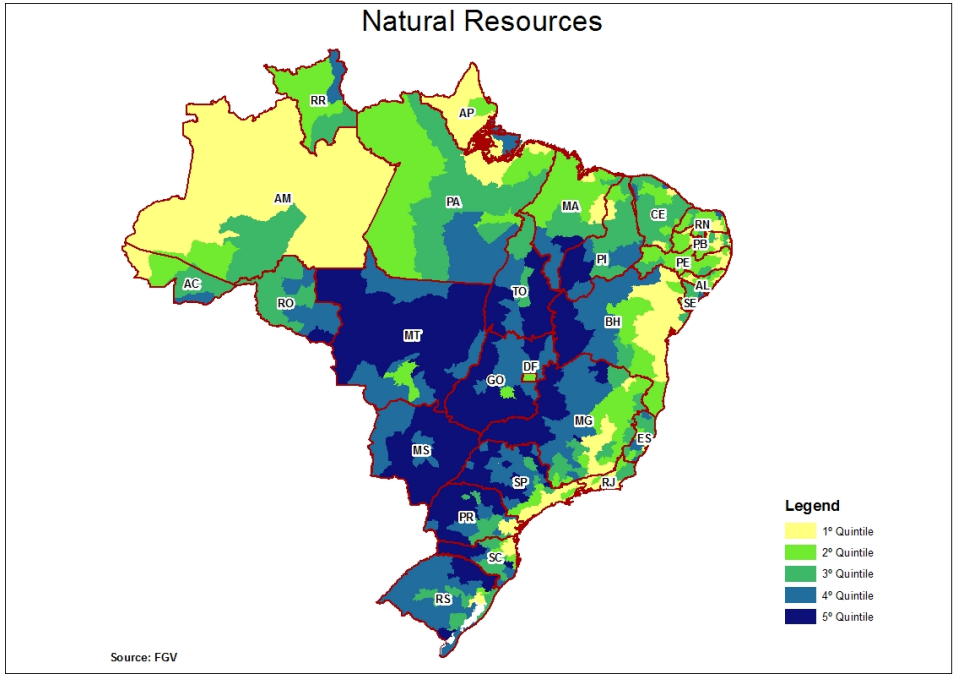
- Energy Resources, and
- Agricultural and Extractive Resources.

Brazil's abundant agricultural, mineral, and energy resources have let to the development of an extensive industrial base and a highly diversified economy. Resource extraction generates the largest source of exports, inward investment and potential for government revenues. The widespread use of renewable sources - including solar and wind - contribute to make growth more sustainable.

In the following, it will be found out which microregion is the most competitive when aggregating renewable energy, agricultural and extractive resources.

RANKING PER MICROREGION: Natural Resources

Interestingly, Brazil's best naturally endowed regions are neither among the country's highest- nor lowest-performing regarding the other vectors. This may mean that the economic growth spurred by the exploitation of these natural resources permits them to enjoy other dimensions of competitiveness. In contrast, the least naturally endowed regions (the semiarid Northeast and the far Amazon) also tend to perform poorly in the other vectors.



RANK	MICROREGION	STATE
1	Astorga	PR
2	Alto Teles Pires	MT
3	Pires do Rio	GO
4	Primavera do Leste	MT
5	Tupã	SP
6	Tesouro	MT
7	Parecis	MT
8	Paranatinga	MT
9	Nhandeara	SP
10	Arinos	MT
11	Goioerê	PR
12	Canarana	MT
13	Xanxerê	SC
14	Sudoeste de Goiás	GO
15	Auriflama	SP
16	Alto Taquari	MS
17	Floraí	PR
18	Cianorte	PR
19	Porecatu	PR
20	Cassilândia	MS

FINAL RESULT

In this final section of the second part of the BRAZIL COMPETITIVENES PROFILE, the final result of the study is presented and further analyzed according to the following points of interest:

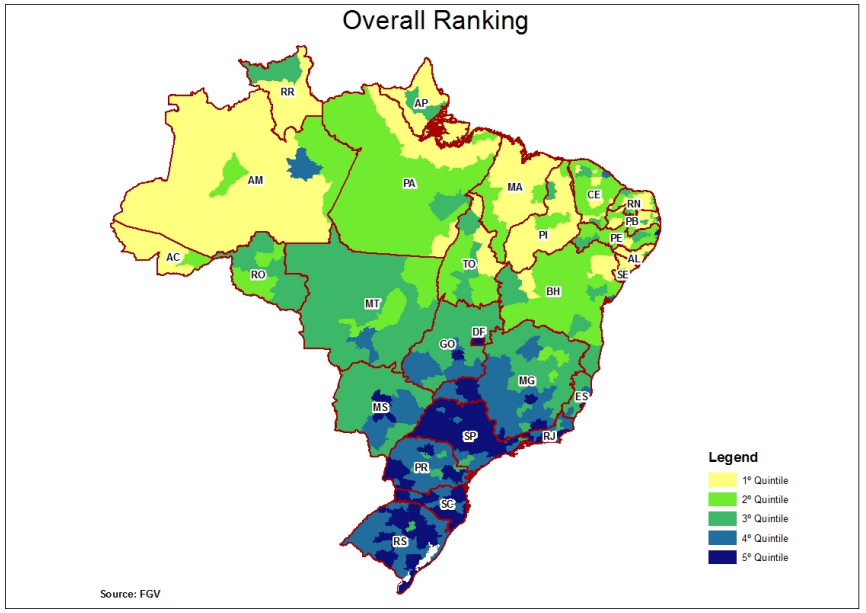
RANKING PER MICROREGION: Which are the 20 most competitive microregions when all 224 indicators are aggregated?

DASHBOARD TOP 10: Which are the success factors of the 10 highest ranking microregions?

TOP 3 PER STATE: Which are the 3 most competitive microregions of each of the 26 States and the Federal District?

RANKING PER MICROREGION: Aggregated index with all 224 indicators

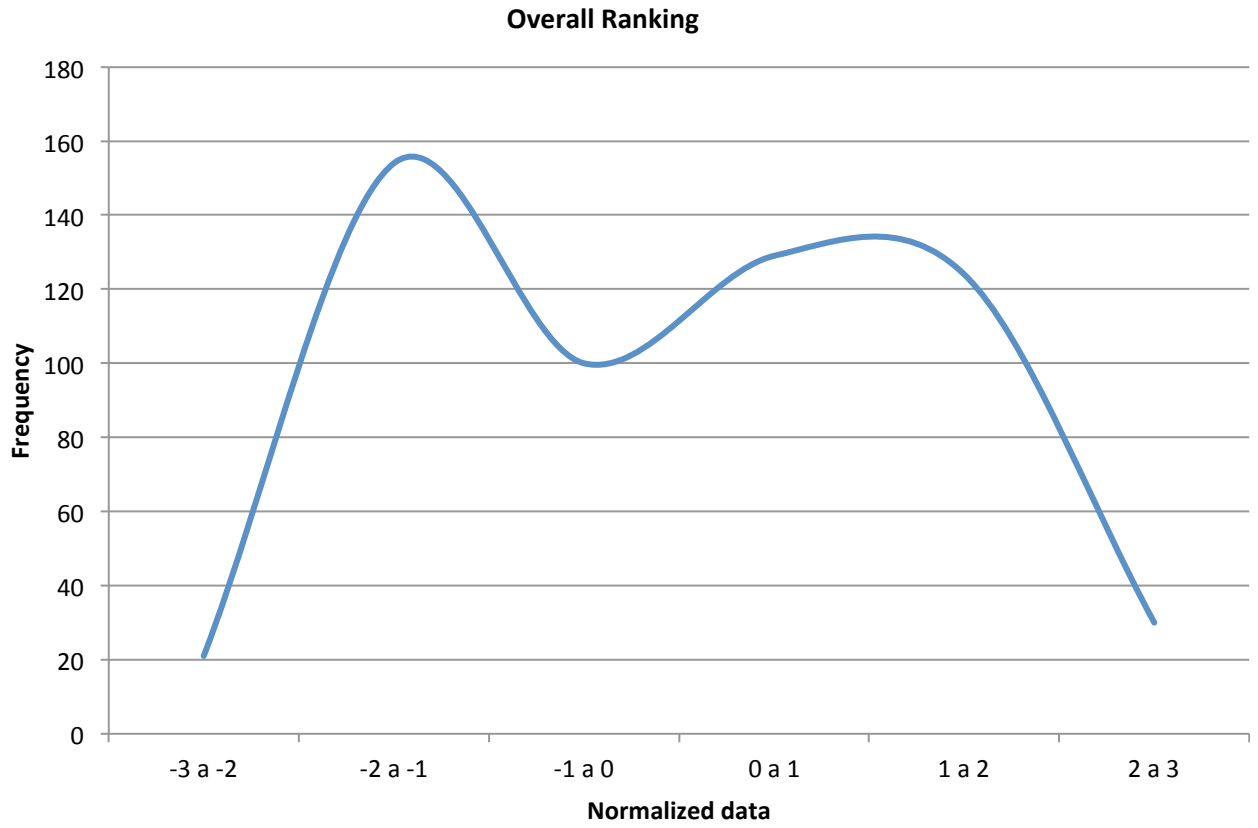
The aggregated index, displayed below, provides a comparative analysis of the relative economic competitiveness of the 558 microregions in Brazil. It has been designed to be a weighted average across the 14 dimensions of competitiveness, each measuring a different aspect that influences the development of businesses and the social and economic welfare of individuals.

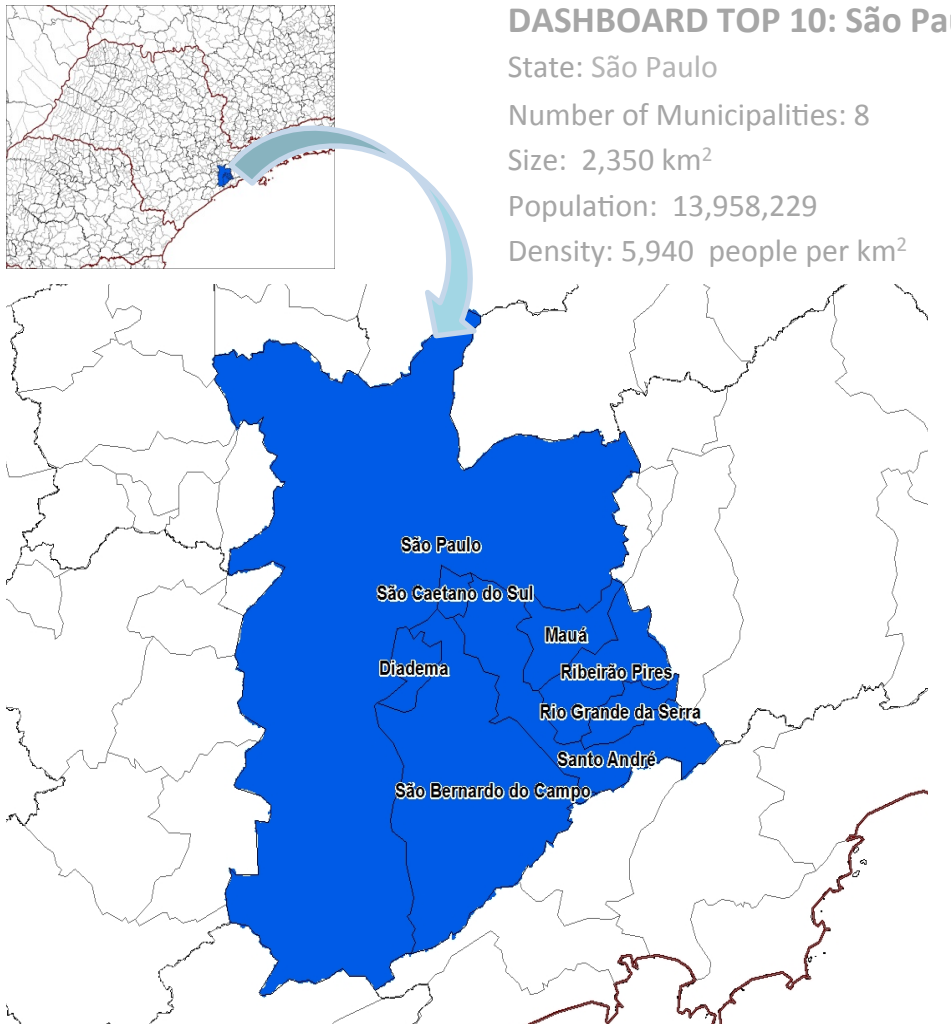


RANK	MICROREGION	STATE
1	São Paulo	SP
2	Campinas	SP
3	Florianópolis	SC
4	Porto Alegre	RS
5	Curitiba	PR
6	Jundiaí	SP
7	Guarulhos	SP
8	Rio de Janeiro	RJ
9	Caxias do Sul	RS
10	São José dos Campos	SP
11	Piracicaba	SP
12	Bauru	SP
13	Osasco	SP
14	Sorocaba	SP
15	Joinville	SC
16	Ribeirão Preto	SP
17	São José do Rio Preto	SP
18	São Carlos	SP
19	Brasília	DF
20	Maringá	PR

INTERESTING PHENOMENON: A tale of two Brazils

As expected, the aggregate competitiveness figures presented in this report do not point towards a uniform condition of competitiveness in Brazil, but instead mask wide differences among the Brazilian microregions, suggesting a competitiveness divide across the country. There is a polarization between very competitive, a less competitive microregions, and a smaller, but considerable, number of regions placed in the middle.





DASHBOARD TOP 10: São Paulo (1st)

State: São Paulo

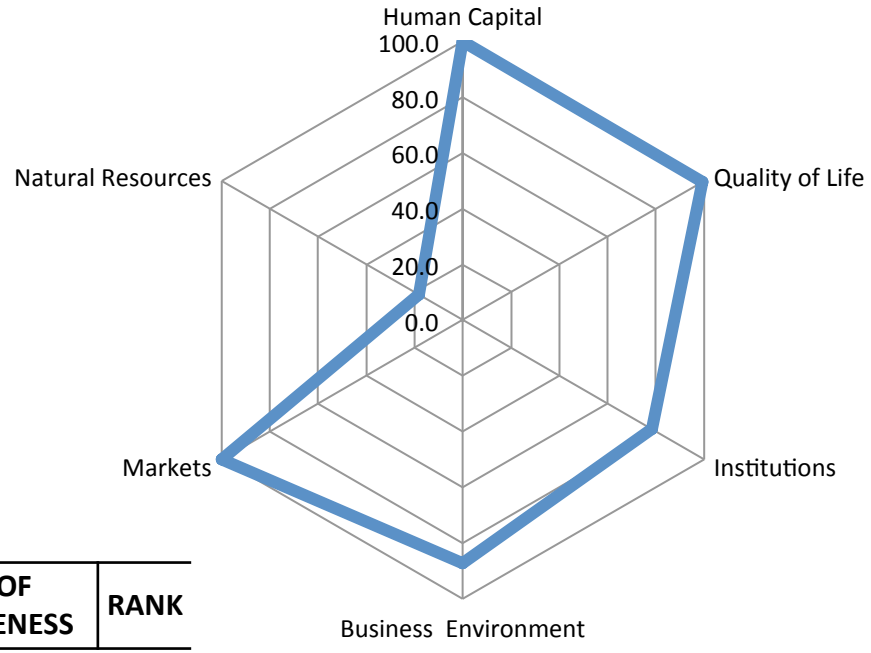
Number of Municipalities: 8

Size: 2,350 km²

Population: 13,958,229

Density: 5,940 people per km²

Vectors Competitiveness Scores



VECTORS OF COMPETITIVENESS	RANK
Human Capital	1
Markets	1
Quality of Life	3
Business Environment	4
Institutions	105
Natural Resources	547

DASHBOARD TOP 10: Campinas (2nd)

