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Regional Disparities

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Abstract and Keywords

This chapter analyzes the emergence of disparities in income and development levels between Brazil's main regions, in particular the gap that exists between the comparatively rich South and Southeast and the poorer North and West regions. Economic activity and the population are concentrated in a small part of the territory. Even within this reduced area, the geographical distribution is highly uneven. Besides concentration, regional inequalities are marked in the country in terms of per capita income, education, access to public services, and so on. This scenario of concentration and inequality is quite persistent, as the data available indicate. We conclude with a discussion of regional policy, both intended and unintended. The present levels of inequality shows the failure of the traditional place-based regional policies implemented in the past. The people-based policies implemented in recent decades have been the most effective way of reducing regional inequality.

Keywords: Brazil, economic development, regional development, regional policy, spatial disparities

20.1. Introduction

AN important initial fact to highlight is the sheer territorial size of Brazil. With an area of 8.5 million square kilometers, Brazil is larger than Australia, the continental parts of the United States and Europe, and smaller only than Russia, China, the United States (all 50 states), Canada, and the enlarged Europe (53 countries). At its longest extent, the distance between the coast in the east and the neighboring countries in the west reaches 2,700 miles. Possible connections with other economies to the north and to the west are limited by, in the former case, the Amazon forest, and in the latter, the Andean range of

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mountains. The economies of the West and North regions of the country are either isolated or connected to the coastal areas many miles away, either with respect to foreign markets or the main population and internal market areas located in the Southeast and South of the country. Long distances and the quality of roads are important economic issues impairing the competitiveness of these regions. There are good connections only in the South and Southeast with Uruguay, Argentina, and Paraguay, and, with limitations related to topography and distance, with Chile. This amplifies the attraction of the internal market concentrated in the Southeast and South of the country.

The other relevant aspect of Brazilian economic geography relates to the 2,700-mile north-to-south spread of its territory (see Figure 20.1). Small parts are located either in the Northern Hemisphere, close to the line of the equator (around 6% of the area and 5.3% of the population) or in the temperate zone (7% of the area and 14.5% of the population). The remaining parts are subtropical, with a concentration of population in coastal areas. This prompts important differences in the resource base of the regions, including levels and variations in temperature, rain regimes, the presence of at least 10 different types of vegetation, soil types, landscapes, and so on, that comprise the natural (p. 424) basis of the country.¹ Given this heterogeneity, it is not surprising to find huge regional disparities in economic and social conditions.



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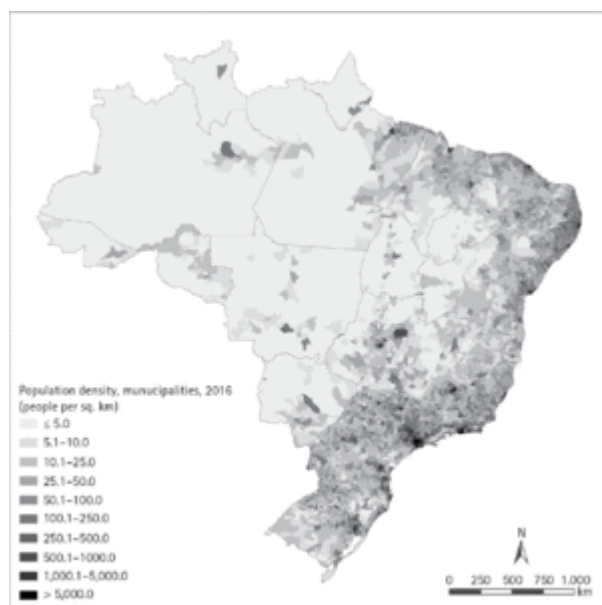
Figure 20.1. Brazilian states and macro regions.