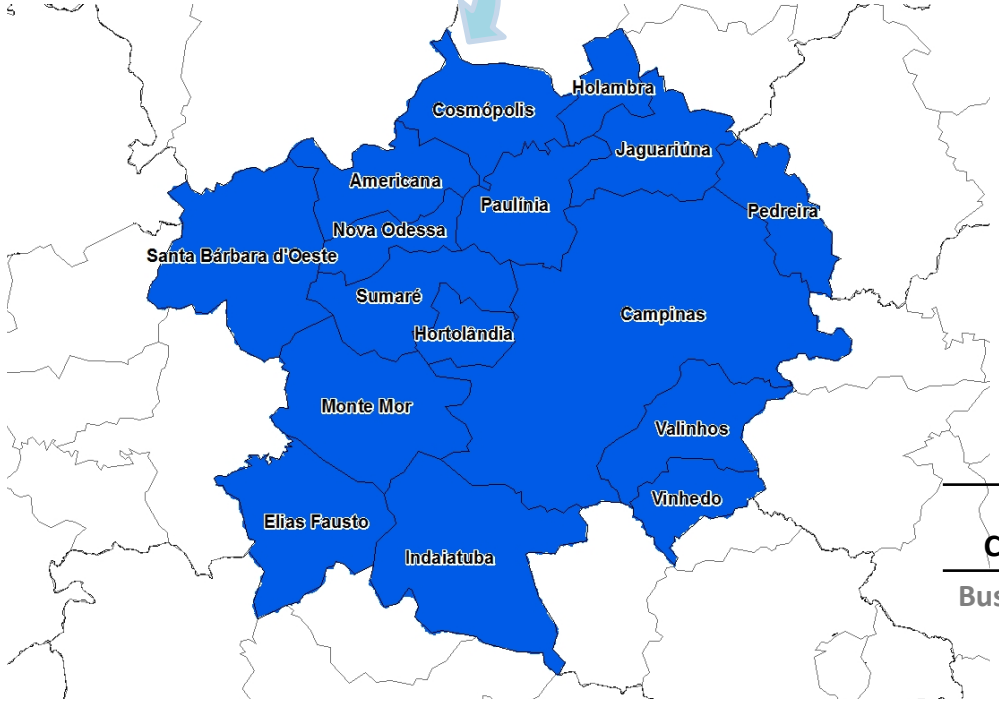
State: São Paulo

Number of Municipalities: 16

Size: 3,083 km^2

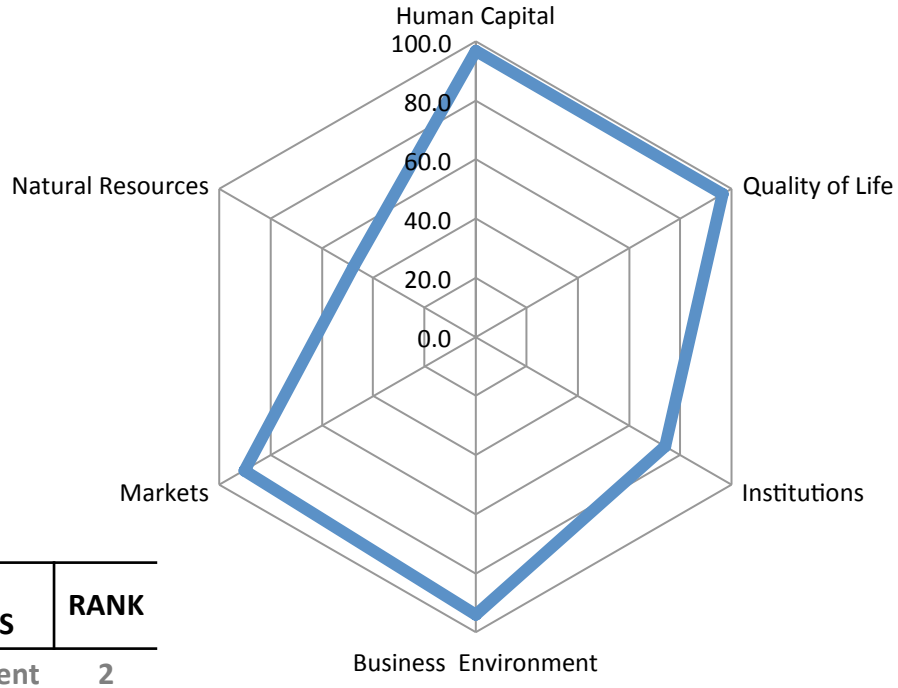
Population: 2,694,521

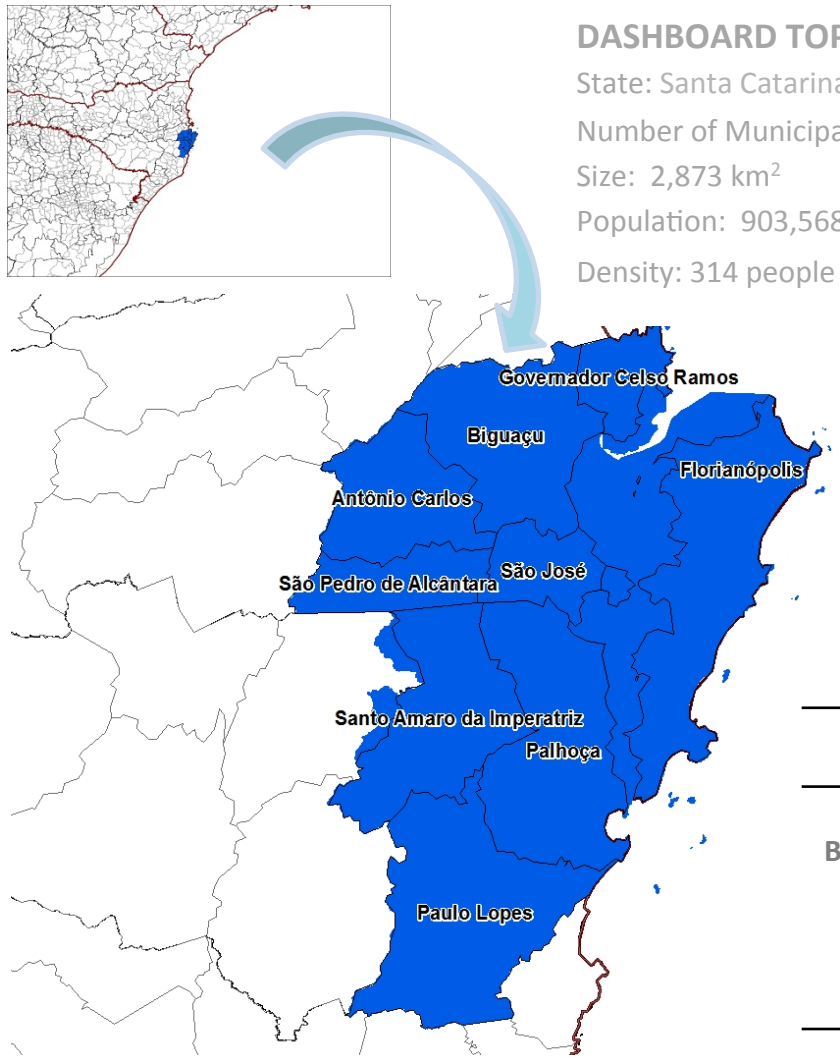
Density: 874 people per km^2



VECTORS OF COMPETITIVENESS	RANK
Business Environment	2
Human Capital	3
Markets	6
Quality of Life	8
Institutions	157
Natural Resources	371

Vectors Competitiveness Scores





DASHBOARD TOP 10: Florianópolis (3rd)

State: Santa Catarina

Number of Municipalities: 9

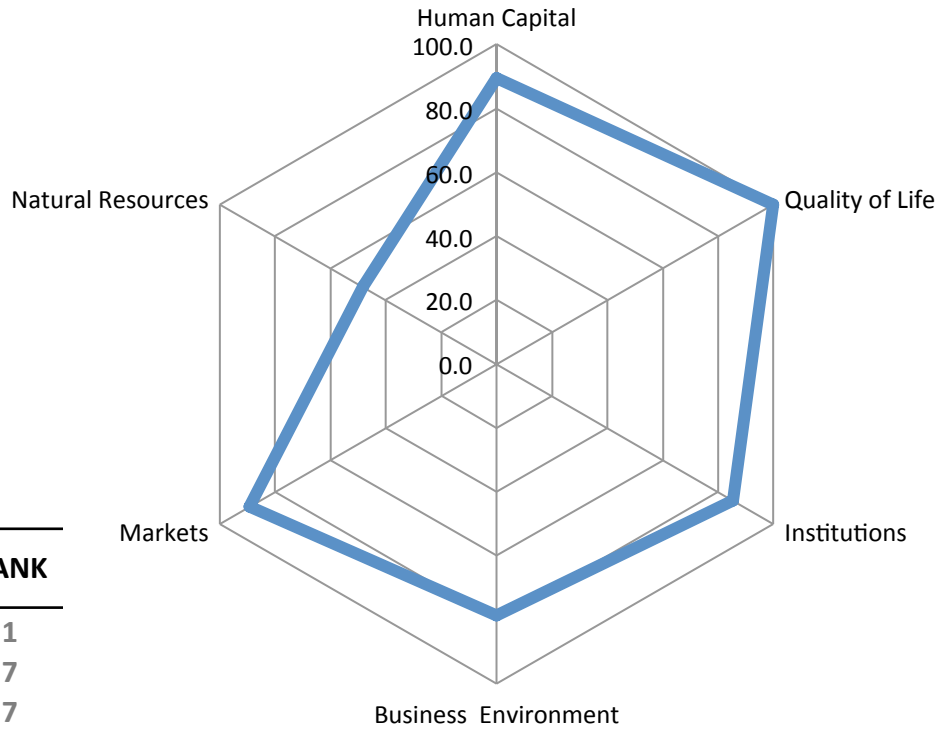
Size: 2,873 km²

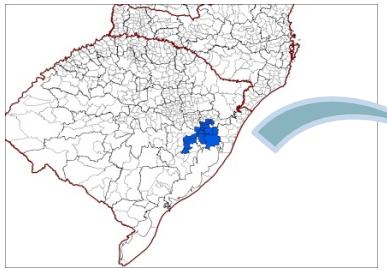
Population: 903,568

Density: 314 people per km²

VECTORS OF COMPETITIVENESS	RANK
Quality of Life	1
Business Environment	7
Markets	7
Human Capital	17
Institutions	50
Natural Resources	362

Vectors Competitiveness Scores





DASHBOARD TOP 10: Porto Alegre (4th)

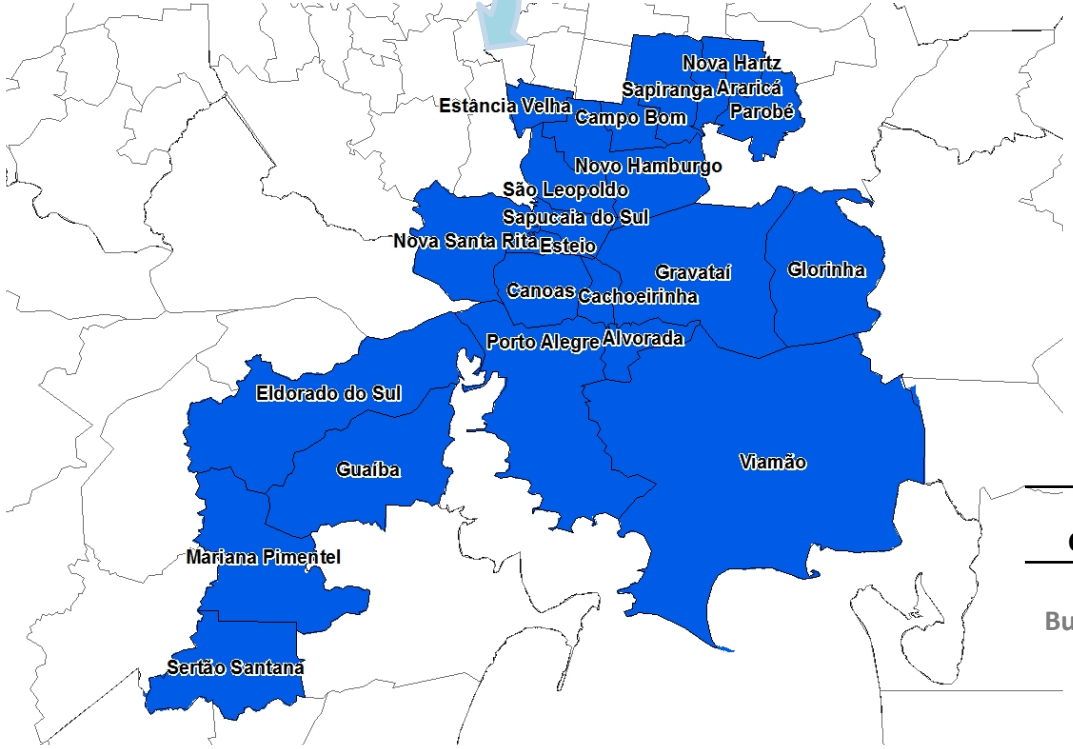
State: Santa Catarina

Number of Municipalities: 22

Size: 5,591 km²

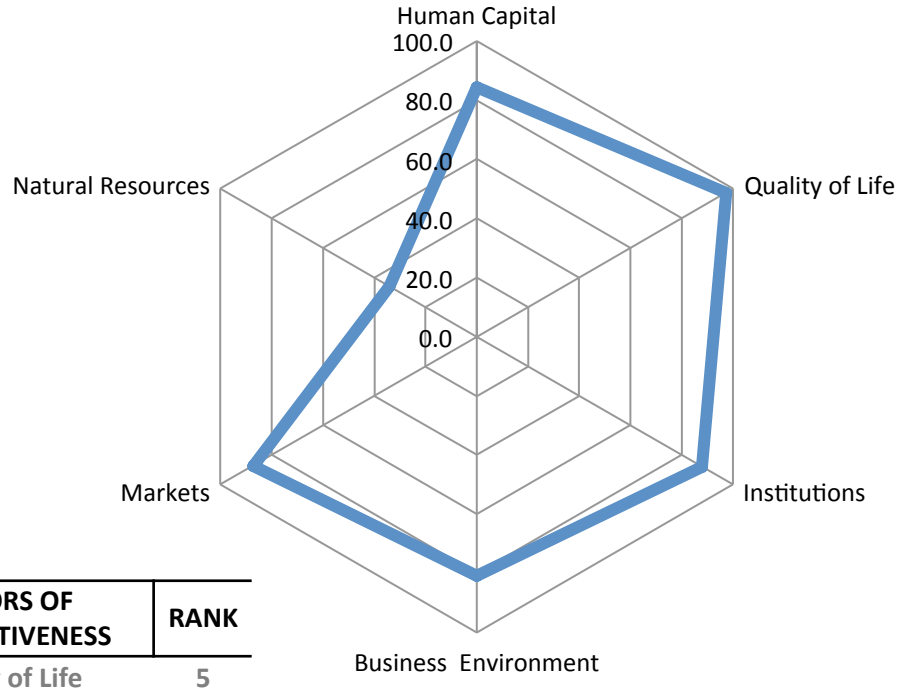
Population: 3,658,690

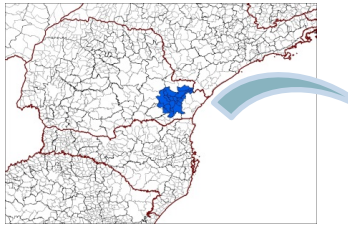
Density: 654 people per km²



VECTORS OF COMPETITIVENESS	RANK
Quality of Life	5
Business Environment	5
Markets	11
Institutions	37
Human Capital	42
Natural Resources	511

Vectors Competitiveness Scores





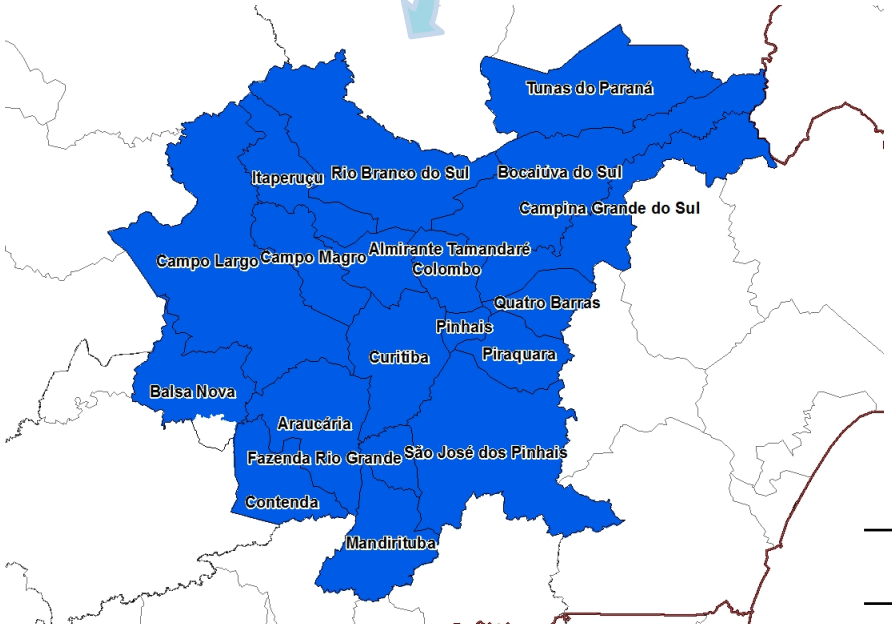
DASHBOARD TOP 10: Curitiba (5th)

State: Paraná

Number of Municipalities: 19

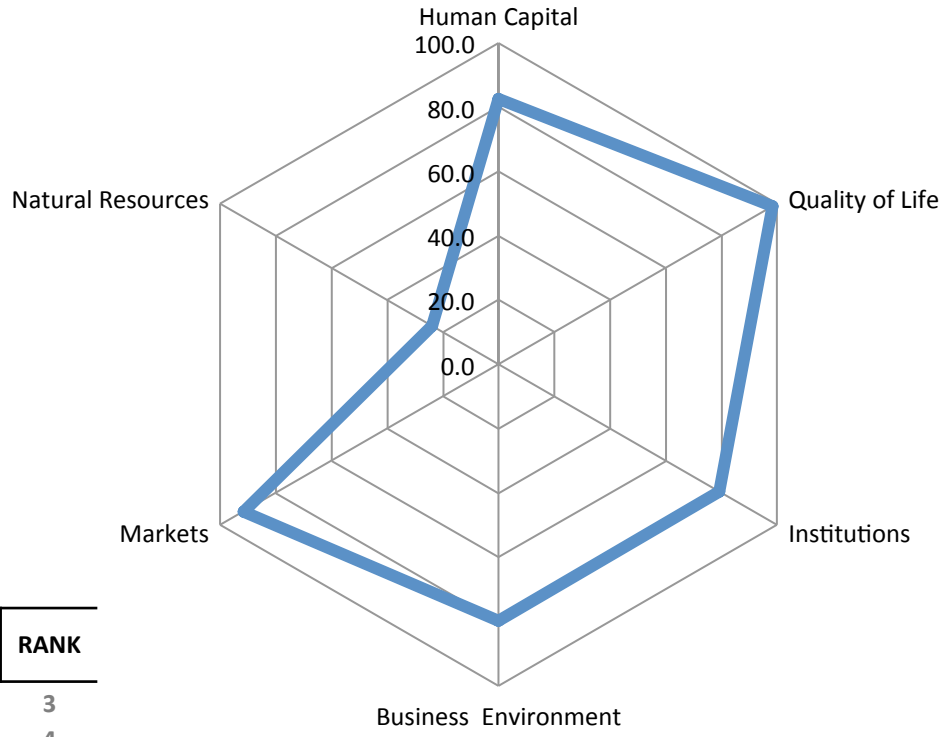
Size: 8,541 km²

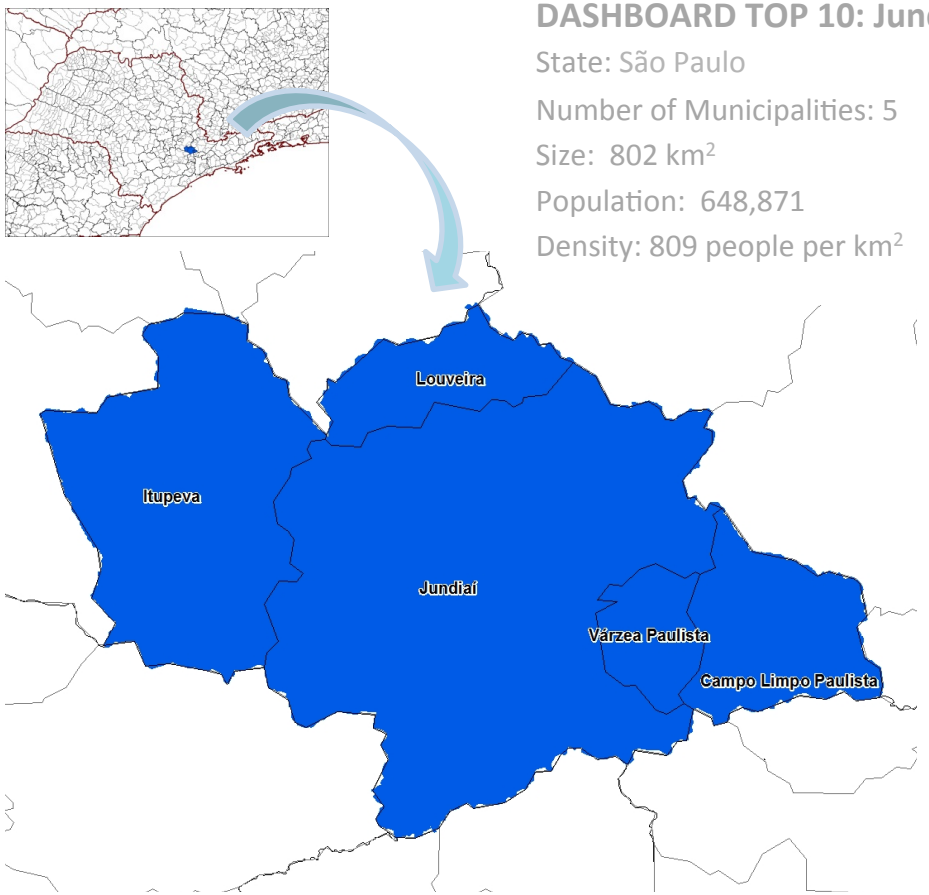
Population: 3,120,488



VECTORS OF COMPETITIVENESS	RANK
Markets	3
Quality of Life	4
Business Environment	6
Human Capital	48
Institutions	94
Natural Resources	537

Vectors Competitiveness Scores





DASHBOARD TOP 10: Jundiaí (6th)

State: São Paulo

Number of Municipalities: 5

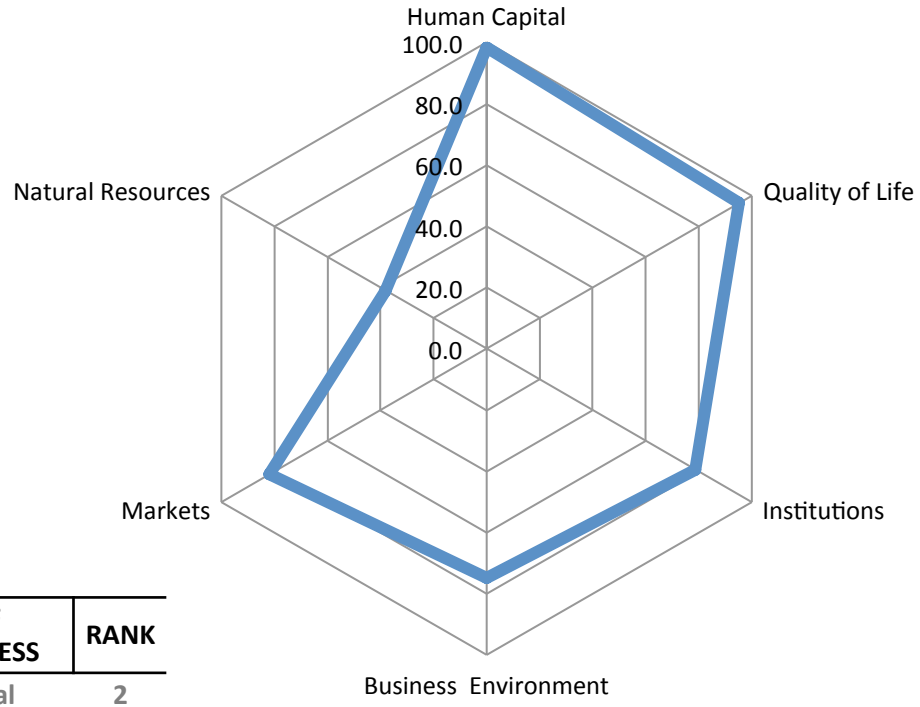
Size: 802 km²

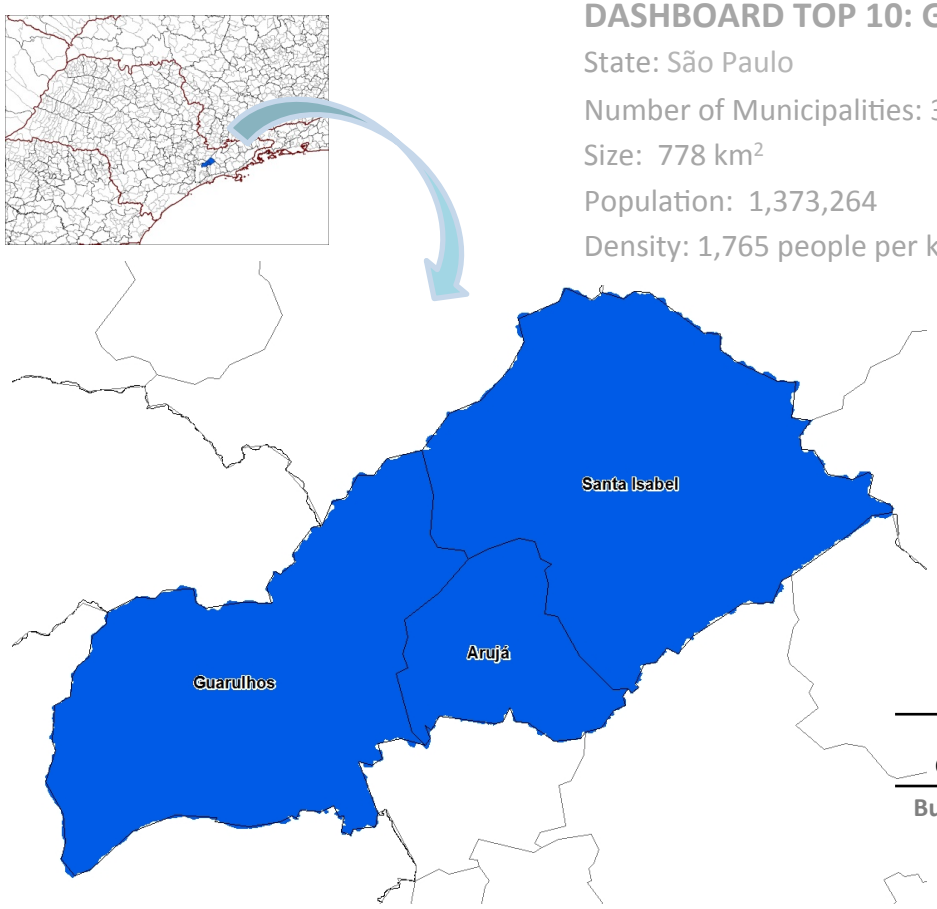
Population: 648,871

Density: 809 people per km²

VECTORS OF COMPETITIVENESS	RANK
Human Capital	2
Business Environment	9
Quality of Life	17
Markets	24
Institutions	100
Natural Resources	483

Vectors Competitiveness Scores





DASHBOARD TOP 10: Guarulhos (7th)

State: São Paulo

Number of Municipalities: 3

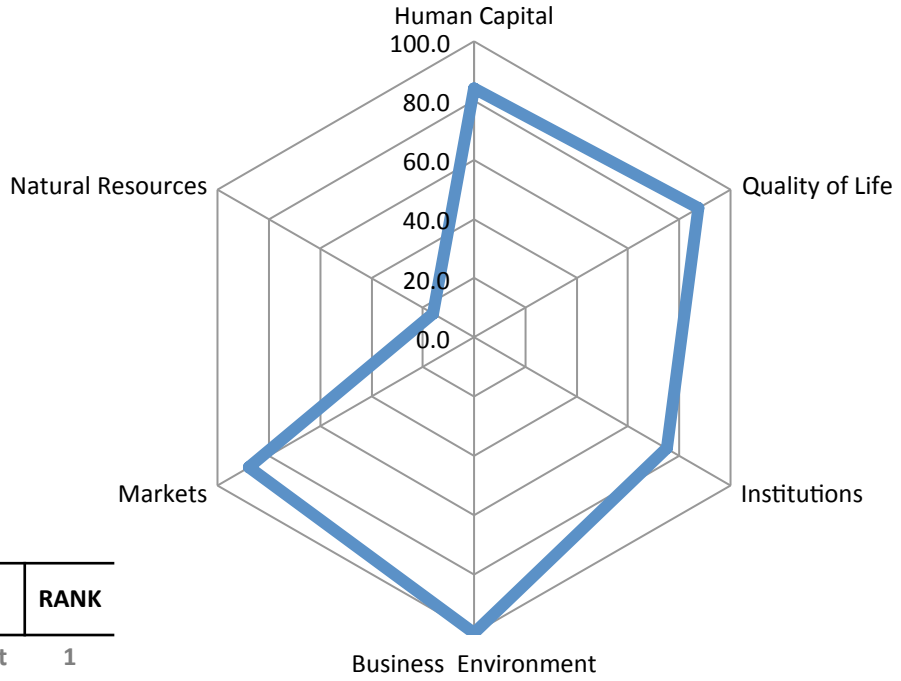
Size: 778 km²

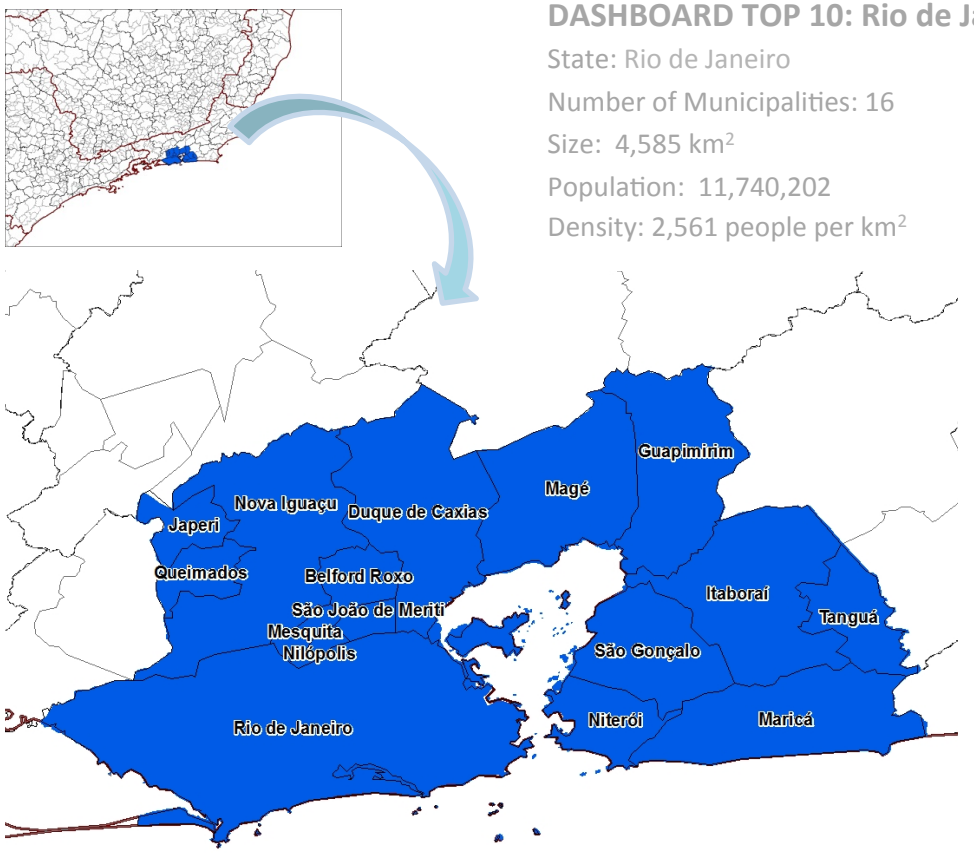
Population: 1,373,264

Density: 1,765 people per km²

VECTORS OF COMPETITIVENESS	RANK
Business Environment	1
Markets	9
Human Capital	44
Quality of Life	94
Institutions	148
Natural Resources	552

Vectors Competitiveness Scores





DASHBOARD TOP 10: Rio de Janeiro (8th)

State: Rio de Janeiro

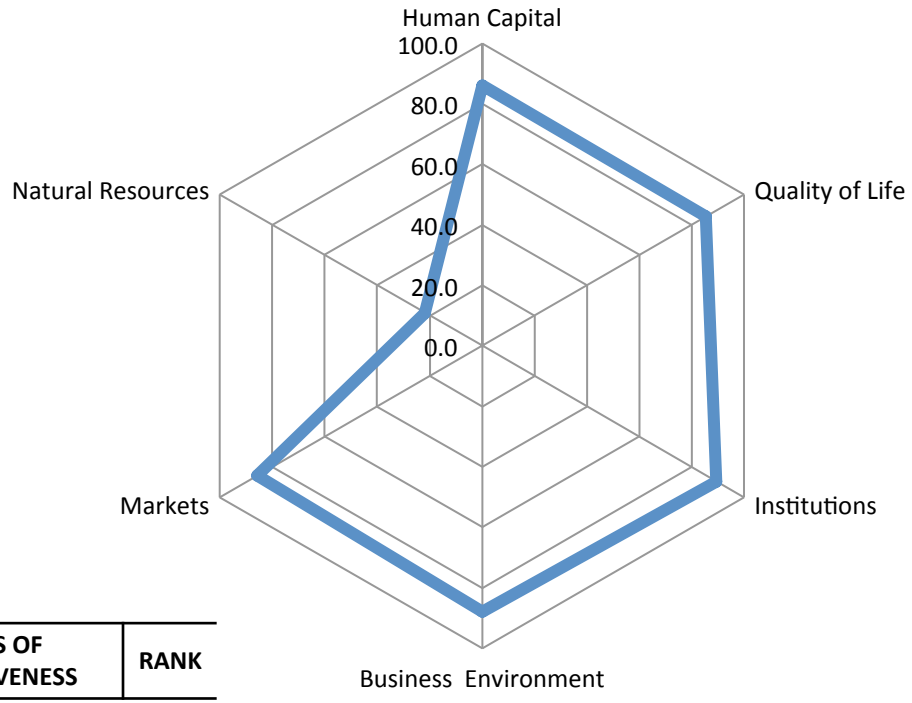
Number of Municipalities: 16

Size: 4,585 km²

Population: 11,740,202

Density: 2,561 people per km²

Vectors Competitiveness Scores



VECTORS OF COMPETITIVENESS	RANK
Business Environment	3
Markets	13
Institutions	28
Human Capital	33
Quality of Life	117
Natural Resources	540

DASHBOARD TOP 10: Caxias do Sul (9th)

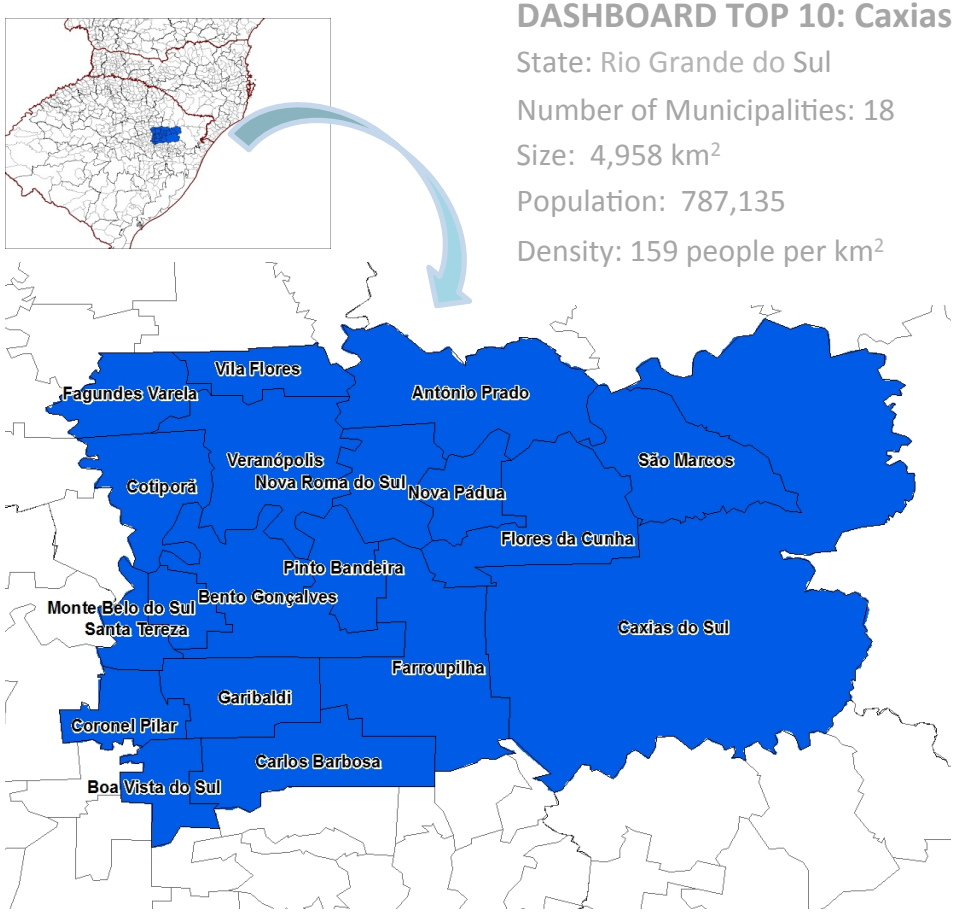
State: Rio Grande do Sul

Number of Municipalities: 18

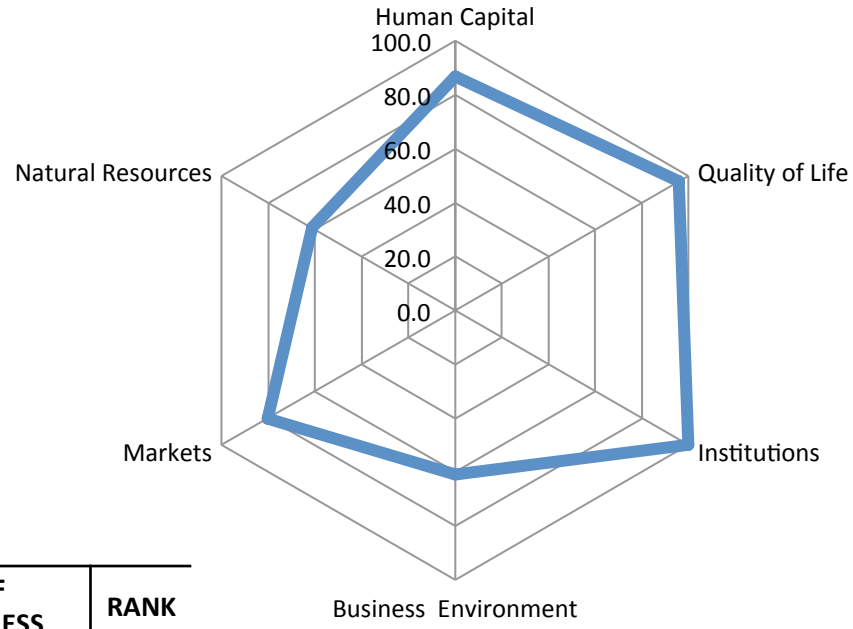
Size: 4,958 km²

Population: 787,135

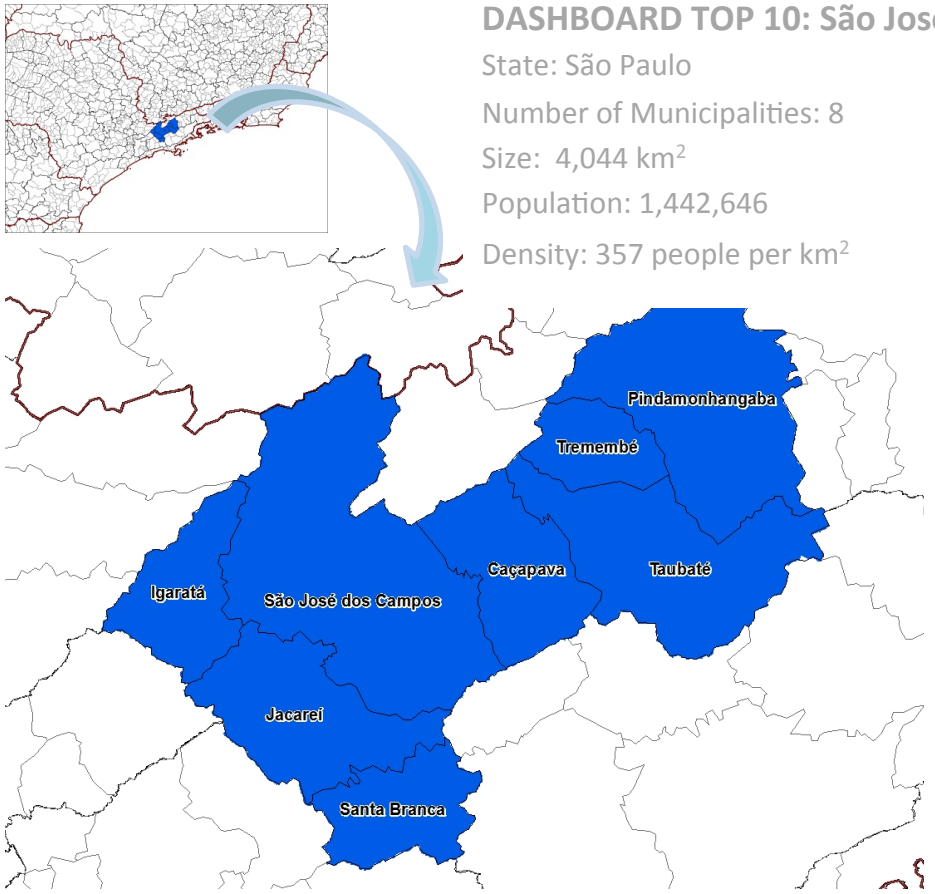
Density: 159 people per km²



Vectors Competitiveness Scores



VECTORS OF COMPETITIVENESS	RANK
Institutions	1
Quality of Life	12
Markets	25
Human Capital	29
Business Environment	38
Natural Resources	211



DASHBOARD TOP 10: São José dos Campos (10th)