The urban system is also concentrated in the coastal area and is markedly skewed in terms of the size distribution of cities. Half of the national population of the country's 5,570 municipalities is located in the 200 largest cities. In 2015, the main metropolitan area, São Paulo, hosted over 21 million inhabitants in its 37 municipalities, but the surrounding area (constituting the same labor market) reached

over 173 municipalities and 32 million inhabitants.² The second largest metropolitan area was Rio de Janeiro, with 12 million inhabitants, followed by Belo Horizonte, with almost 6 million. Fourteen other cities contain populations larger than 1 million. Given their location in the coastal area or close to it, density varies significantly. The North and Center-West areas present demographic densities of 2.66 and 5.86 inhabitants per square kilometers; the poor Northeast region is denser, with 27.33 inhabitants per square

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kilometer; the South shows 38.38, and the rich Southeast, 67.77 inhabitants per square kilometer (Figure 20.2). (p. 425)



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Figure 20.2. Population density by municipality, 2016.

20.2. Regional Disparity Indicators

In the first decades after the arrival of the Portuguese, very few activities were developed since the country offered no easily accessible source of gold or silver. Exploration for a specific type of tree³ used to color clothes was the first surge of activity. Once the easy-to-find trees were exhausted, interest faded and the country was left alone. Some attempts were made to populate the newfound land, but it was only with the beginning of the production of sugar and, to a lesser degree, tobacco that this goal was partially reached. This happened in the Northeast region, mainly in the present state of Pernambuco,⁴ in the mid-sixteenth century and lasted until the mid-eighteenth century. The region was (p. 426) the economic core of the country at the time, with the remaining area left essentially untouched.

Gold was finally found in 1697 in the Southeast region, although initially not in the expected volume, and was followed by diamonds in the same region in 1714. In the years that followed, a gold rush started, thus bringing about huge transformations in the area. In parallel with events occurring in Europe, this prompted massive migratory flows from Portugal to the colony, mainly to its Southeast portion. This included even the movement of the capital city from Salvador (in the Northeast region) to Rio de Janeiro in 1763. Though sugar and tobacco were produced mainly to supply the international market, the large population contingents in the Southeast constituted sizable internal markets for

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food and some services. This is the first distinction between the regions, although both used slaves to produce their products.

A new era came with coffee, planted and developed in the Southeast. The crop was brought to Brazil in the eighteenth century, but only in the early nineteenth century did it finally boom. This started in the coastal areas between Rio de Janeiro and São Paulo, but attained full steam as it reached adequate soil inland to the west in the states of São Paulo and Paraná. This almost 100-year cycle produced several transformations in the economy, including the substitution of European migrants for slaves—thus amplifying the local market—the construction of important railways, the development of ports, and so on. This sizable internal market, the qualification of the labor force, the presence of potential entrepreneurs, and the development of a transportation (railways) infrastructure provided the conditions for the present concentration of activities in the country.

By the time of the Great Depression and World War I, the economy of the Southeast was well ahead of the other parts of the country. The capital city of Rio de Janeiro and the city of São Paulo were important urban centers concentrating the new middle class. Import limitations during World War I and the Great Depression gave space for the development of manufacturing activities to substitute for imported goods. Exporting coffee demanded some supporting manufacturing, such as tools and textiles for the sacks, which were developed in these urban centers, mainly in São Paulo. A natural step was to expand these activities to other manufacturing areas, which gave way to the industrialization of the country, with a focus in the Southeast.

Estimates of regional data for the distant past illustrate the shape of regional disparities in the country. Rands Barros (Chapter 21 in this volume) presents a long-term series of per capita GDP for the Northeast region, indicating that it was above the national average until the mid-nineteenth century, the time at which the coffee boom began in the Southeast. Reis and Monasterio (2008) have shown that regional disparities at the time, based on the 1872 population census, were not much different from the present levels. Official statistics are only available after 1939, and they are summarized in Table 20.1. As Rands Barros's chapter on the Northeast analyses, the region hosted almost 28% of the national population in the most recent census, and has lost shares in population and production since 1940. Being populous, it attracts attention in terms of regional policy, thus constituting the most significant "regional problem" in Brazil. In (p. 427) contrast, the rich Southeast, with 11% of the area, hosted 42% of population in 2010, and 55% of the national GDP in 2014. Although this region lost almost 8 percentage points over the period, it is still the locomotive behind the national economy, especially in manufacturing and services. The South is small in terms of area, is second in economic importance, and has increased its share in population and GDP over time. A comparison of the states of Piauí in the Northeast and São Paulo in the Southeast, with identical area sizes, is illustrative. The former lost 20% of its share in population, and one-third of its share in GDP; the latter lost 5% of its share in population, but gained 3% of share in GDP.

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Table 20.1 Regional Disparity Indicators

Regions	Shares (% of National Totals)										
	Area	Population		GDP		Value Added, 2013				Per Capita GDP	
		1940	2010	1939	2014	Agric.	Minin g	Manuf.	Tertiar y	1939	2014
North	45.3	3.9	8.3	2.7	5.3	10.6	12.5	4.4	5.0	0.75	0.63
Northeast	18.3	35.0	27.8	16.9	13.9	16.5	7.8	8.8	14.7	0.48	0.50
Piauí State	2.9	2.0	1.6	0.9	0.6	0.7	0.0	0.2	1.0	0.43	0.41
Southeast	10.9	44.5	42.1	63.0	54.9	23.4	77.6	56.4	55.6	1.41	1.31
São Paulo State	2.9	17.4	21.6	31.3	32.1	11.0	3.8	38.6	33.6	1.8	1.48
South	6.8	13.9	14.4	15.3	16.4	29.5	1.0	24.5	15.2	1.11	1.15

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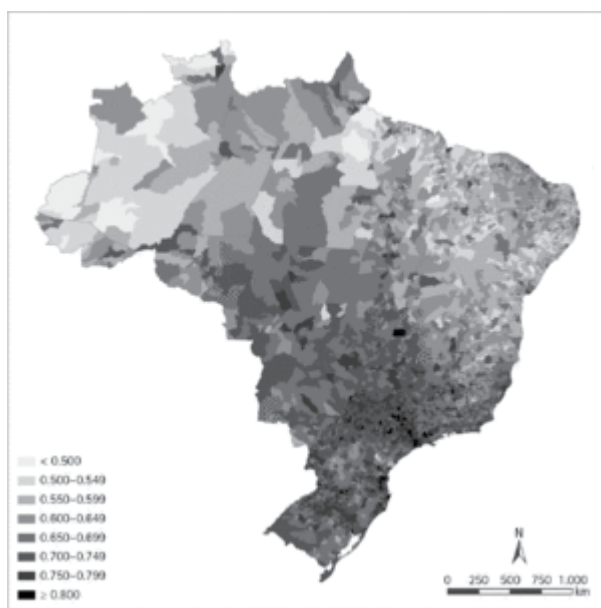
Midwest	18.9	2.7	7.4	2.1	9.4	19.2	1.1	5.9	9.6	0.7	1.25
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Source: IBGE, Censo Populacional and Contas Regionais.

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The gainers in terms of population and production are the North and the Midwest. The North is another poor area, but with less importance in terms of population. It has more than doubled in its share of the population from 1940 to 2010, and doubled its share of national GDP. Its growth is based on natural resources, with important logging and mining activities and some cattle ranching. It also hosts a very active tax-free import zone (Zona Franca de Manaus), established in the 1960s. The Midwest more than tripled its share of the population, and multiplied its share of GDP more than fourfold. Besides the transference of the capital city to Brasília in 1961—now a metropolis with more than 3 million inhabitants, and 3% of the national value added—the advance of the agricultural frontier toward the west explains its growth in importance.