State: São Paulo

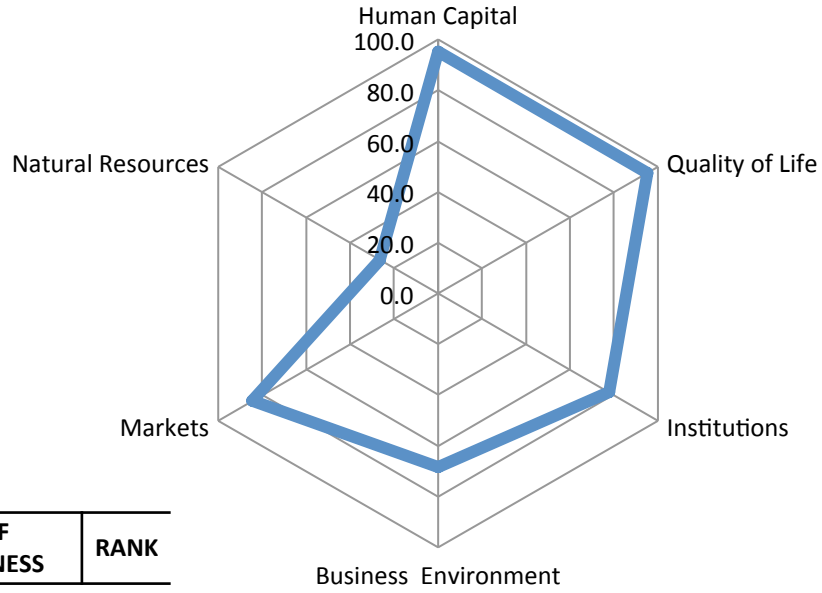
Number of Municipalities: 8

Size: 4,044 km²

Population: 1,442,646

Density: 357 people per km²

Vectors Competitiveness Scores



VECTORS OF COMPETITIVENESS	RANK
Human Capital	4
Business Environment	15
Markets	15
Quality of Life	18
Institutions	112
Natural Resources	533

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TOP 3 MICROREGIONS OF EACH FEDERAL UNIT

MACRO REGION	FEDERAL UNIT	MOST COMPETITIVE MICROREGION	SECOND MOST COMPETITIVE MICROREGION	THIRD MOST COMPETITIVE MICROREGION
North	RO	PORTO VELHO (261st)	VILHENA (282nd)	CACOAL (302nd)
	AC	RIO BRANCO (342nd)	CRUZEIRO DO SUL (502nd)	BRASILÉIA (530th)
	AM	MANAUS (219th)	RIO PRETO DA EVA (369th)	ITACOATIARA (420th)
	RR	BOA VISTA (312nd)	SUDESTE DE RORAIMA (470th)	CARACARAÍ (506th)
	PA	BELÉM (225th)	PARAUAPEBAS (316th)	MARABÁ (335th)
	AP	MACAPÁ (340th)	MAZAGÃO (497th)	OIAPOQUE (535th)
	TO	PORTO NACIONAL (258th)	GURUPI-TO (324th)	ARAGUAÍNA (333rd)
Northeast	MA	AGLOMERAÇÃO URBANA DE SÃO LUÍS (273rd)	IMPERATRIZ (346th)	GERAIS DE BALSAS (399th)
	PI	TERESINA (292nd)	FLORIANO (402nd)	PICOS (426th)
	CE	FORTALEZA (142nd)	CARIRI (288th)	SOBRAL (318th)
	RN	NATAL (189th)	MOSSORÓ (289th)	SERIDÓ OCIDENTAL (337th)
	PB	JOÃO PESSOA (230th)	CAMPINA GRANDE (276th)	PATOS (374th)
	PE	RECIFE (125th)	SUAPE (291st)	PETROLINA (301st)
	AL	MACEIÓ (286th)	ARAPIRACA (413rd)	SÃO MIGUEL DOS CAMPOS (455th)
	SE	ARACAJU (233rd)	AGRESTE DE ITABAIANA (373rd)	ESTÂNCIA (377th)
	BA	SALVADOR (148th)	BARREIRAS (290th)	FEIRA DE SANTANA (306th)
Southeast	MG	BELO HORIZONTE (22nd)	UBERLÂNDIA (42nd)	UBERABA (67th)
	ES	VITÓRIA (78th)	CACHOEIRO DE ITAPEMIRIM (210th)	LINHARES (214th)
	RJ	RIO DE JANEIRO (8th)	VALE DO PARAÍBA FLUMINENSE (58th)	MACAÉ (83rd)
	SP	SÃO PAULO (1st)	CAMPINAS (2nd)	JUNDIAÍ (6th)
South	PR	CURITIBA (5th)	MARINGÁ (20th)	LONDRINA (21st)
	SC	FLORIANÓPOLIS (3rd)	JOINVILLE (15th)	BLUMENAU (24th)
	RS	PORTO ALEGRE (4th)	CAXIAS DO SUL (9th)	PASSO FUNDO (32nd)
Central-West	MS	CAMPO GRANDE (98th)	TRÊS LAGOAS (199th)	DOURADOS (203rd)
	MT	CUIABÁ (208th)	RONDONÓPOLIS (237th)	ALTO TELES PIRES (242nd)
	GO	GOIÂNIA (77th)	ANÁPOLIS (137th)	CATALÃO (151st)
	DF	BRASÍLIA (19th)		

1º Quintile
2º Quintile
3º Quintile
4º Quintile
5º Quintile

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PART 3: MACROECONOMIC VARIABLES AND SECTOR COMPETITIVENESS

i. Methodological Note

FGV Projetos and Financial Times have developed an innovative methodology to measure the exposure of Brazil's productive sectors to two macroeconomic factors: exchange rate and fiscal burden. The Methodology can be summarized as follows:

1. Data Collection: Exports, Imports, ICMS and IPI*, Production of 110 Brazilian product categories;
2. Calculations: Exchange rate and fiscal burden outputs' exposure of 110 product categories;
3. Aggregation of results: Output‘s exposure for each sector of the Brazilian economy – “direct effects”;
4. Input-Output analysis: Exposure of the total inputs** used to produce the sector's output – “indirect effects”;
5. In-depth Analysis: Identification of special cases which present the nuances (dynamics) of the Brazilian economy.

*ICMS (Imposto de Circulação de Mercadorias e Serviços) is a tax on the movement of goods and services. IPI (Imposto sobre Produtos Industrializados) is a tax on industrialized products. They were chosen because of their representativeness in total taxes, and because they are value added taxes. This allow the usage of the methodology without incurring in double accounting.
** Total inputs means the direct inputs used in the production, plus the inputs of the direct inputs, and so on. It captures the chain effects of a given product.

The exposure of the 56 sectors to the exchange rate is calculated by dividing the flow of the 110 product (imports plus exports) by its total production and then aggregating by sectors.

The economic intuition of this variable differs between import and export exposure: If the imports of a product are high relative to its production, foreign competition is high. On the other hand, elevated value of a product's export is a sign of strong foreign demand. In both cases, the exchange rate affects the production of internationalized industries.

An important innovation of the analysis is the assessment of the total input exposure rate. By using the Input-Output Table not only the inputs of a given product (called direct inputs) can be assessed, but also the effect on the whole chain (the inputs of the direct inputs and so on). It provides a parameter for the intensity of the exposure of a product's production process. A high number revels that a considerable part of its inputs is exported or imported and, consequently, is subject to exchange rate variability.

The same methodology can be applied to assess the fiscal burden exposure rate. It represents the relative tax paid per productive sector and its inputs. The product rate is calculated by dividing the tax paid (ICMS and IPI) by the total output. Subsequently it is aggregated by sectors, and the Input-Output Table allows for the measurement of the (indirect) fiscal burden exposure rate.

ii. Assessment Framework

The framework of analysis consists in examining the effects of two macroeconomic variables, exchange rate and fiscal burden, into 56 Brazilian production sectors defined by the national accounts system (SCN/IBGE). For each sector the output and input effects of both variables will be assessed. The result will help to answer the following questions:

1. Which sectors are most affected by each of the macroeconomic variables?
2. Which sectors are not affected by them?
3. Is the effect on inputs relevant regarding the output effects?
4. Which sectors have their input effects higher than the output ones?

The sectors which have been included in the analysis are displayed on the following page.

Fifty Six Brazilian Sectors (SCN/IBGE)					
Agriculture	Wood Products	Ink, Varnish	Appliances	Furnitures and Other Products	Hotels and Food Services
Livestock and Fishing	Paper Products	Other Chemical Products	Computers and Office Machines	Electricity, Gas, Water and Sewer	Services to Companies
Oil and Natural Gas	Papers, Magazines and Books	Rubber and Plastic Goods	Electric Machines	Construction	Private Education
Iron Ore	Oil Refining	Cement	Electronic and Communication Products	Commerce	Private Health
Other Extrative Products	Alcohol	Other Non-Metallic Products	Medical Equipment	Tansport and Storage	Services to Families
Food and Beverages	Chemical Products	Steel and Derived	Automotive	Information Services	Domestic Services
Tobacco	Resins and Elastomers	Metallurgy	Trucks and Buses	Finance and Insurances	Public Education
Textile	Pharmaceutical Products	Metal Products	Automotive Parts and Components	Real Estate	Public Health
Clothes and Accessories	Pesticides	Machines and Equipment	Other Transport Equipment	Maintenance	Social Security and Public Administration
Leather Handcraft and Shoes	Hygiene				

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iii. Results

Exchange Rate

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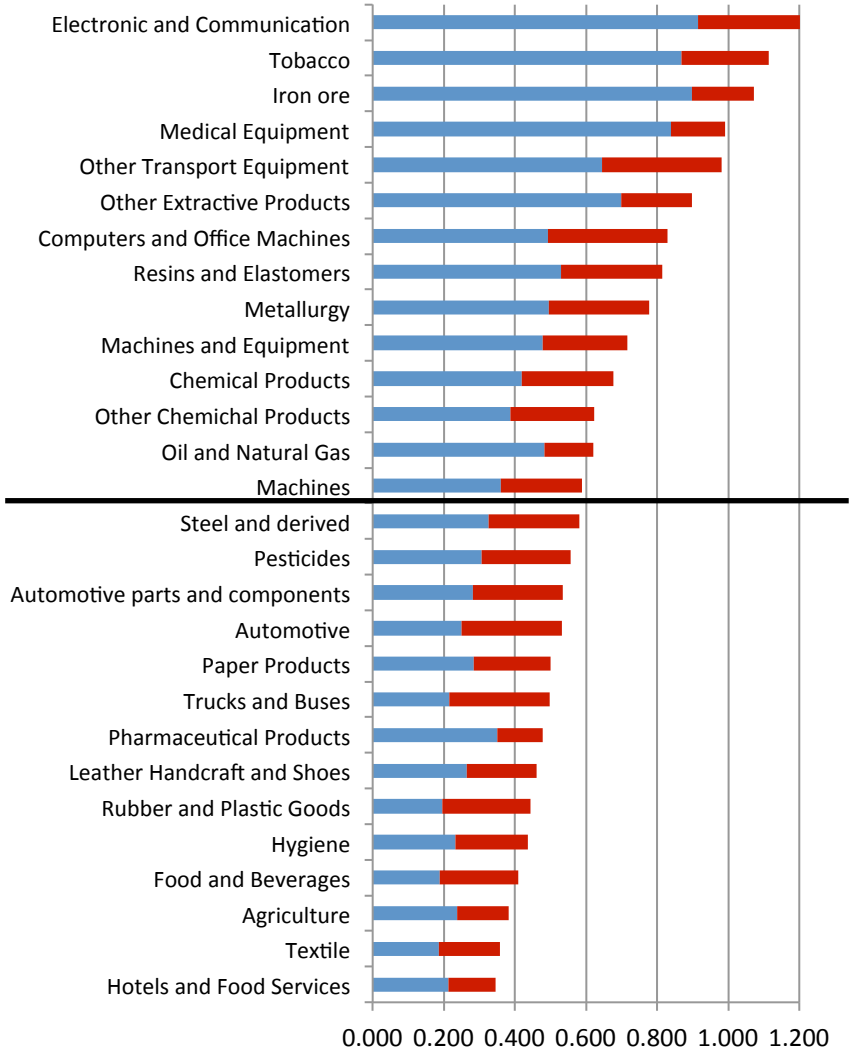
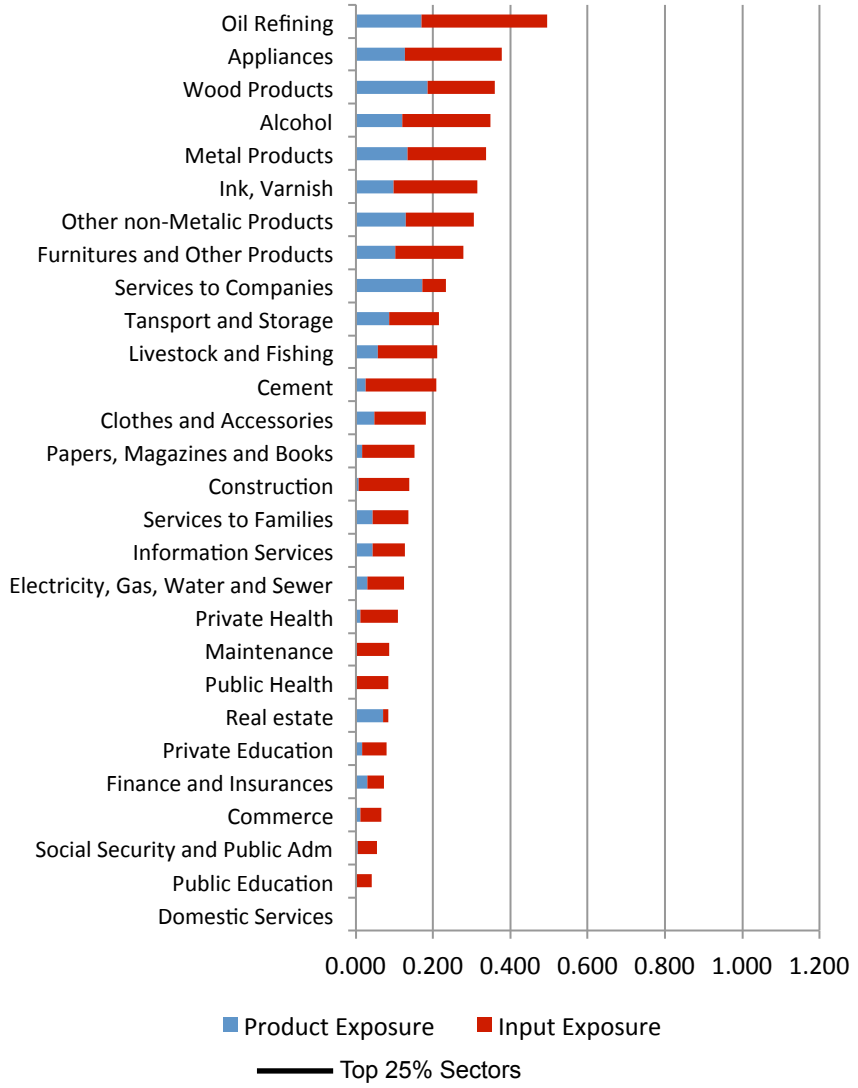
Result I: Total (Direct and Indirect) Effect of the Exchange Rate on Brazilian Sectors





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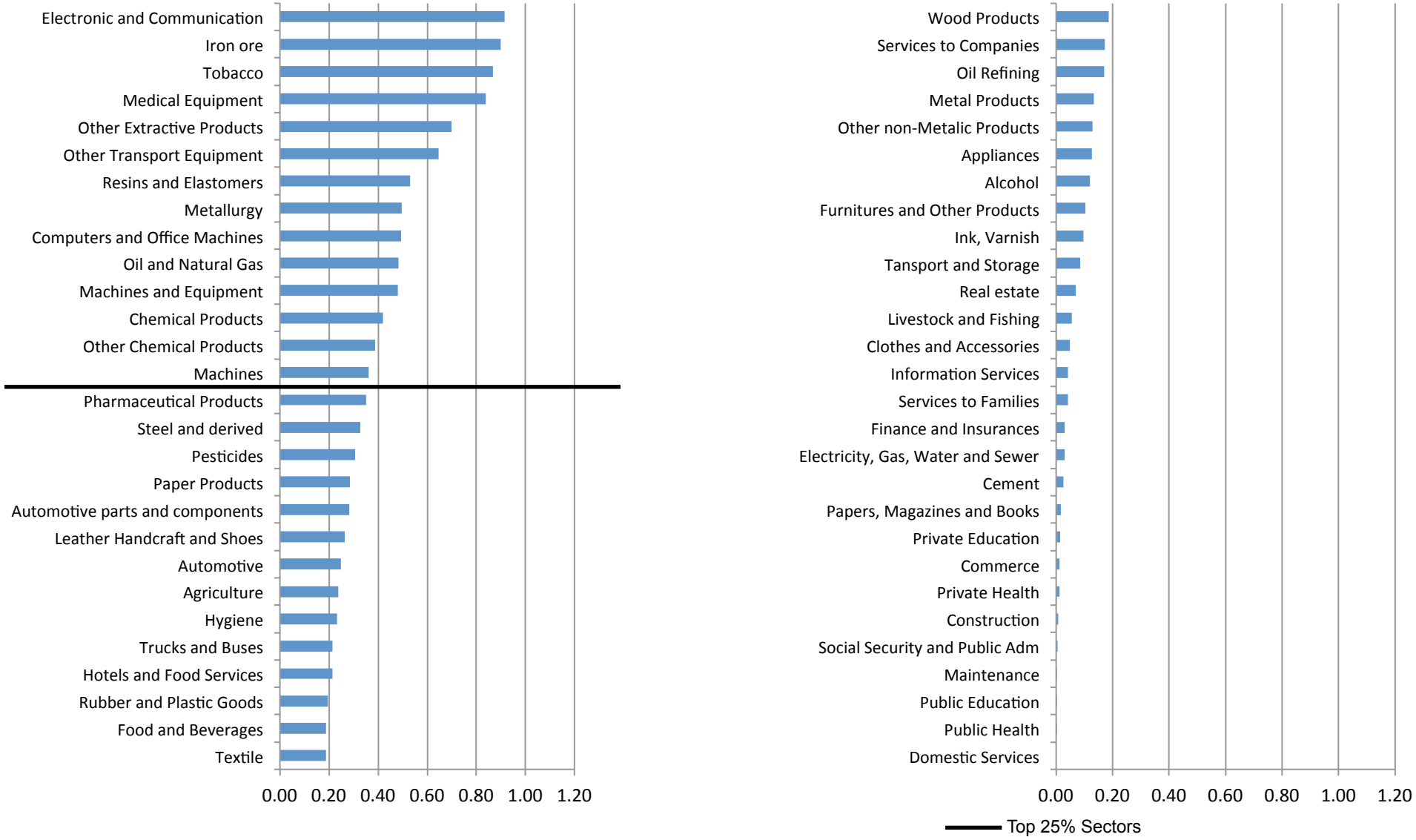
Result II: Direct Effect of the Exchange Rate on Brazilian Sectors