Table 20.1 also provides information on the importance of the regions in broad sectors of activities. In 2013, the North region hosted 12.5% of all mining activities in Brazil. This is the sector with the highest importance, though agriculture is also important in the region. In the Northeast, agriculture and tertiary activities are highlights. The Midwest excels in terms of agriculture, and the South, in agriculture and manufacturing. In the (p. 428) richest region, the Southeast, mining is of the highest importance (oil in Rio de Janeiro and iron ore in Minas Gerais), along with manufacturing and tertiary activities.



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Figure 20.3. Human Development Index by municipality, 2010.

The preceding indicators highlight the concentration of people and production, but disparities also can be expressed in terms of inequality. The final two columns of Table 20.1 provide information on per capita income levels, in relation to the national average. The Southeast region is well above the national average, followed by the Midwest and the South. The Midwest has almost doubled its relative level of per capita income, powered by the

penetration of agriculture into the region, and the movement of the national capital in 1961 to the region. The new capital has exerted a large influence on that outcome since the Federal District exhibits the highest level of per capita income in the country, influenced by the high percentage of well-paid public workers. At any rate, the increase in its share in production (7.3 percentage points [p.p.]) was larger than (p. 429) the increase in its share in population (2.7 p.p.). As for the North, its increase in production

share (2.6 p.p.) was smaller than the increase in its population share (4.4 p.p.), thus leading to a decrease in distance from the national per capita income average. The poor Northeast region was never able to reach half the per capita income level of the country.

Education is another important way of presenting inequality. The share of illiterates in the population over 20 years of age in 2014 was less than 27% in the South and Southeast, 31% in the Midwest, 39% in the North, and 42% in the Northeast. The share of the population over 10 years of age with six or more years of schooling was 60% in the North, 55% in the Northeast, 66% in the Midwest, 67% in the South, and 70% in the Southeast. Public health services are very poor in Brazil, and people who can afford it rely on private health insurance. In the Southeast, 36% of the population was insured, 30% in the South, 25% in the Midwest, and only 13% in the Northeast (PNAD 2008, Special Issue on Health). Water services were present only in 80% of houses in the Northeast in 2014, in contrast with 91% in the Southeast. Sewage collection was available for 88% of houses in the Southeast, and only 41% in the Northeast (PNAD 2013; SNIS 2016). Indicators of regional inequality can be summarized in the Human Development Index of municipalities, which is a simple average of indicators⁵ of life expectancy, schooling, and per capita income. Results for the most recent census are displayed in Figure 20.3.

20.3. Competitiveness

The preceding section describes just how pronounced are regional disparities in Brazil, whether in terms of concentration or inequality. It is interesting to investigate the causes behind these differences and to provide information on trends. The most significant region in terms of policy interest is evidently the Northeast, since it hosts almost 28% of the population (and votes). That is why there is a specific chapter in this *Handbook* devoted to that region.

As mentioned earlier, given the size of the country, especially the spread in latitude, it is natural to find huge differences in terms of weather conditions and endowment of natural resources. From the hot and dry areas in the Northeast, subject to cyclical droughts, to the rainy and hot Amazon area, to the cooler Southern states, Brazil's weather is heterogeneous. In addition, soil quality varies, as mentioned earlier with respect to coffee. In general, the best soil for agriculture is located in the southern half of the country, where the rain regime is also more favorable for agriculture in general. Available measures of productivity confirm these endowment differences, since total factor productivity indicators are the highest in these regions (Imori 2012).

An important development in this context is the advancement of agriculture toward previously unfit land in the Midwest. As the chapters on agriculture in this volume describe, an impressive government-led research effort has made it possible to explore large savannah areas with new varieties of soybeans, corn, beans, and even cotton. The region is highly competitive in terms of physical productivity at the farm gate, but

(p. 430) high transportation costs attenuate this advantage as the products approach the main markets and the ports. Nonetheless, Brazil is one of the leading exporters of grains, with most of them coming from the savannah areas.

Before coffee, manufacturing activities—as precarious as they were at the time—were widespread all over the main urban centers in the country, and essentially supplied the surrounding markets. The introduction of coffee provided many stimuli for the development of manufacturing activity. The high demand for textile products related to shipping the product promoted a captive market for the rudimentary manufacturing bases of the urban centers next to the planting areas. The massive labor market associated with the crop, with migrants from Europe substituting for slaves, provided a local demand for wage goods, thus reinforcing the stimulus for manufacturing development. The construction of railways enlarged the market for plants located in the main urban centers in the coffee-growing areas, whose products had not only better quality but also lower costs than those produced elsewhere. Through this process, a concentration started in the coffee-related urban areas, producing the same pattern of concentration observed at present. The two world wars and the Great Depression increased the cost of imports—if not precluded them—which produced an increased demand for local producers. As competitiveness already existed with the established manufacturing centers, further concentration was an expected byproduct.

Thus, by the end of World War II, the main manufacturing centers were in São Paulo and Rio de Janeiro. After a short period of abundant international reserves, when imports of consumer goods were massive, local producers became more competitive and accessed the increasing local market. An intense import-substitution program followed, which even further boosted local production, now already concentrated in spatial terms. This pattern of concentration has continued to the present, given the economies of agglomeration typically required by manufacturing activities. Studies indicate that increased concentration leads to increased productivity through a reduction in transaction costs related to the proximity of connected sectors, the sorting of firms and workers, large pools of well-qualified workers, and so on. Barufi (2015) has shown that an increase in urban size, even after controlling for the characteristics of workers, increases productivity, as represented by wage levels. Gonzaga and Azzoni (2016) have estimated that even after controlling for the sorting of firms and individuals, the urban premium is still present: a 1% in urban size increases productivity by 3%–4%; that is, other than sorting, it has a place in explaining large centers' productivity edge. In reality, relative measures of productivity calculated by Azzoni and Ferreira (1998) have shown that productivity advantages of the traditional industrial centers outweigh their larger wage levels. Schettini and Azzoni (2013) have estimated relative productivity levels for the first decade of the twenty-first century, and their numbers indicate that the traditional centers are still ahead in terms of competitiveness.

Infrastructure is clearly an important factor in economic growth, especially so at the regional level, and notably in a country with wide heterogeneity in the supply of such a factor. Schettini and Azzoni (2015) estimate stochastic frontiers at the regional level to

assess the role of infrastructure on regional growth between 2000 and 2010. The availability of transportation infrastructure is markedly heterogeneous, with deep concentration in the states of São Paulo, Paraná, and Rio de Janeiro, the economic core of the country. Similar situations are found for the urban infrastructure (water and sewage, and electricity), and for communications (telephones and Internet). Their results indicate that increases in the regional coverage of transportation infrastructure leads to an increase in regional efficiency. A similar result was found for the urban infrastructure and for communications. (p. 431)

Based on their results, a simulation was made in which regional efficiency indexes were computed with and without infrastructure variables. The difference between these results indicates the role of infrastructure in regional growth. The results show that the agricultural and mineral frontiers, localized in the North and Midwest, are the regions most negatively affected by the lack of reasonable infrastructure. However, their results do not show impacts of great amounts, at least in the short run. As Grimes (2014) indicates, infrastructure investments give the private sector a future option, not an obligation. On the other hand, Crescenzi and Rodríguez-Pose (2012) emphasize that investments directed toward bottlenecks have larger positive impacts, indicating that investments should be prioritized according to their impacts.

A rich way to look at competitiveness relates to the quality of human capital in the regions. This variable can be approached both by labor supply (quality of labor available in terms of education, experience, discipline, cultural attitude toward work, etc.) and demand (what sort of occupations are being offered by the establishments located in the region). Using the adaptation of a comprehensive American study⁶ performed by Maciente (2013), who associated skill levels with each occupation in Brazil, it is possible to evaluate the relative position of the regions. Moreno and Azzoni (2016) used these skills to determine the innovative potential of Brazilian regions in manufacturing, and discovered a high degree of concentration.