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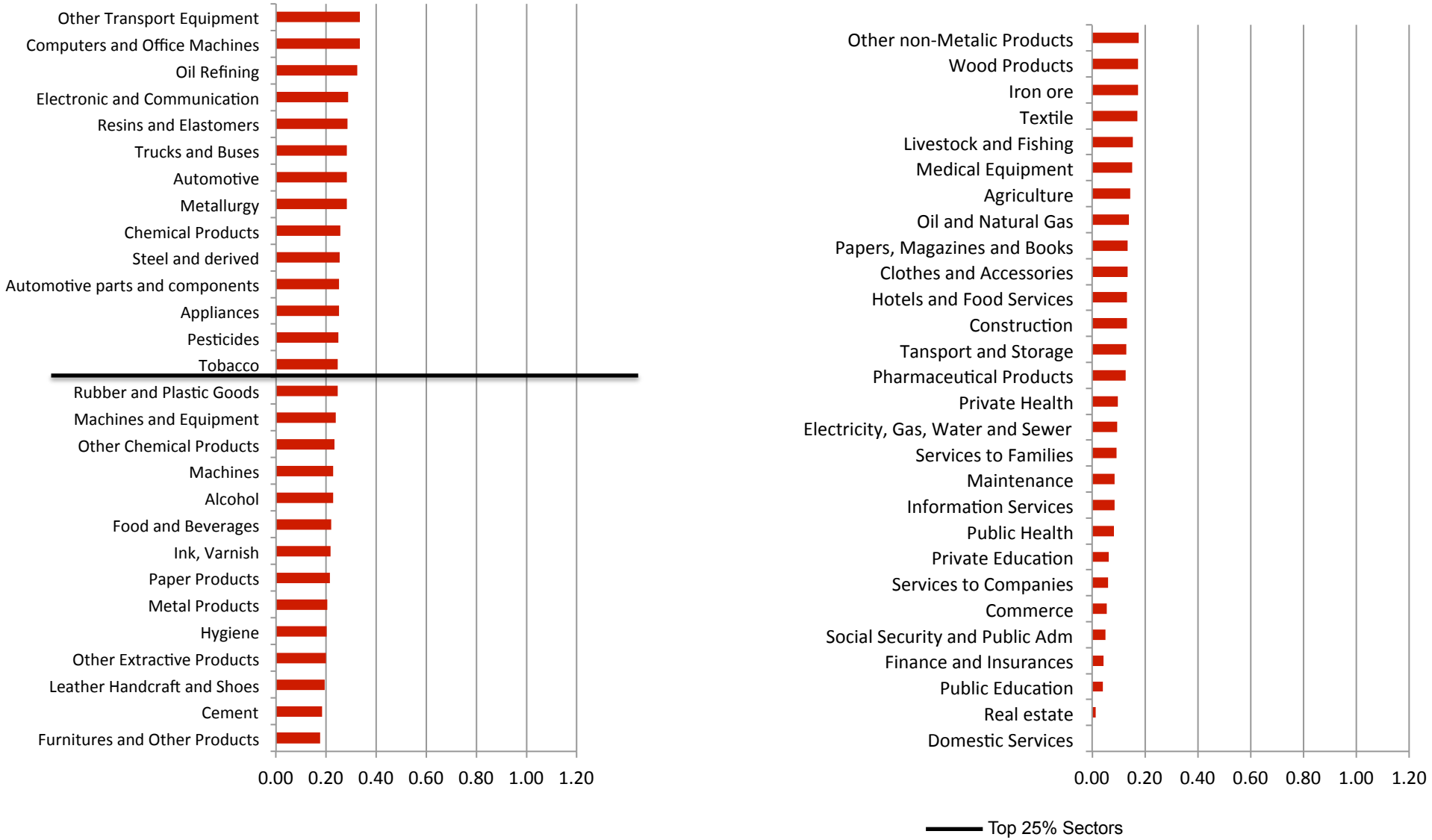
Result III: Indirect Effect of the Exchange Rate on Brazilian Sectors



Key Findings

Indirect effect analysis evaluates the impact of direct effects as mediated by the intermediate consumption from other Brazilian sectors. The result presents the exposure to exchange rate of its inputs.

Those sectors with a high value of this kind of exposure benefits from an appreciated exchange rate, given that this would reduce the input cost, lowering the production expenses and leading to higher competitiveness.

The results are more homogeneous that those presented for the direct effect, meaning that all the non-tradable sectors have similar exposure.

On the top 25% is possible to see three big industries with more than three sectors:

1. Machines and Equipment – Computers and Offices Machines, Electronic and Communication Products, and Appliances;
2. Chemical – Resins and Elastomers, Chemical Products, and Pesticides; and
3. Transport – Other Transport Equipment, Trucks and Buses, Automotive, and Automotive Parts and Components.

Metallurgy and Steel and Derived also presents a cluster on the Metallurgy Industry (probably due to the high flow of its own products and Iron Ore). Tobacco and Oil Refining closes the top 25% sectors with highest indirect exposure.

iii. Results

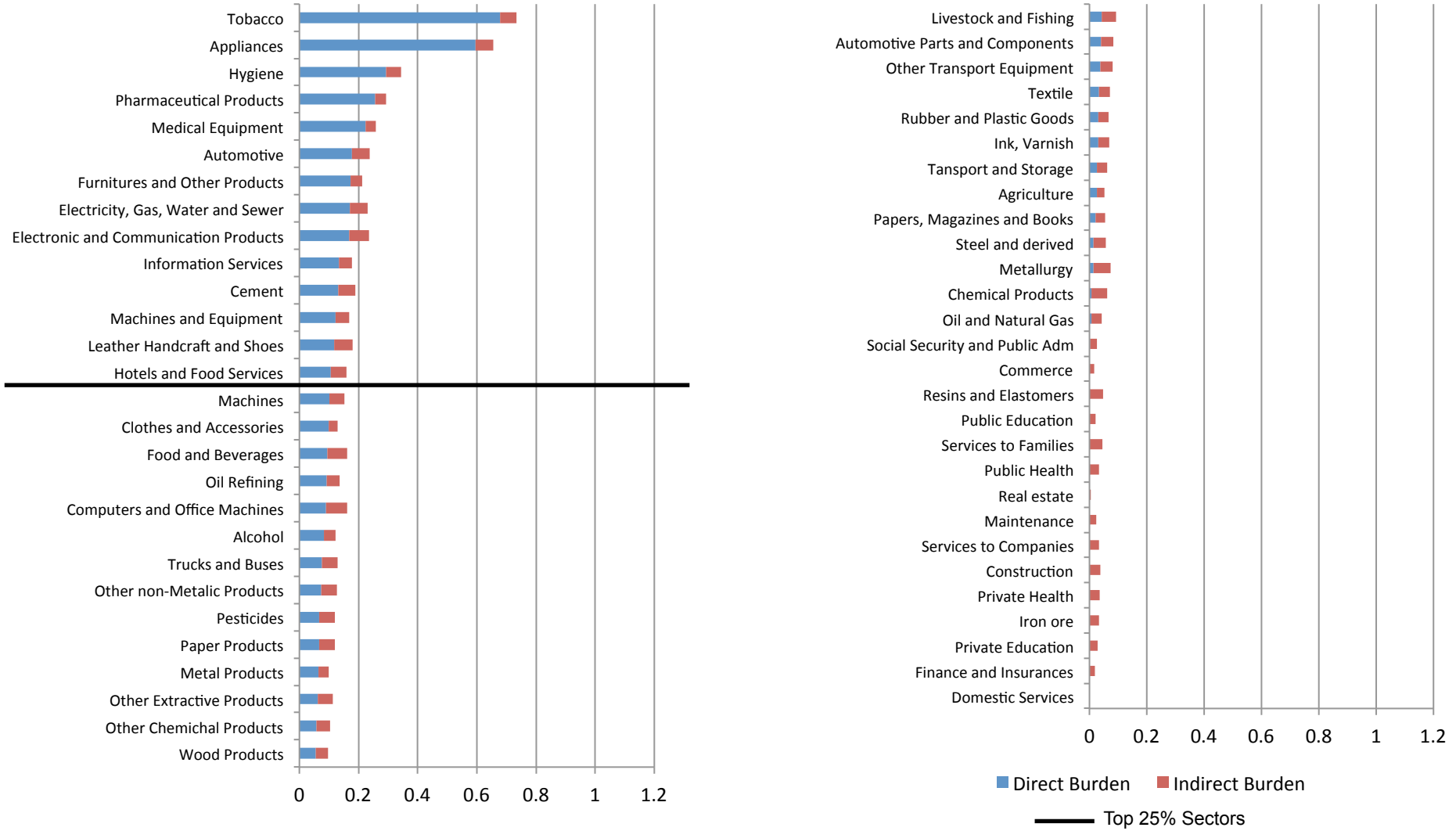
Fiscal Burden

The analysis of the fiscal burden is important to measure the competitiveness of each sector. Those who are most affected by taxes have higher frictions in their production process.

Another possible channel is the political effect. If, for some reason, a government has to increase its revenues, those sectors with highest exposure will be more susceptible to bear this increase.

The division between direct and indirect effects are important to truly measure all the effects of the tax burden across different sectors. The direct effect is responsible to verify those who pay more taxes by output. The indirect effect measures the exposure of its inputs, providing all the value added tax paid within the sectors costs.

Result I: Total (Direct and Indirect) Exposure to Tax Burden



Key Findings

The most prominent result is the total tax burden difference between the sectors of Tobacco and Appliances and all other Brazilian sectors. The first one has a total effect of 0.73 while the second accounts for 0.66. The third sector most affected is Hygiene, with almost 50% less total tax burden, 0.34.

Moreover, unlike the exchange rate effect, there is not a well-marked industry pattern of the main 25% affected sectors.

The direct effect ranges from 0 up to 0.68. The top 25% ranges from 0.11 and 0.68. Excluding the top two sectors, the burden varies between 0.11 and 0.29. This means that there is still a big difference between those sectors, indicating that the sectors which suffer from big value added taxes are very concentrated.

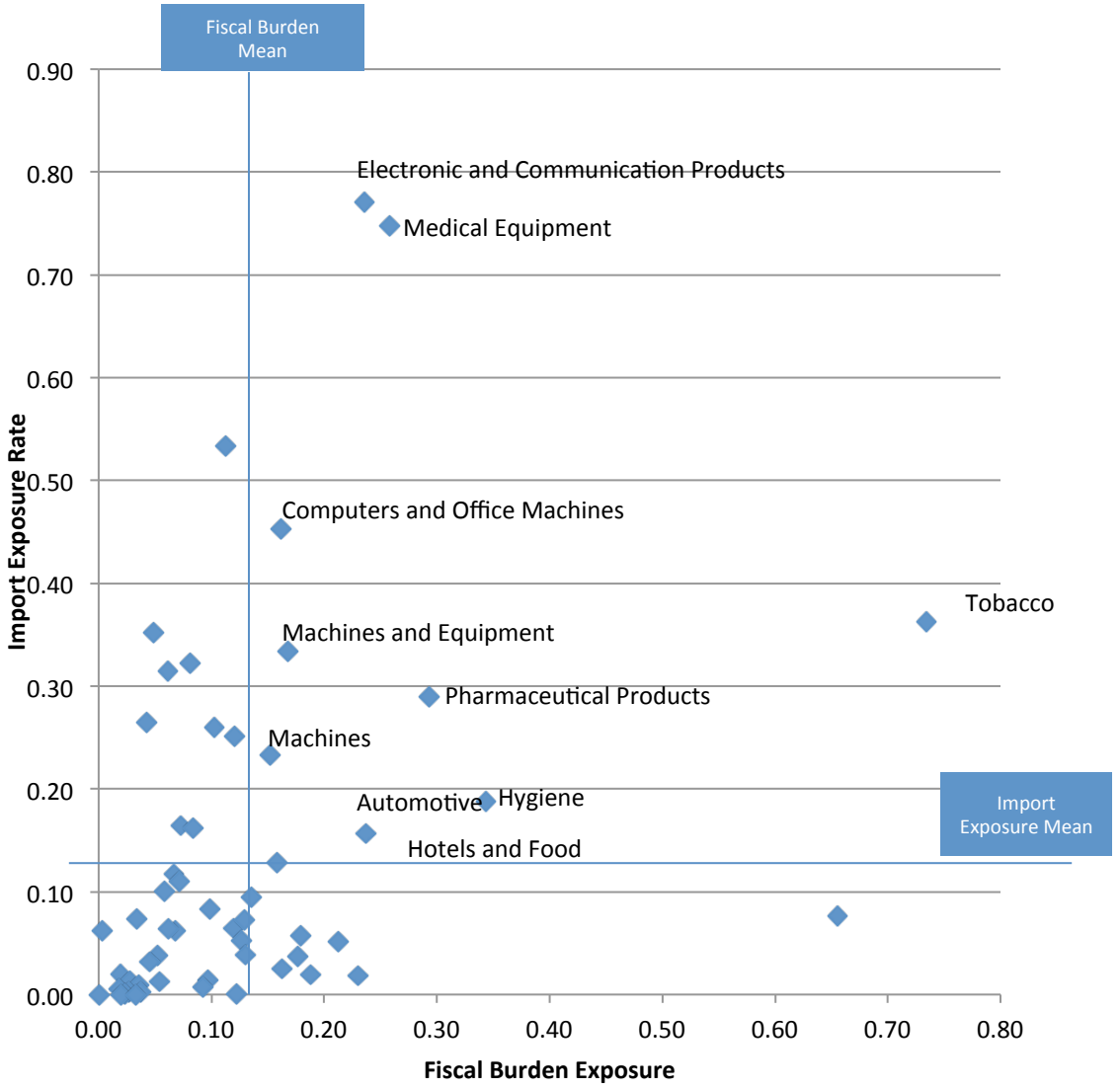
The indirect tax burden is homogeneous among the sectors, ranging from 0 until 0.7. This provides a first glimpse that the tax burden affects evenly production chain of the various sectors.

It is important to state that the analysis is under the value added taxes ICMS and IPI as noted before.

Sector Fiscal Burden x Import Exposure

This dispersion graph presents two measures: Fiscal Burden Exposure on the horizontal axis, while the Import Exposure Rate is presented on the vertical axis. The second variable is a proxy for foreign competition faced by a sector.

If a given sector faces no competition from foreign products, than the fiscal burden does not interfere in the sector's competitive edge. This happens because every company produces under the same environment (national environment). If a sector has foreign competition, than the tax structure will affect the sectors competitiveness, when comparing to companies from other countries.



Key Findings

The aim of this analysis is to select those sectors that faces a high foreign competition that has also an elevated tax burden. To present these sectors, the plot was divided in four quarters by the mean of Import Exposure rate (around 0.13) and the Fiscal Burden rate (around 0.14).

From this analysis it was selected ten sectors that presents elevated effect by both variables. They pertains mainly to two industries:

1. Equipment and Machines: Electronic and Communication Products, and Medical Equipment have the highest import exposure, and high fiscal burden. Computers and Office Machines, Machines and Equipment and Electric Machines also presents high exposure to international competition.
2. Health Industry: Pharmaceutical Goods and Hygiene are present in this quarter showing that, together with Medical Equipment (placed on Equipment and Machines), the Health Industry is exposed to both import rate and fiscal burden.

The remaining three sectors within this quarter are Hotels and Food, Automotive, and Tobacco. The first one is on the edge of the boundaries. It comprises non tradable service like tourism. The Automotive sector faces increasing competition from foreign countries. The third sector, Tobacco also has a high tax exposure.

There are key consequences from these results:

1. Brazilian industry lose competitiveness due to a greater price of inputs from Equipment and Machinery. Their elevated prices is a consequence, among other factors, of the elevated tax burden beard by this sector;
2. Public Health: An important finding is the consequences of the effects on the Health Industry. It suffers from high taxes and high international competition.

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PART 4:
CONCLUDING REMARKS

Concluding Remarks

Regional Competitiveness

There is a set of stylized facts that has held for long enough to fossilize into sociological cliché: Southern and Southeastern states having better standards of life, while the Northeast remains poor and the North and Central-West lay nearly undiscovered. Much of this has changed, but much of it remains living fact, and indicators such as the logistics-weighted market size (page 70) still showcase an economy radiating from the Rio-São Paulo axis inwards.

However, as many other measurements of this study have shown, this is far from the whole story. First, the macro-regional story has changed. Old saws about there being “a Belgium and an India” in Brazil have been complicated by the emergence of large-scale, export-oriented agriculture as a major economic and political force, as well as income growth at the lower strata and oil, gas and mineral developments. There are many facets to the regional arrangement of the Brazilian economy now, that country comparisons cannot prove enough. At the same time,

the South and Southeast outperform the rest of the country in terms of infrastructure, labor markets, education, as well as in providing a healthy environment for its citizens. This translates into a wide dominance of most rankings by a handful of states.

The novel contribution of this study, however, has not been in the further qualification of this age-old regional issue. Rather, it focuses at the level of microregions – 558, overall – which allows to shed a closer light at the many facets of the competitiveness puzzle. Far from being smooth, this microregional map is blotchy, both revealing contrasts and gradients inside states and highlighting focal points at underdeveloped states that seem to be unique among their peers.

This gives rise to two sets of useful interpretations. First, the microregional map allows for enough heterogeneity that tracking the evolution of regions that are, for example, further along in STEM training than in other education statistics should prove enlightening.

The massive heterogeneity of Brazil can be leveraged to the goal of a massive experiment, with potential useful generalizations. The second set of interpretations has to do with identifying opportunities. The isolated regions standing out in less-developed states may turn out to be strategic entry points for the expansion of market or the establishment of corporate bases around natural resources, for example. Differentials inside a state may also point to specific places (rather than abstract regions) to watch as potential grounds for investments and public-private partnerships. There are, evidently, general lessons to be taken: education, institutions and business environment appear to be more important than natural, static endowments. Low-income regions tend to be located in states with lacking infrastructure and poor education. What microregional measurements show, however, is that the complexities and irregularities of the regional map of the Brazilian economy are worth understanding.

Concluding Remarks

Sector Competitiveness

Competitiveness was discussed, earlier on, as the meeting between potential productivity and the presence of enabling circumstances that allow for that potential to be actualized. Two major variables that have a macro effect on this ability to actualize potentials, that is, exchange rates and differential tax burdens were also highlighted.

In contrast to what general equilibrium or trade-driven views may lead the thinking, the dynamics of exchange are not simply a result of international competition and comparative advantage. Rather, they are mediated by monetary policies, secondary goals and further complexities (such as the tradables/non-tradables split). This means that despite being arguably desirable for many reasons, floating exchange rates do not lead, automatically, to a level playing field in the international stage. What is more, differential tax burdens have an even more direct effect: if industries that compete against each other face a different cost structure due to local policies,

competitiveness will, in all likelihood, be affected. But beyond these very broad strokes, there remains the question of why economies facing different exchange rate regimes (whether conducive to cheaper imports or exports) and taxation rates focus on specific sectors – or rather, why some industries thrive more than others. In this study, it has been deployed a generalization of input-output analysis to track the effects of these factors as they have different effects on sectors and how these effects spread throughout the linkages in the economy.

As with the microregional analysis in regional economics, this has allowed to put traditional stylized facts under a microscope and emerge with a more complex, nuanced picture. A key result is that devaluated exchange rates, while particularly favorable to exports, can also be harmful for the imports of many important sectors of the Brazilian economy, in light of their cost structure and their location within the sectorial interdependence networks captured by input-output analysis.

The tax burden, too, has different effects over sectors, although cumulatively (the degree to which taxes are paid over and over again at each link in productive chains) leads to an approximate correspondence between more industrialized sectors and heavier overall tax burdens once sectorial linkages are taken into account.

The picture that emerges from these analyses, while more complicated, leads also to a more mature debate about macro policy as a competitiveness factor. Brazil must make headway in many areas in order to set itself on a sustainable growth trajectory going forward, which might mean taking short-term and long-term considerations on equal footing, lest too-broad policies lead to punitive economic distortions to important sectors of the economies. Ultimately, the challenge for macro policy to create the right conditions for the economy as a whole to be able to best realize their potential.