As for the cognitive skills required by the occupations, it is clear that only the states of São Paulo, Rio de Janeiro, and the Federal District demand above-average skills; the same states use below-average physical-strength skills. This means that these areas, comprising the traditional economic center of the country, display a productive structure more intensive in sophisticated skills, which can thus give them a competitive edge against the other regions. In terms of growth in skill requirements in the twenty-first century, however, there seems to be a convergence; that is, states offering low-skill occupations, on average, presented faster growth in the incidence of such sorts of skills between 2002 and 2014. Thus, although the absolute levels indicate a divide between the more advanced regions and the backward ones, it seems that this situation has the potential to change in the future. However, the speed of change is modest, and it would take a very long time before the labor-demand quality would be even across regions.

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The tertiary sector is becoming more and more important in economic terms, accounting for about 70% of the national GDP and even more in terms of employment, particularly in the informal sector (Azzoni and Guilhoto 2011). This sort of activity is urban by its very nature and is widespread in the territory, and follows, in general, the geographical distribution of the population. However, there are important aspects of this (p. 432) area of activity that should be mentioned. Government-related activities and more basic sectors, such as services to families, tend to follow the population more closely than private activities. More sophisticated commerce (wholesale, for example) and services (consulting, financial, etc.) tend to be more concentrated. Azzoni and Andrade (2005) found that the rich areas were losing competitiveness in commerce and in traditional services in the 1980s and 1990s, but were becoming more competitive in the modern subsectors within the tertiary sector, such as in services to firms, computing, and so on. As for spatial concentration, the majority of subsectors presented decreasing concentration in the period, although six subsectors presented increasing concentration.

20.4. Per Capita Income Convergence

The productivity levels mentioned in the previous section indicate that the regions responsible for the great part of the national GDP still have a competitive edge, meaning that the concentration pattern observed tends to be maintained in the future. This conclusion is reinforced by the analysis of recent changes in productivity levels across regions also present in those studies, which have shown that lagging regions are also those with the least productivity growth. The combination of these two lines of results points to the continuation of the highly concentrated pattern of the geographical distribution of economic activities in the country. At least, it precludes any optimism in terms of radical changes in the observed situation.

Another strand of literature deals with the inequality in per capita income levels across regions, and how it evolves over time. Following Barro and Sala-i-Martin (1992, 1995), many studies have dealt with this subject in Brazil (Azzoni 1994, 1997, 2001; Azzoni and Servo 2002; Azzoni and Silveira-Neto 2005; Cravo and Resende 2013; Ferreira 1996, 2000; Laurini et al. 2005; Lima and Resende 2007; Magalhaes et al. 2005; Mossi et al. 2003). The results indicate that there are no signs of absolute convergence, which would mean that all regions would tend to the same absolute per capita income level at some point in time. Thus, the present situation, not only in terms of concentration but also in terms of regional income inequality, would tend to remain.

The existence of a persistent regional dualism, in which spatial spillovers are very important, is one of the most robust results of these studies. Geography has also been shown to play an important role in driving regional growth. Regional efficiency of manufacturing sectors, for instance, independent of technology intensity, is heavily affected by neighborhood effects (Schettini et al. 2011). Spatial spillovers are also important in determining regional innovative capacity and technology diffusion in Brazil (Gonçalves and Almeida 2009). Demography influences the economic environment either through income inequality across individuals, or through the possible influence of demographic characteristics on economic growth, with important effects on the process of convergence across Brazilian regions (Menezes et al. 2012). The existing uneven spatial distribution of demographic indicators that are deemed important to understand (p. 433) the current and future levels of welfare of a region (e.g., infant mortality) may, however, be improved by investments in health infrastructure, with more likely impacts in the long run (Barufi et al. 2012).

Once the hypothesis of absolute convergence has been excluded, the next question concerns what the equilibrium level of regional inequality, which is analyzed by looking at conditional convergence, would be. Contrary to absolute convergence, in this case each region could converge to a region-specific per capita income level, compatible with their endowments of capital and labor (and the evolution of that endowment). In this case,

there would be a particular level of regional economic inequality that would be an equilibrium situation, thus meaning that there would be no mechanisms leading to a change in that situation.

All studies that have dealt with convergence have found evidence of conditional convergence. This result is robust for different periods of time (the longest is 1939–2013), types of geographical areas (states, meso or micro regions, municipalities), ways of measuring income (per capita income—GDP/inhabitant or labor productivity—GDP/worker), econometric techniques applied (panel data, spatial econometrics), and so on. Some aspects are worth mentioning, such as the fact that convergence is faster for labor productivity than for per capita income. It seems that the labor market, which considers only employed people—a subset of the adult population—is working toward conditional convergence faster than the population at large. This means that differentials in the age composition of the population make it more difficult for poor regions to catch up with rich regions. Another negative aspect is that convergence of per capita income is faster for people over 60 years of age, mainly caused by pensions and retirement payments. Again, age composition differentials play an important role.

One interesting finding is the presence of convergence clubs, that is, clusters of regions with similar per capita income levels. A clearly identified rich-region club involves the states of the Southeast and the South, and another is the poor-region club, encompassing states in the Northeast (and some states in the North). The conclusion of this sort of analysis is that the equilibrium level of regional inequality is one that will register a clearly marked disparity between the North and the South. Since it is the steady-state solution for the models behind the studies, it is the situation the economic system tends to produce. Even considering this caveat, the time necessary to reach the steady-state solution is long, indicating that the adjustment process is taking place at a very slow pace.

20.5. Economic Integration of the Regions

Given the pronounced disparities among Brazilian regions, it is important to observe how integrated the regions are. Based on the national input-output tables developed (p. 434) by the national statistics office (IBGE), some multiregional I-O models have been estimated (Guilhoto and Sesso-Filho 2005, 2010).

Of the 27 states, only five present net exports to other states. The isolated state of Amazonas, home of the free-trade area Zona Franca de Manaus, exports 64% of its production to other states, essentially in the wealthy parts of the country. Espírito Santo state in the Southeast exports 14% of its production, but this is mostly transference to other states of imports from abroad. The state of São Paulo exports only 12% of its production to other states, but the absolute amount is four-fifths of the total internal trade surplus. Two other states in the Southeast (Paraná and Santa Catarina) also have

trade surplus, but at a much lesser value. In summary, except for the artificial economy of Zona Franca de Manaus in the North, the main exporter is the state of São Paulo, where economic activity is concentrated. This indicates how the Brazilian economy gravitates around its traditional economic center.

The largest import shares (imports/local production) take place in the Northeast as a macro region (24%), which also shows the largest absolute amount. The region is followed by the Federal District with 22%, and the North region with 17%. The states of Minas Gerais and Rio de Janeiro, in the Southeast, present lower shares but important absolute amounts. While interregional exports are more concentrated, interregional imports are more widespread across all states.

Considering trade with other countries, the interregional surplus states of São Paulo, Amazonas, Paraná, and Santa Catarina present negative balances. The state of Pará (mining and timber) in the North, the grain and beef producing states of the Midwest, Minas Gerais (mining products) and Rio de Janeiro in the Southeast, and Rio Grande do Sul in the South show positive trade balances with other countries. This positions São Paulo state, and the traditional economic center of the Brazilian economy, as a net exporter to other states. Thus, economic activity radiates out from that traditional area to reach other parts of the national economy, which, in turn, export primary products to other countries (grains, beef, cotton, mining products).