Annex:

State Abbreviations

STATE	ABBREVIATION	CAPITAL CITY
Acre	AC	Rio Branco
Alagoas	AL	Maceió
Amapá	AP	Macapá
Amazonas	AM	Manaus
Bahia	BA	Salvador
Ceará	CE	Fortaleza
Federal District	DF	Brasília
Espírito Santo	ES	Vitória
Goiás	GO	Goiânia
Maranhão	MA	São Luiz
Mato Grosso	MT	Cuiabá
Mato Grosso do Sul	MS	Campo Grande
Minas Gerais	MG	Belo Horizonte
Pará	PA	Belém
Paraíba	PB	João Pessoa
Paraná	PR	Curitiba
Pernambuco	PE	Recife
Piauí	PI	Teresina
Rio de Janeiro	RJ	Rio de Janeiro
Rio Grande do Norte	RN	Natal
Rio Grande do Sul	RS	Porto Alegre
Rondônia	RO	Porto Velho
Roraima	RR	Boa Vista
Santa Catarina	SC	Florianópolis
São Paulo	SP	São Paulo
Sergipe	SE	Aracaju
Tocantins	TO	Palmas

Annex:

Data Sources

The BRAZIL COMPETITIVENESS PROFILE is based on nationally consistent and updated public available data on municipalities and states which together represent a uniform basis to evaluate the competitiveness of the Brazilian microregions, as well as state and municipal. The final database collected information from a wide range of sources, which are described in the following pages. Moreover, for each dimension, a detailed description of all indicators will be provided, including source, year, and level (state or municipal).

FINANCIAL TIMES

FGV PROJETOS

Dimension 1: BASIC EDUCATION
Number of indicators: 12

#	INDICATOR	INDICATOR DESCRIPTION	SOURCE	YEAR
	PRIMARY AND SECONDARY SCHOOL PERFORMANCE			
1	Average Test Score, 4th Grade Exam	Data comes from the Basic Education Development Index (IDEB) which monitors student achievement and progression flows at primary and lower secondary education (4th and 8th grade) based on data from the School Census, the National Basic Education Assessment System (Aneb-SAEB) and Prova Brasil, a population-based assessment of public schools. The results of IDEB are calculated from the performance obtained by the students who participated in the Prova Brazil / SAEB and approval rates, calculated on the basis of information provided to the School Census.	IDEB	2013
2	Average Test Score, 8th Grade Exam			
3	Average Test Score, 11th Grade Exam			
	CLASS SIZE			
4	Ratio of Students to Classrooms	Class Size is an indicator for the quality of the basic education system, as the number of children in a class affects the quality of teaching and learning. Measured by ratio of students to classroom.	INEP	2013
	COLLEGE PREPAREDNESS			
5	Average Test Score, High School Exam (3rd Year) - Natural Sciences	Data comes from the National Exam of Upper Secondary Education (ENEM) which measures the performance of secondary school students in 5 subjects: Sciences, Humanities, Languages, Mathematics, and Writing. ENEM is centered on the assessment of achievement in skills and capabilite of individuals. The exam is the main access instrument to ascend to higher education in Brazil, including scholarship.	ENEM	2012
6	Average Test Score, High School Exam (3rd Year) – Humanities			
7	Average Test Score, High School Exam (3rd Year) – Languages			
8	Average Test Score, High School Exam (3rd Year) – Mathematics			
9	Average Test Score, High School Exam (3rd Year) – Writing			
	LITERACY SKILLS			
10	Percentage of Population Older than 5 Able to Read and Write	The percentage of the population older than 5 unable to read or write, as an indicator for literacy skills.	Censo	2010
	YOUTH IN SCHOOL AT CRITICAL AGE			
11	Share of Female Youth Aged 16-17 in School	Out-of-school-youth undermine competitiveness, as they miss many of the fundamentals of basic education. The ability of keeping youth at critical age in school, thus, is an indicator for a competitive education system.	Censo	2010
12	Share of Male Youth Aged 16-17 in School			

FINANCIAL TIMES

FGV PROJETOS

Dimension 2: HIGHER AND VOCATIONAL EDUCATION
Number of indicators: 42

#	INDICATOR	INDICATOR DESCRIPTION	SOURCE	YEAR
HIGHLY SKILLED LABOR				
13	Share of Formal Workforce with University Degree	These indicators look at the availability of highly qualified labor. IPEA (Institute for Applied Economic Research - Secretariat of Strategic Affairs) defines qualified labor as individuals with work experience in a specific sector, and/or with "above average years of schooling". As a result, individuals with Graduate Diplomas, Master Degree and PhDs, are considered skilled.	RAIS/M TE	2013
14	Number of Higher Education Graduates		INEP	2013
15	Share of Those Aged 18 to 25 in University	University attainment is a key indicator of human capital which refers to the skills and knowledge on hand in the workforce.	Censo	2010
16	Share of Those Aged 35 to 65 in College		Censo	2010
17	Share of Higher Education Students per 100.000 Residents		INEP, Censo	2012
LABOR WITH TECNICAL EDUCATION				
18 - 31	Number of Students Enrolled in Technical Education	Students enrolled in technical schools, from the fields of: Environment and Health; Educational and social development; Industrial processes and control; Management and Business; Tourism, Hospitality and leisure; Information and communication; Infrastructure; Military; Food Services; Cultural production and design; Industrial Production; Natural Resources; Security	INEP	2013
QUALITY OF ACADEMIC TRAINING				
32 - 49	Test Score in National Student Performance Exam	Data comes from ENADE (National Exam for the Assessment of Student Performance) Administration; Accounting; Economics Design; Law; Journalism; Psychology; Publicity and Advertising; International Relations; Executive Secretary; Business Technology Management; Human Resources Technology Management; Financial Technology Management; Logistics Technology; Marketing Technology; Technology in Management Processes; Tourism. ENADE is obtained by the average performance of their graduates in General Education (FG) and the Specific Component (EC)	ENADE	2012
50	Rankings of Best State Universities	National college rankings of best state universities	Folha de São Paulo	2014
51	Rankings of Best State Universities	National college rankings of best state universities	CWUR	2014
52	Rankings of Best State Universities	National college rankings of best state universities	QS ranking	2013
53	Rankings of Best State Universities	Global college ranking	Webometrics	2011
ABILITY TO ATTRACT TALENT				
54	Inbound Student Mobility	The states ability to attract talent from abroad is measured by the number of foreign students	Ciência sem Fronteiras	2013

Dimension 3: SOCIAL INFRASTRUCTURE
Number of indicators: 17

#	INDICATOR	INDICATOR DESCRIPTION	SOURCE	YEAR
ACCESS TO INFORMATION AND COMMUNICATION TECHNOLOGY				
55	Households with Telephone Access	These indicators consider the state of development of mobile and landline connections and the extent of the mobile telecommunications network in each region. Assessment covers the absolute numbers of Households with Telephone Infrastructure, as well personal computers and internet access. An additional measure used is the Internet bandwidth speed.	Censo	2010
56	Households with Telephone Access, Landline Only			
57	Households with Telephone Access, Mobile			
58	Households with Telephone Access, Landline And Mobile			
59	Households with Personal Computer		Censo	2010
60	Households with Personal Computer with Internet Access			
61	Internet Bandwidth Speed (Up to 2Mbps)		Anatel	2014
62	Internet Bandwidth Speed (Above 2Mbps)			
ACCCESS TO AND AFFORTABILITY OF ELECTRICITY				
63	Percentage of Households with Access to Electricity	The percentage of households with access to electricity is an indicator of a state's electricity supply network	Censo	2010
64	Cost of Electricity – Residential (in R$ per KWh)	. Cost of electricity is an indicator for the affordability of electricity.	ANEEL	2014
65	Cost of Electricity – Industrial (in R$ per KWh)			
66	Cost of Electricity – Commercial (in R$ per KWh)			
QUALITY OF URBAN TRANSPORT				
67	Time Spent Commuting from Home to Work - Up to 5 min	This indicator looks at the average time spent commuting from home to work as an indicator for the quality of urban transportation infrastructure.	Censo	2010
68	Time Spent Commuting from Home to Work - Between 6 and 30 min			
69	Time Spent Commuting from Home to Work - Between 30 and 60 min			
70	Time Spent Commuting from Home to Work - Between 1 and 2 hours			
71	Time Spent Commuting from Home to Work - More than 2 hours			

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FGV PROJETOS

Dimension 4: SUSTAINABILITY
Number of indicators: 14

#	INDICATOR	INDICATOR DESCRIPTION	SOURCE	YEAR
		INCOME INEQUALITY		
72	Gini Coefficient	Two different measures are used to evaluate the inequality of income distribution within a region. The Gini coefficient captures the distribution of monthly income from all jobs held by individuals aged 10 years or older. The higher the value of the Gini coefficient, the more income disparity. The second measure is the Ratio of income at 90th percentile to that at 10th in urban areas, which looks at the ratio between incomes at the top of the distribution (the 90th percentile) and the bottom of the distribution (the 10th percentile)	PNAD	2013
73	Ratio of Income at 90th Percentile to that at 10th		Censo	2010
74	Poverty	Share of population living in extreme poverty (US$ PPP 1,25/day)	MDS	2013
		AFFORDABILITY AND QUALITY OF HOUSING		
75	Ratio of Rent to Household Income among Renters in Urban Areas	The measurement of housing affordability provides information on the overall performance of housing markets and its dysfunctions. The main drivers of housing affordability are family income and mortgage rates. The rent to income ratio is the basic affordability measure for housing in a given area. Another important metric is the mortgage interest to income ratio.	Censo	2010
76	Ratio of Mortgage to household Income among those with Mortgages in Urban Areas		PNAD	2013
77	Quality of Housing	Share of population living in adequate housing. Adequate housing affects health status, access to jobs, and general inclusion in society.	Censo	2010
		BASIC SANITATION		
78	Households with Bathroom	This indicator describes the extent to which people access to safe drinking-water and basic sanitation, and the extent to which they can avoid contaminating the living environment and drinking-water sources.	Censo	2010
79	Households with Access to Public Water Services	Inadequate access to water in the home is also a source of economic disadvantage and social inequality.	Censo	2010
		BIODIVERSITY PROTECTION		
80	Pollution	Emissions of vehicle fleet is used as a proxy for air pollution.	Denatran	2014
81	Protected Areas	Protected areas per region in sq km.	MMA	2012
		QUALITY OF PUBLIC SERVICES		
82	Quality of Public Transport	Based on individual perceptions of the quality of public transportation, health, and education services as well as leisure offers in urban areas. Data comes from the Integrated System of Household Surveys (POF) of the Brazilian Institute of Geography and Statistics (IBGE).	POF/IBGE	2009
83	Quality of Public Health Services			2009
84	Quality of Public Education Services			2009
85	Quality of Public Offers for Leisure			2009

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FGV PROJETOS

Dimension 5: HEALTH
Number of indicators: 15

#	INDICATOR	INDICATOR DESCRIPTION	SOURCE	YEAR
		ACCESS TO HEALTH SERVICES		
86	Employment in Health Care Services	Absolute number of people employed in health care services	RAIS/M TE	2013
87-96	Employment in Health Care Services per Field of Activity	Absolute number of people employed in health care services, including: Mobile emergency attendance services; Patient pick up services, except emergency attendance services; Ambulatorial services performed by physicians and dentists; Complementary diagnostic and therapeutic services; Activities of health professionals, except physicians and dentists; Activities in support of health management; Care activities for human health not previously specified; Assistance services for the elderly, handicapped, immunosuppressed and convalescent sick provided in collective and private residences; Provision of Home care infrastructure and assistance; Psychosocial assistance to people with mental health disorders, mental retardation and substance abuse	RAIS/M TE	2013
97	Hospital Beds	Number of hospital beds per 1,000 inhabitants, as an indicator for access to health services	Datasus - MS	2013
		QUALITY OF PUBLIC HEALTH SERVICES		
98	Life Expectancy	Life Expectancy at birth	Atlas IDHM/ PNUD	2010
99	Infant Mortality	Number of deaths of infants under one year old per 1,000 live births as an indicator for the quality of public health services.	Atlas IDHM/ PNUD	2010
		SELF-RATED HEALTH		
100	Self-rated Health	Self-rated health, classified as very good, good, average, bad, very bad among the population aged 55 to 65, for the following diseases: Diabetes, Cardiovascular Disease, Cancer, Depression.	IBGE	2013

Dimension 6: PUBLIC SECTOR PERFORMANCE
Number of indicators: 9

#	INDICATOR	INDICATOR DESCRIPTION	SOURCE	YEAR
		MANAGEMENT OF PUBLIC FINANCES		
101	Own Revenue	The proper management of public finances (including investments; spending; revenue; liquidity; net debt) is critical for ensuring trust in the state's business environment.	FIRJAN	2012
102	Spending with Personnel			
103	Investments			
104	Liquidity			
105	Cost of Debt			
		JUDICIAL SYSTEM PERFORMANCE		
106	Budget Management	Judicial efficiency. IDJus is an indicator that attempts to measure the Brazilian judicial performance in the State Court. IDJus assumes that adequate performance Justice involves the improvement of the courts in three basic dimensions of the Judiciary: budget management, resource management and process management.	CPJUS	2012
107	Resource Management			
108	Process Management			
		PUBLIC SECURITY CONDITIONS		
109	Number of Homicides per 100,000 People	This indicator looks at whether violent crime is likely to pose a significant problem for business. Assessment is based on the number of homicides per 100,000 people.	Julio Jacobo Waiselfisz, Mapa da Violencia	2013

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Dimension 7: LOGISTICS
Number of indicators: 17

#	INDICATOR	INDICATOR DESCRIPTION	SOURCE	YEAR
		ROADS		
110-114	Quality of Paved Roads	The indicator measures the quality of paved roads which determine the likelihood of new firms entering a given location. Data comes from the Pesquisa de Rodovias of the CNT, which assesses paved road according to five criteria: Number of Roads evaluated as very good, good, regular, fair, very fair.	CNT - Pesquisa de Rodovias	2013
		RAILROAD		
115	Extension of Railroad Lines	The indicator measures the total Lengths of railroad lines (kms of rail per sq km) in a region. An inadequate railroad network raises the costs of doing business and may result in an overuse of road transport.	PNTL - Mtrasnporte	2010
		PORTS		
116-118	Cargo Movement at Inland Ports and Seaports	The indicator looks at the cargo Movement at Ports and Seaports, measured as the total container movements, as well as container movement (weight) divided by total cargo movement (weight).	ANTAQ	2013
119	Distance to Port	Microregion center distance to nearest port.	FGV	2014
		AIRPORTS		
120-121	Number of Domestic and International Destinations at Airports	The indicator looks at the number of national and regional destinations, as well as international destinations of the regional airport(s).	ANAC	2014
122-123	International and Domestic Flights per Week	The indicator looks at the number of seats in National and Regional Flights per week, as well as the number of seats in international Flights per week.	ANAC	2014
124	Distance to Airport	Microregion center distance to nearest airport.	FGV	2014
		WATERWAYS		
125	Extension of Waterways	The indicator measures the total Lengths of waterways (kms per sq km).	PNTL	2010
		TRADE FLOWS		
126	Export	Export Value in US$.	Aliceweb2	2013

Dimension 8: BUSINESS SOPHISTICATION
Number of indicators: 4

#	INDICATOR	INDICATOR DESCRIPTION	SOURCE	YEAR
	SKILLED HUMAN RESOURCES IN MANAGEMENT			
127	Management	Share of workforce employed in management positions, according to the following employee classifications: Management COD 1120-1330	Censo	2010
	SKILLED HUMAN RESOURCES IN ADVANCED MANUFACTURING			
128	Complex Manufacturing	Share of workforce engaged in complex manufacturing, according to the following firm classifications: Manufacturing of chemical products CNAE 20-21 Metallurgy CNAE 24 Metal products CNAE 25 , Electronics CNAE 26 Capital equipment CNAE 27-28 Motor vehicles CNAE 29, 30, Gas and electricity CNAE 35	RAIS/M TE	2013
	SKILLED HUMAN RESOURCES IN COMMUNICATION AND INFORMATION TECHNOLOGY			
129	Occupational Employment in Communication and Information Technology	Total occupational employment in Communication and Information technology, according to the following employee classifications: CIT Managers COD 1330 CIT instructors COD 2356 CIT professionals and database and network specialists COD 2521-2529 CIT Technicians COD 3511-3514	Censo	2010
130	Sector Employment in Communication and Information Technology	Total sector employment in Communication and Information technology, according to following firm classifications: Information technologies services CNAE 62 Information services CNAE 63 Telecommunications CNAE 61	RAIS/M TE	2013

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FGV PROJETOS

Dimension 9: INNOVATION
Number of indicators: 42

#	INDICATOR	INDICATOR DESCRIPTION	SOURCE	YEAR
AVAILABILITY OF SKILLED LABOR				
131-146	Scientists , Engineers, and R&D Directors	The Indicator includes absolute numbers of Scientists , Engineers, and R&D Directors, including: Civil engineers (2142), Electronic engineers (2143), Mechanical engineers (2144), Chemical engineers (2145), Metallurgist and Materials engineers (2146), Mining engineers (2147), Agrimensor engineers and cartographic engineers (2148), Industrial, Production and Security engineers (2149), Agricultural Engineers (2221), Food engineers (2222), Philosophers and Political scientists (2514)	RAIS/MTE	2013
147-156	Workers Employed in R&D; Market Research and Pharmaceutical Production	The Indicator includes people employed in R&D; Market research and Pharmaceutical Production, including: Manufacture of Pharmaceutical Chemical Products (21106), Medicines for Human Use (21211), veterinary medicinal products (21220), pharmaceutical preparations (21238), R&D in natural sciences and engineering (72100) and in social sciences and humanities (72207), Advertising agencies (73114), Allocation of advertising space, except media (73122), Advertising activities not specified above (73190), Market and Public Opinion Research (73203)	RAIS/MTE	2013
157-159	Workers with Graduate Diploma, Masters Degree, and PhD	Highest level of education completed.	Censo	2013
FOREIGN DIRECT INVESTMENT				
160	FDI per State in R$	Looks at inward Foreign Direct Investment in R$, considered critical for innovation.	Banco Central	2010

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Dimension 9: INNOVATION (cont.)
Number of indicators: 42

#	INDICATOR	INDICATOR DESCRIPTION	SOURCE	YEAR
		R&D ENVIRONMENT		
161-165	Performance of R&D Institutions	This indicator looks at the performance of research and development (R&D) institutions in each region, assessed by the number of universities with a Score of 4, 5, 6 or 7 in the Ranking of the Coordination Agency for the Improvement of Higher Education Personnel (Coordenação de Aperfeiçoamento de Pessoal de Nível Superior, CAPES) .	Ministry of Education	2013
166	Technology Parks	Number of Technology Parks, an area managed in a manner designed to promote innovation	Anprotec	2008
167	Public Expenditure in R&D	Looks at the expenditure in R&D in R$ da FINEP. Financial assistance from state agencies is considered crucial for the development of cutting-edge products and processes and higher value-added activities .	FINEP	2013
		ENTREPRENEURSHIP AND STARTUP INNOVATION		
168	Number of Venture Capital Firms	Unleashing innovation requires an environment that enables entrepreneurship. Providing access to venture capital and financing determines how many businesses will succeed in developing new or improved products and services. The indicator looks at the concentration of entrepreneurs and startup companies, service providers, angel investors and the number of venture capital firms.	ABVCAP	2012
169	Startups		StartupBase	2011
170	Entrepreneurs			2011
171	Angel Investors			2011
172	Service Providers			2011

Dimension 10: MARKET SIZE
Number of indicators: 5

#	INDICATOR	INDICATOR DESCRIPTION	SOURCE	YEAR
SIZE OF THE ECONOMY				
173	Size of the Economy	Gross Domestic Product at current prices (in thousand Reais)	IBGE	2012
POPULATION				
174	Population	Number of residents	IBGE	2012
FIRM SIZE				
175	Firm Size	Number of enterprises with more than 100 employees	RAIS/MTE	2013
DISTANCE BETWEEN MARKETS				
176	Distance between Markets	Physical Distance to consumer centers (in km)	FGV	2014
177	Weighted Market Size	This indicator measures each microregion's proximity to the country's main internal markets	FGV	2014

Dimension 11: GOODS MARKET
Number of indicators: 5

#	INDICATOR	INDICATOR DESCRIPTION	SOURCE	YEAR
	INTENSITY OF LOCAL COMPETITION			
178	Points in the Herfindahl Index - Calculated with the Payroll of firms	Points in the Herfindahl Index is an indicator for the intensity of local competition, an important driver for market efficiency, and thus business productivity, by ensuring that the most efficient firms, producing goods demanded by the market, are those that thrive.	RAIS/MTE	2012
179	Points in the Herfindahl Index - Calculated with the Number of firms			
	TAX BURDEN			
180	Social Contribution on Net Profits (CSLL) - R$	This indicator looks at the tax burden of each state, which can be an obstacle to the efficient exchange of goods. Data comes from analysis of ICMS, a state tax for goods and services (Imposto sobre Operações relativas à Circulação de Mercadorias e Serviços), CSLL, the Social Contribution on Net Profits (Contribuição Social sobre o Lucro Líquido), and ISS, a tax on services (Imposto sobre Serviços de Qualquer Natureza).	CONFAZ - MF	2013
181	Tax on the Circulation of Goods and Services (ICMS) - R$			
182	Tax on Services (ISS) – R$			

Dimension 12: LABOR MARKET
Number of indicators: 15

#	INDICATOR	INDICATOR DESCRIPTION	SOURCE	YEAR
EMPLOYMENT				
183	Full Employment	Share of the population aged 18 to 64 in employment for pay (positive earnings).	PNAD	2013
184	Employment to Population Ratio	% of working age population in labor force	PNAD	2013
185	Male Employment Rates	Share of the male population aged 18 to 64 in employment for pay	PNAD	2013
186	Female Employment Rates	Share of the female population aged 18 to 64 in employment for pay	PNAD	2013
UNEMPLOYMENT				
187	Unemployment Rate	Unemployment rates by age group	PNAD	2013
188 - 189	Youth Unemployment	Share of the population aged 18 to 24 that is looking for a job	Censo e PNAD	2013
190	Youth neither in Employment nor in School	Share of the population aged 18 to 25 that is neither employed nor in school	PNAD	2013
CAPABILITY TO ATTRACT TALENT				
191-192	Internal Migration – Municipality	Share of the population aged 18 to 64 born in another municipality	Censo and PNAD	2010 and 2013
193-194	Internal Migration – State	Share of the population aged 18 to 64 born in another state	Censo and PNAD	2010 and 2013
CAPABILITY TO RETAIN TALENT				
195	Ratio of Long-term Migrants to (sending) State Population	Ratio of those born in a state but living in another, to sending's state population	PNAD	2013
196	Ratio of Recent Migrants to (sending) State Population	Share of the population aged 18 to 64 that moved to another state within last 5 years	PNAD	2013
197	Ratio of migrants from a state and that state's population	Share of the population that moved to another state within last 5 years to that state's population	PNAD	2013

Dimension 13: RENEWABLE ENERGY SOURCES
Number of indicators: 2

#	INDICATOR	INDICATOR DESCRIPTION	SOURCE	YEAR
		SOLAR INSOLATION		
198	Average Daily Solar Radiation	Average daily solar radiation in kwh/sqm/day is used as a proxy for potential of solar energy generation per region .	http:// en.openei.org/ wiki/SWERA/Data	2006
		WIND POWER		
199	Average Daily Wind Speed	Average daily wind speed (sq km) is used as a proxy for the potential of wind energy generation per region.	http:// en.openei.org/ wiki/SWERA/Data	2006

Dimension 14: AGRICULTURAL AND EXTRACTIVE ACTIVITIES
Number of indicators: 25

#	INDICATOR	INDICATOR DESCRIPTION	SOURCE	YEAR
AVAILABLE WORKFORCE				
200	Total Employment	Total Number of employees	RAIS/MTE	2013
201	Employment in Mining	Number of people employed in the following industries: Carbon (CNAE 05); Oil (CNAE 06); Metals (CNAE 07); Iron, aluminum, tin, Non-metals (CNAE 08); and Support services (CNAE 09)	RAIS/MTE	2013
202	Employment in Fishing	Number of people employed in the Fishing (CNAE 03.1) and Aquaculture Industries (CNAE 03.2)	RAIS/MTE	2013
203	Employment in Forestry	Number of people employed in the forestry industry (Native and planted timber and support services, CNAE 02)	RAIS/MTE	2013
PRODUCTION VOLUME				
204-205	Production from Extractive and Silviculture Industries	Gross value of production in thousands of R$	PEVS - IBGE	2012
206-207	Production from permanent and temporary cropland	Crop value in thousands of R$	PAM - IBGE	2012
208	Production from Sugarcane	Production in thousand tons per harvest period	ÚNICA	2013/14
LIVESTOCK				
209-220	Volume of Livestock	Average size of herd in thousands (Cattle, Horses, Buffalos, Donkeys, Mules, Swines, Goats, Sheeps, Roosters, Pullets, Chicks, Chickens, Quails , Rabbits)	PPM - IBGE	2011
221-224	Slaughter Value	Slaughter value in thousands of R$ (Cattle, Chickens, Sheep, Swines)	PPM - IBGE	2011

Annex:

Methodology –

Dimensions of Competitiveness

Each of the dimensions of competitiveness was built according to a four-stage iterative process:

- **Variable selection and grouping –** selecting suitable variables from the database, according to criteria of completeness, data quality and economic sense; adjusting for missing or nonexistent values[1]; and occasionally grouping closely-related variables into a single indicator;
- **Spatial aggregation –** conforming the variables into a per-microregion level;
- **Standardization –** transforming the aggregated variables to conform to the same statistical properties;
- **Variable aggregation –** synthesizing the standardized variables into a single indicator, through averaging with selected weights.

1 - The general procedure was that nonexistent values for municipalities were imputed as the microregion's mean, if available, or the national mean otherwise. Missing values were imputed as zero or the non-zero minimum, depending on the situation.

At the end of the four stages, the produced indicator was analyzed for consistency and, if deemed necessary, the process was adjusted and repeated.

The detailed results of this process are described hereafter for each dimension. They are also available as Python scripts.

Dimension 1: BASIC EDUCATION

Variable selection and grouping – the following variables were selected:

- BEV001 - Literacy
- BEV002 - Class size
- BEV003007 - Average test score - National Exam of Upper Secondary Education (ENEM) – sum of Natural Sciences, Humanities, Languages, Mathematics and Writing
- BEV008009 - Index of Development of Basic Education (IDEB) – sum of 4th grade and 8th grade exams
- BEV011 – Male school rate
- BEV013 – Female school rate
- BEV015 – Index of Development of Basic Education (IDEB) 11th grade exam

Spatial aggregation – BEV001 through BEEV008009 were supplied on a per-municipality basis and were aggregated to microregion level using population weights. The remaining variables were supplied on a per-microregion basis.

Standardization – All variables were z-score standardized[2].

2 - If the original variable is x, the z-score is defined as $z=X-\mu/\sigma$, where μ and σ are, respectively, the sample mean and sample standard deviation. The resulting variable has zero mean and unitary variance.

Dimension 1: BASIC EDUCATION

Variable aggregation – Weights were selected using Principal Component Analysis (PCA)[3], and are presented in the table at right. The indicator produced explains 47.8% of the total variance in the sample.

#	INDICATOR	WEIGHT
1	Average Test Score, 4th Grade Exam	0.4643
2	Average Test Score, 8th Grade Exam	
3	Average Test Score, 11th Grade Exam	0.45825
4	Ratio of Students to Classrooms	-0.1027
5	Average Test Score, High School Exam (3rd Year) - Natural Sciences	0.4973
6	Average Test Score, High School Exam (3rd Year) – Humanities	
7	Average Test Score, High School Exam (3rd Year) – Languages	
8	Average Test Score, High School Exam (3rd Year) – Mathematics	
9	Average Test Score, High School Exam (3rd Year) – Writing	
10	Percentage of Population Older than 5 Able to Read and Write	0.4827
11	Share of Female Youth Aged 16-17 in School	0.2713
12	Share of Male Youth Aged 16-17 in School	0.0998

3- PCA is a simple, widely used numerical method with several applications. Given a set of variables, the algorithm calculates optimal weighing factors such that the weighed average (also called the *first principal component*) is the best single synthetic indicator for the whole group, that is, it captures or explains the highest proportion of the overall variability of the dataset across samples (compared to all other possible weighed averages).

Dimension 2: HIGHER AND VOCATIONAL EDUCATION

Variable selection and grouping – the following variables were selected:

- HEV009 - Higher education graduates - Total (normalized by population)
- HEV016028 - Vocational student enrollment – Total (normalized by population)
- HEV031 - Higher Education enrollment – Total (normalized by population)
- HEV033049 – University performance – all subjects
- HEV050 – Inbound student mobility
- HEV051 - Share of the population aged 18 to 25 in university
- HEV053 - Workforce aged 25 to 64 with college degree
- HEV055 - Grading of state's two top universities (Folha)
- HEV056 - Grading of state's top university (CWUR)
- HEV057 - Grading of state's top university (QS)
- HEV058 - World ranking (Webometrics)
- HEV059 - Share of the population aged 35 to 65 in collegeBEV001 – Literacy

Dimension 2: HIGHER AND VOCATIONAL EDUCATION

Spatial aggregation – HEV009 through HEV033049 were supplied on a per-municipality basis and were aggregated to microregion level using population weights. HEV050 was supplied on a per-state basis and state values were utilized as proxies for the microregions. The remaining variables were supplied on a per-microregion basis.

Standardization – All variables were log-transformed[4] and z-score standardized.

Variable aggregation – Weights were selected using Principal Component Analysis (PCA), and are presented in the table at right. The indicator produced explains 48.2% of the total variance in the sample.

#	INDICATOR	WEIGHT
13	Share of Formal Workforce with University Degree	0.3059
14	Number of Higher Education Graduates (normalized by population)	0.2961
15	Share of Those Aged 18 to 25 in University	0.3117
16	Share of Those Aged 35 to 65 in College	0.0927
17	Share of Higher Education Students per 100.000 Residents	0.2965
18 - 31	Number of Students Enrolled in Technical Education (normalized by population)	0.2490
32 - 49	Test Score in National Student Performance Exam	0.2235
50	Rankings of Best State Universities (Folha de São Paulo)	0.3136
51	Rankings of Best State Universities (CWUR)	0.3046
52	Rankings of Best State Universities (QS ranking)	0.3335
53	Rankings of Best State Universities (Webometrics)	0.3315
54	Inbound Student Mobility	0.3184

4- More precisely, the transformation $Y=\log(X+1)$ was used, in order to avoid zero-value issues.

Dimension 3: SOCIAL INFRASTRUCTURE

Variable selection and grouping – the following variables were selected:

- IFV001005 – Number of households with telephone infrastructure
- IFV006 – Number of households with personal computer
- IFV007 – Number of households with Internet access
- IFV008 - Internet bandwidth speed (up to 2Mbps)
- IFV009 - Internet bandwidth speed (above 2Mbps)
- IFV010 - Access to electricity
- IFV011 - Cost of electricity - Residential
- IFV012 - Cost of electricity - Industrial
- IFV013 - Cost of electricity - Commercial
- IFV014018 – Excess commuting time

Spatial aggregation – IFV008-009, 011-013 were supplied on a per-state basis and state values were utilized as proxies for the microregions. The remaining variables were supplied on a per-municipality basis and were aggregated to microregion level using population weights. The remaining variables were supplied on a per-microregion basis.

Dimension 3: SOCIAL INFRASTRUCTURE

Standardization – IFV001005 through IFV007 were normalized by population. IFV010 was log-transformed. All variables were z-score standardized.

Variable aggregation – Weights were selected using Principal Component Analysis (PCA), and are presented in the table at right. The indicator produced explains 36.9% of the total variance in the sample.

#	INDICATOR	WEIGHT
55	Households with Telephone Access	0.3940
56	Households with Telephone Access, Landline Only	
57	Households with Telephone Access, Mobile	
58	Households with Telephone Access, Landline And Mobile	
59	Households with Personal Computer	0.4157
60	Households with Personal Computer with Internet Access	0.4168
61	Internet Bandwidth Speed (Up to 2Mbps)	0.2675
62	Internet Bandwidth Speed (Above 2Mbps)	0.2609
63	Percentage of Households with Access to Electricity	0.3588
64	Cost of Electricity – Residential (in R$ per KWh)	-0.2403
65	Cost of Electricity – Industrial (in R$ per KWh)	-0.2094
66	Cost of Electricity – Commercial (in R$ per KWh)	-0.3566
67	Time Spent Commuting from Home to Work - Up to 5 min	0.0342
68	Time Spent Commuting from Home to Work - Between 6 and 30 min	
69	Time Spent Commuting from Home to Work - Between 30 and 60 min	
70	Time Spent Commuting from Home to Work - Between 1 and 2 hours	
71	Time Spent Commuting from Home to Work - More than 2 hours	

Dimension 4: SUSTAINABILITY

Variable selection and grouping – the following variables were selected:

- SUV001 – Biodiversity protection
- SUV002 - Pollution
- SUV003 - Income equality
- SUV004 - Poverty
- SUV005 - Access to water services
- SUV013 - Access to basic sanitation
- SUV022 - Quality of housing
- SUV025 - Ratio of household income at 90th percentile to that at 10th
- SUV027 - Ratio of rent to household income among renters
- SUV029 - Perception of good quality in public transportation
- SUV030 - Perception of good quality in public health system
- SUV031 - Perception of good quality in public education system
- SUV032 - Perception of good quality in leisure activities
- SUV033 - Ratio of mortgage to household income among those with mortgages

Dimension 4: SUSTAINABILITY

Spatial aggregation – SUV001-002 and SUV005 through SUV022 were supplied on a per-municipality basis and were aggregated to microregion level using population weights. SUV003-004 were supplied on a per-state basis and state values were utilized as proxies for the microregions.

Standardization – SUV002, SUV005, SUV013 and SUV022 were normalized by population. SUV001, SUV002, SUV005, SUV013, SUV022, SUV025, SUV027 and SUV033 were log-transformed. All variables were z-score standardized.

Variable aggregation – Principal Component Analysis (PCA) presented economically unsuitable weights for this set of variables. It was thus utilized a simple average, with variable signs inverted depending on the intended interpretation of the dimension.

Dimension 5: HEALTH

Variable selection and grouping – the following variables were selected:

- HHV001 - Life expectancy at birth
- HHV002 - Infant mortality
- HHV003 - Hospital beds
- HHV004014 - Number of people employed in health care
- HHV019 - Self-rated health among the population aged 55 to 65

Spatial aggregation – HHV019 was supplied on a per-microregion basis. The remaining variables were supplied on a per-municipality basis and were aggregated to microregion level using population weights.

Standardization – HHV003 and HHV004014 were normalized by population and log-transformed. All variables were z-score standardized.

Dimension 5: HEALTH

Variable aggregation – Weights were selected using Principal Component Analysis (PCA), and are presented in the table at right. The indicator produced explains 72.4% of the total variance in the sample.

#	INDICATOR	WEIGHT
86	Employment in Health Care Services	0.4442
87-96	Employment in Health Care Services per Field of Activity	
97	Hospital Beds	0.3084
98	Life Expectancy	0.5054
99	Infant Mortality	-0.5020
100	Self-rated Health	0.4474

Dimension 6: PUBLIC SECTOR PERFORMANCE

Variable selection and grouping – the following variables were selected:

- ISV003 – Homicide rate
- ISV004008 – Fiscal management of municipalities – IFGF index (Firjan)
- ISV009011 – Performance of the Judicial System – IDJus index (CPJUS)

Spatial aggregation – ISV009011 was supplied on a per-state basis and state values were utilized as proxies for the microregions. The remaining variables were supplied on a per-municipality basis and were aggregated to microregion level using population weights[5].

Standardization – ISV003 was log-transformed. All variables were z-score standardized.

5-The Federal District, where Brasília is located, does not possess a municipal government and does not have an IFGF score. The mean of all municipalities was imputed.

Dimension 6: PUBLIC SECTOR PERFORMANCE

Variable aggregation – Weights were selected using Principal Component Analysis (PCA), and are presented in the table at right. The indicator produced explains 45.7% of the total variance in the sample.

#	INDICATOR	WEIGHT
101	Own Revenue	0.6905
102	Spending with Personnel	
103	Investments	
104	Liquidity	
105	Cost of Debt	
106	Budget Management	0.7030
107	Resource Management	
108	Process Management	
109	Number of Homicides per 100,000 People	-0.1702

Dimension 7: LOGISTICS

Variable selection and grouping – the following variables were selected:

- LOV001005 – Quality of road pavement
- LOV017 – Distance to nearest airport
- LOV018 – Distance to nearest port
- LOV006 – km of railway per sq km
- LOV007 – km of waterways per sq km
- LOV012 – Cargo movement at dry ports
- LOV013 – Cargo movement at seaports
- LOV014 – Containerization rate
- LOV015 – Trade flows
- LOV008 – Number of seats in regional flights at local airport
- LOV009 – Number of seats in international flights at local airport
- LOV010 – Number of regional destinations at local airport
- LOV011 – Number of international destinations at local airport

Dimension 7: LOGISTICS

Spatial aggregation – LOV008-011, 017, 018 were supplied on a per-municipality basis and were aggregated to microregion level using population weights. The remaining variables were supplied on a per-state basis and state values were utilized as proxies for the microregions.

Standardization – LOV008-011, 017, 018 were log-transformed. All variables were z-score standardized.

Variable aggregation – Weights were selected using Principal Component Analysis (PCA), and are presented in the table at right. The indicator produced explains 30.7% of the total variance in the sample.

#	INDICATOR	WEIGHT
110-114	Quality of Paved Roads	0.3596
115	Extension of Railroad Lines	0.2638
116	Cargo Movement at Inland Ports	0.4496
117	Cargo Movement at Inland Seaports	0.4504
118	Containerization rate	0.1398
119	Distance to Port	-0.0759
120	Number of Domestic Destinations at Airports	0.1753
121	Number of International Destinations at Airports	0.1714
122	Domestic Flights per Week	0.1793
123	International Flights per Week	0.1739
124	Distance to Airport	-0.1956
125	Extension of Waterways	0.0699
126	Export	0.4530

Dimension 8: BUSINESS SOPHISTICATION

Variable selection and grouping – the following variables were selected:

- BUS001 – Share of workforce in management
- BUS002 – Share of workforce in complex manufacturing
- BUS003 – Share of workforce in IT occupations
- BUS004 – Share of workforce in IT firms

Spatial aggregation – All variables were supplied on a per-microregion basis.

Standardization – BUS002, BUS003, BUS004 were log-transformed. All variables were z-score standardized.

Dimension 8: BUSINESS SOPHISTICATION

Variable aggregation – Weights were selected using Principal Component Analysis (PCA), and are presented in the table at right. The indicator produced explains 30.7% of the total variance in the sample.

#	INDICATOR	WEIGHT
127	Management	0.3960
128	Complex Manufacturing	0.4209
129	Occupational Employment in Communication and Information Technology	0.3881
130	Sector Employment in Communication and Information Technology	0.4164

Dimension 9: INNOVATION

Variable selection and grouping – the following variables were selected:

- INV010026 – Concentration of human resources in R&D
- INV027029 – Density of people with graduate, Master's degrees and Doctor's degrees (weighed)
- INV030042 – State Innovation & Entrepreneurship Sub-index[6]

Spatial aggregation – INV030042 was supplied on a per-state basis and state values were utilized as proxies for the microregions. The remaining variables were supplied on a per-municipality basis and were aggregated to microregion level using population weights.

Standardization – INV010026 and INV027029 were log-transformed. All variables were z-score standardized.

6-Composed of Foreign Direct Investment , Expenditure in R&D, Concentration of startups, Concentration of entrepreneurs, Concentration of angel investors, Concentration of service providers, Technology parks, Venture Capital, CAPES evaluation of R&D institutions.

Dimension 9: INNOVATION

Variable aggregation – Weights were selected using Principal Component Analysis (PCA), and are presented in the table at right. The indicator produced explains 73.4% of the total variance in the sample.

#	INDICATOR	WEIGHT
131-146	Scientists , Engineers, and R&D Directors	0.5947
147-156	Workers Employed in R&D; Market Research and Pharmaceutical Production	
157-159	Workers with Graduate Diploma, Masters Degree, and PhD	0.6167
160	FDI per State in R$	0.5158
161-165	Performance of R&D Institutions	
166	Number of Technology Parks	
167	Public Expenditure in R&D	
168	Number of Venture Capital Firms	
169	Startups	
170	Entrepreneurs	
171	Angel Investors	

Dimension 10: MARKET SIZE

Variable selection and grouping – the following variables were selected:

- MSV018 – Distance to the border
- MSV028 – Weighed market size[7]
- MSV001 – Municipal GDP (Gross Domestic Product)
- MSV002 – Population
- MSV017 – Number of enterprises

Spatial aggregation – All variables were supplied on a per-municipality basis and were aggregated to microregion level, either by sum (MSV001, MSV002 and MSV017) or by GDP weights (others).

Standardization – All variables were log-transformed and z-score standardized.

7-The weighed market size of each municipality i is defined as $S_i = \sum_{j \neq i} Y_j \exp\{-\alpha d_{ij}\}$, where Y_j is the GDP of municipality i and d_{ij} is the distance between municipalities i and j. α is a constant scale equal to $0.002\ km^{-1}$

Dimension 10: MARKET SIZE

Variable aggregation – Weights were selected using Principal Component Analysis (PCA), and are presented in the table at right. The indicator produced explains 60.6% of the total variance in the sample.

#	INDICATOR	WEIGHT
173	Size of the Economy	0.5589
174	Population	0.5256
175	Firm Size	0.5669
176	Distance between Markets	-0.0886
177	Weighted Market Size	0.2865

Dimension 11: GOODS MARKET

Variable selection and grouping – the following variables were selected:

- GMV001 – Herfindahl-Hirschman Index (HHI) of firms by payroll[8]
- GMV002 – Herfindahl-Hirschman Index (HHI) of firms by number
- GMV003005 – Tax intensity as a % of GDP[9]

Spatial aggregation – GMV001 and GMV002 were supplied on a per-municipality basis and were aggregated to microregion level by GDP weights. GMV003005 was supplied on a per-state basis and state values were utilized as proxies for the microregions.

Standardization – GMV001 and GMV002 were log-transformed. All variables were z-score standardized.

8- The HHI is a measure of concentration. Payroll HHI is defined as $H=\sum i\uparrow\square s\downarrow i\uparrow 2$, where $s\downarrow i$ is the share of firm i in the total firm payroll of a given municipality. Number HHI is simply equal to $1/N$, where N is the number of firms.

9-Including the following taxes: CSLL (excise tax on corporate profits), ICMS (goods VAT) and ISS (services VAT).

Dimension 11: GOODS MARKET

Variable aggregation – Weights were selected using Principal Component Analysis (PCA), and are presented in the table at right. The indicator produced explains 62.7% of the total variance in the sample.

#	INDICATOR	WEIGHT
178	Points in the Herfindahl Index - Calculated with the Payroll of firms	-0.6666
179	Points in the Herfindahl Index - Calculated with the Number of firms	-0.6656
180	Social Contribution on Net Profits (CSLL) - R$	-0.3355
181	Tax on the Circulation of Goods and Services (ICMS) - R$	
182	Tax on Services (ISS) – R$	

Dimension 12: LABOR MARKET

Variable selection and grouping – the following variables were selected:

- LMV001 – Unemployment rate
- LMV002 - % working age population in the labor force
- LMV004 - % of young people (15-29) who neither study nor work
- LMV009 - Share of the population aged 18 to 64 born in another municipality (Censo)
- LMV010 - Share of the population aged 18 to 64 born in another state (Censo)
- LMV011 - Share of the population aged 18 to 64 in employment for pay
- LMV012 - Share of the male population aged 18 to 64 in employment for pay
- LMV013 - Share of the female population aged 18 to 64 in employment for pay
- LMV014 - Share of the population aged 18 to 24 that is looking for a job
- LMV015 - Share of the population aged 18 to 25 that is neither employed nor in school
- LMV016 - Share of the population aged 18 to 64 born in another municipality (PNAD)
- LMV017 - Share of the population aged 18 to 64 born in another state (PNAD)
- LMV018 - Share of the population aged 18 to 64 that lived in another state within 5 years
- LMV019 - Ratio of those born in a state but living in another, to sending's state population
- LMV020 - Ratio of migrants from a state and that state's population

Dimension 12: LABOR MARKET

Spatial aggregation – LMV004, LMV009, LMV010 were supplied on a per-municipality basis and were aggregated to microregion level by population weights. The remaining variables were supplied on a per-state basis and state values were utilized as proxies for the microregions.

Standardization – All variables were z-score standardized.

Variable aggregation – Weights were selected using Principal Component Analysis (PCA), and are presented in the table at right. The indicator produced explains 50.1% of the total variance in the sample.

#	INDICATOR	WEIGHT
183	Full Employment	0.3260
184	Employment to Population Ratio	0.2652
185	Male Employment Rates	0.3282
186	Female Employment Rates	0.3035
187	Unemployment Rate	-0.2639
188	Youth Unemployment – Censo	0.2463
189	Youth Unemployment – PNAD	-0.1826
190	Youth neither in Employment nor in School	-0.2975
191	Internal Migration – Municipality – Censo	0.2218
192	Internal Migration – Municipality – PNAD	0.2946
193	Internal Migration – State – Censo	0.1660
194	Internal Migration – State – PNAD	0.2085
195	Ratio of Long-term Migrants to (sending) State Population	0.1883
196	Ratio of Recent Migrants to (sending) State Population	0.1611
197	Ratio of migrants from a state and that state's population	0.0336

Dimension 13: RENEWABLE ENERGY SOURCES

Variable selection and grouping – the following variables were selected:

- EEV001 – Wind power potential
- EEV002 – Solar insolation

Spatial aggregation – Both variables were supplied on a per-municipality basis and were aggregated to microregion level by area weights.

Standardization – All variables were z-score standardized.

Variable aggregation – Principal Component Analysis (PCA) presented economically unsuitable weights for this set of variables. It was thus utilized a simple average.

Dimension 14: AGRICULTURAL AND EXTRACTIVE ACTIVITIES

Variable selection and grouping – the following variables were selected:

- AEV001004 – Total employment in agriculture and extractive activities
- AEV005008 – Value of agricultural and extractive production
- AEV009020 – Size of herd
- AEV021024 – Slaughter value of herd
- AEV025 – Sugar cane production

Spatial aggregation – AEV025 was supplied on a per-state basis and state values were utilized as proxies for the microregions. The remaining variables were supplied on a per-municipality basis and were aggregated to microregion level by population weights.

Standardization – All variables were log-transformed and z-score standardized.

Dimension 14: AGRICULTURAL AND EXTRACTIVE ACTIVITIES

Spatial aggregation – Weights were selected using Principal Component Analysis (PCA), and are presented in the table at right. The indicator produced explains 40.5% of the total variance in the sample.

#	INDICATOR	WEIGHT
200	Total Employment	0.1275
201	Employment in Mining	
202	Employment in Fishing	
203	Employment in Forestry	
204-205	Production from Extractive and Silviculture Industries	0.5763
206-207	Production from Permanent and Temporary Cropland	
208	Production from Sugarcane	0.0272
209-220	Volume of Livestock	0.5942
221-224	Slaughter Value	0.5457

Annex:

Methodology – Competitiveness Index

The regional competitiveness index is built from the 14 dimensions described in the previous section. Worth remembering that each dimension corresponds to an indicator for the 558 microregions. To calculate the regional competitiveness index, these 14 indicators were all z-score standardized and then aggregated. The aggregation weights were, once again, selected using Principal Component Analysis, and are presented.

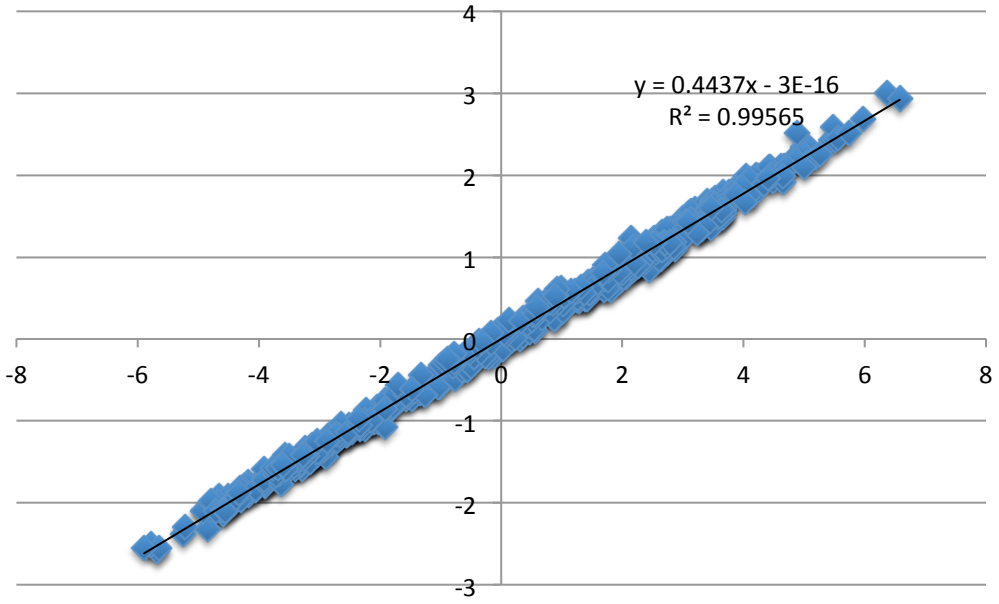
DIMENSION	WEIGHT
Basic Education – BE	0.3139
Higher & Vocational Education – HE	0.3042
Social Infrastructure – IF	0.2814
Sustainability – SU	0.2836
Health – HH	0.3179
Public Sector Performance - IS	0.2579
Logistics – LO	0.2174
Business Sophistication – BS	0.3281
Innovation – IN	0.3249
Market Size – MS	0.2473
Goods Market – GM	0.2847
Labor Market – LM	0.2656
Energy Resources – EE	0.0397
Agricultural and Extractive Resources - AE	-0.0854

As the first principal component of this sample space, the regional competitiveness index explains 62.1% of the total variance of the 14 dimensions. Considering that these dimensions correspond to variables that are, in principle, completely unrelated, this is a very successful summary of the inter-sample variability. This is a reflection of the strong correlation between dimension indicators, as shown in the correlation matrix below.

index	IS	IN	BS	EE	LO	IF	AE	BE	SU	HE	GM	HH	MS	LM
IS	1,00	0,67	0,71	0,03	0,44	0,57	-0,32	0,68	0,69	0,58	0,58	0,72	0,41	0,64
IN	0,67	1,00	0,93	0,13	0,65	0,80	-0,16	0,90	0,74	0,91	0,79	0,88	0,74	0,68
BS	0,71	0,93	1,00	0,07	0,64	0,81	-0,18	0,88	0,76	0,86	0,83	0,89	0,73	0,74
EE	0,03	0,13	0,07	1,00	0,04	0,18	-0,18	0,12	0,09	0,18	-0,02	0,07	0,05	0,05
LO	0,44	0,65	0,64	0,04	1,00	0,67	0,25	0,51	0,33	0,67	0,46	0,46	0,66	0,26
IF	0,57	0,80	0,81	0,18	0,67	1,00	-0,04	0,73	0,64	0,81	0,63	0,70	0,61	0,50
AE	-0,32	-0,16	-0,18	-0,18	0,25	-0,04	1,00	-0,24	-0,46	0,00	-0,21	-0,36	0,16	-0,60
BE	0,68	0,90	0,88	0,12	0,51	0,73	-0,24	1,00	0,81	0,84	0,73	0,90	0,58	0,72
SU	0,69	0,74	0,76	0,09	0,33	0,64	-0,46	0,81	1,00	0,69	0,61	0,86	0,38	0,82
HE	0,58	0,91	0,86	0,18	0,67	0,81	0,00	0,84	0,69	1,00	0,69	0,79	0,76	0,52
GM	0,58	0,79	0,83	-0,02	0,46	0,63	-0,21	0,73	0,61	0,69	1,00	0,79	0,74	0,67
HH	0,72	0,88	0,89	0,07	0,46	0,70	-0,36	0,90	0,86	0,79	0,79	1,00	0,58	0,82
MS	0,41	0,74	0,73	0,05	0,66	0,61	0,16	0,58	0,38	0,76	0,74	0,58	1,00	0,38
LM	0,64	0,68	0,74	0,05	0,26	0,50	-0,60	0,72	0,82	0,52	0,67	0,82	0,38	1,00

Further is observed that, for 12 of the 14 dimensions, the weights can be considered approximately equal (between 0.21 and 0.33). The two exceptions are Renewable Energy Resources and Agricultural and Extractive Resources – precisely the two dimensions relating to natural endowments and not to human or social development – which obtain near-zero weights, due to their generally low correlation with the remaining dimensions.

As an exercise, it is compared at right the index resulting from this aggregation with the one obtained by a simple average of the 14 dimensions. One notes that the choice of PCA weights, instead of equal weights, produces substantially similar scores: although the exact orderings change, the cardinal changes are never extreme.



Annex:

Input-Output Analysis

Input-output analysis is a quantitative methodological framework respected and widely used, combining perfectly with the objectives of this study. This enshrined approach is much appreciated in assessing the importance of industrial sectors or individual projects for the economy as a whole, whether on a regional, national or even international scope (IBGE. 1997; Fundação Cide. 1996; Montoya. 2001). These models start by splitting the economy into *economic activities* or sectors, each with its own accounts for production and consumption of goods and services, representing the so-called *social accounting* of that particular economy.

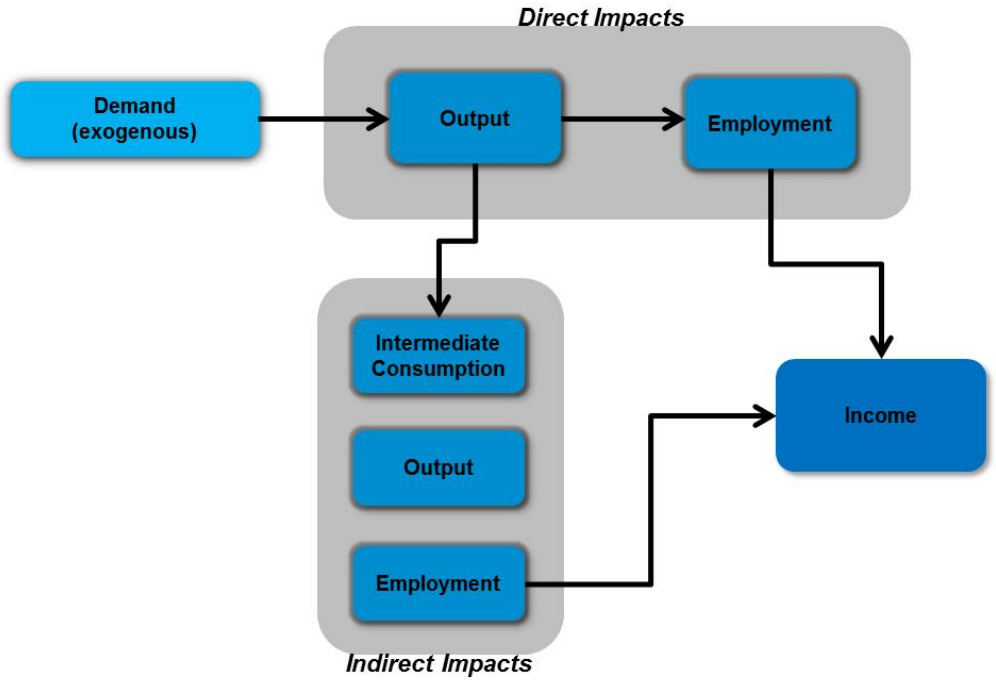
Each sector's accounts satisfy certain *accounting identities*, the following having special importance:

These identities express the division of the production value of goods and services in accordance with their use:

- *Intermediate consumption,* that is, consumption on the part of the productive sectors of the economy; and
- *Final demand,* that is, absorption of the products otherwise, for instance: gross fixed-capital formation (investments), exports, variation of stock, public-administration consumption and family consumption.

Input-output analysis permits capturing not only the effects of the final demand for steel on the economic activities directly involved in its production (*direct effect*), but also the *indirect effects* on the activities making up the productive chain of steel, caused by the intermediate consumption between these activities, as shown below**.**

Input-Output Matrix Methodology



The **Input-Output Matrix** of **IBGE** encompasses 110 products (goods and services) and 56 economic activities (including the government). An algorithm will be developed and applied to update this matrix, along with the use of more recent sectorial data disclosed by **IBGE** and data from other official surveys, namely:

- **IBGE Input-Output Matrix** – This matrix organizes, by origin and destination, the data on the economic flows that occur in Brazil. It shows production, intermediate consumption, imports, exports, investments (capital expenditures), household and public-sector consumption, along with generation and distribution of income between wages and company earnings.
- **System of National Accounts** – These are prepared based on the **Input-Output Matrix**, and consist of a set of tables (**Sources and Use of Goods and Services** and **Integrated Economic Accounts**) that describe the flows of production and intermediate consumption among economic sectors, households, government and the external sector. This is an important tool for consistent calculation and analysis of the nation's **gross domestic product**.
- **Brazilian Regional Accounts** – These detail the components of the production value of various economic activities in all **states** in the country, in each of the years analyzed. They are prepared based on sectorial and household surveys conducted by **IBGE** and decompose the national GDP, permitting analysis of intermediate consumption and value added to the economy on a regional level, structured in 17 sectors, compatible with the aggregation employed in the **System of National Accounts.**

Thus, is the value of the production of sector , represents the value consumed by sector of goods and services produced by sector , and is the final demand for these goods or

services. The fundamental hypothesis of a output-input model is that *the intermediate consumption by each sector is directly proportional to its own production*: , where the coefficients are called *technical coefficients* of production. This hypothesis can be easily understood as the postulation of a fixed technology for each sector, where the use of inputs is required in direct proportion to the volume of production, without economies of scale, substitute or complementary goods.

Based on this hypothesis, the accountable identities (1) can be written in the matricial form

or else, if the matrix is invertible[1]

 is the so-called *Leontief matrix,* which shows how much each sector must produce to attend not only to the final demand for its products but also to the intermediate consumption on the part of all the other activities that use them as inputs.

In particular, should a – shock occur, for instance an increase or decrease in the volume of exports, in public or private investments, or in public-administration consumption, then, by linearity, the level of production of the activities will change to , which includes the direct impact of the increased demand and the impact induced by the increase in the intermediate consumption of the sectors.

The IBGE has a output-input model for the Brazilian economy divided into 56 sectors and 110 products and using the year 2009 as a reference. This model is considered to be an

1-Here I is the matrix identity $n \times n$

appropriate starting point inasmuch as it enables individualized identification of the inter-connections between the productive and institutional sectors. The following stages were completed using the IBGE Output-Input Matrix:

- Definition and characterization of the productive chain (institutions and products considered);
- Analysis of the IBGE output-input model and identification of the productive chain in the classifications employed; and
- Implementation of an updated and extended output-input model based on the IBGE model.

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Created in 1944, FGV is a nonprofit entity that provides an extensive range of services to the technical, scientific and business communities, and society as a whole. The tradition of efficiency and excellence are FGV's trademark.

In the field of projects, FGV stands out by aggregating to its works its greatest asset: the credibility built up over the years by the security and competence of everything it does.

The quick and efficient formation of multidisciplinary groups with outstanding qualifications permits providing a broad range of consulting services.

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