20.6. Explicit Regional Policies

Given the significant share of the Northeast region in terms of population, and therefore political power, regional policies have been designed with the aim of overcoming its backwardness. In the 1950s, development agencies for the backward regions of the Northeast and North were established, and a series of incentives for investment were put into place with the aim of attracting capital, including the creation of regional development banks. Ferreira (2004) describes the instruments utilized by the federal government and provides an assessment of these experiences. With the change in the national constitution in 1988, the previous instruments, which, as indicated by the numbers presented at the start of the chapter, had proven to be ineffective, were replaced (p. 435) by investment funds. A recent review of these initiatives can be found in Soares et al. (2009), Resende (2012, 2013), and Silva et al. (2007; 2009).

Resende (2013) provides a summary of the evaluation literature relating to regional policy. From the late 1980s until recently, the agreed agenda for Brazil included the competitive integration of the country into the global trade network, with additional domestic concerns focused on sustainable stabilization and social cohesion. This implied attracting foreign investment and a responsible (balanced) budget policy for all levels of government, reinforced by the promulgation of the *Lei de Responsabilidade Fiscal* (Fiscal Responsibility Law) in 2000. The latter restricted regional policies based primarily on

redistributional expenditures, as was the case in the 1970s (Haddad 1999). The research undertaken in the last two decades by regional scientists in Brazil refers to this context of policies in such areas as macroeconomic stabilization, economic opening with respect to both trade and investment, and the expansion of market forces within the domestic economy, common to many developing countries that have embraced the “Washington Consensus.”

Studies have shown that the interplay of market forces in the Brazilian economy tends to favor the more developed regions of the country. An increase in regional inequality (Guilhoto and Fonseca 1998; Haddad et al. 2002, 2005) is a very likely regional repercussion of trade liberalization policies, including the creation of MERCOSUR. The loss of importance of MERCOSUR, in turn, brings challenges for Brazilian regional economies as specific rules for the free-trade area (FTA) seem to overcome the usual effects of relative competitiveness associated with movements in relative prices (Vieira et al. 2014).

Regional governments in Brazil continue to adopt tax incentive programs to attract private investment to their jurisdictions. The case of the automobile industry deserves the special attention of regional scientists. New investments were attracted in the late 1990s and the first decade of the 2000s by policies implemented by the Brazilian government, which has played an active role in negotiations with foreign investors in the country. Up to today, state governments have engaged in strong competition for the incoming capital through fiscal incentives. It has been documented that the regional dualism in Brazil is also associated with a strong productive dependence of the less developed regions on the more developed regions (Guilhoto et al. 2002). This poses a very real danger that the benefits of new inward investments are not fully internalized by the states that seek to instigate them. In this regard, from a regional perspective, it is important that effective strategies are devised that minimize this risk (Amann et al. 2007; Perobelli et al. 2007). Moreover, investments in the poorer regions, which tend to be more beneficial to the improvement of regional imbalances in the country, do not generate the same level of national growth as investments in the more developed, denser areas that benefit from agglomeration economies (Haddad and Hewings 1999). Specialized structures of production are also important features of regional economies, even in more developed states, that help in understanding the local impact of regional tax incentives (Porsse et al. 2007).

(p. 436) Even though fiscal incentives continue to play a role in attracting capital to the regions, for private investors the search is dominated by attention to maximal financial returns with little concern for regional equity; location is defined on a purely economic basis. A stream of research has looked at the implication of investors' rationale for the location of investments in Brazil. While Silva and Hewings (2012) attempted to understand, from a theoretical perspective, the role played by the internal organization of the firms, other authors have addressed important empirical features of the Brazilian economy, common to many developing countries, such as financial constraints and volatility of the business cycle (Kalatzis et al. 2008, 2011). The results reveal that, in the

case of Brazil, there are significant differences across regions in the importance of investment determinants, thus bringing significant insights with respect to the design of regional policies in the country (Azzoni and Kalatzis 2008).

20.7. Sectoral Policies with Regional Effects

As the chapters on agriculture in this volume demonstrate, investments in technology to boost the primary sector have proven to be a trend-changing tool in reducing regional disparities in Brazil. At the same time, it can be argued that most sectoral policies could act in favor of the more developed regions (export promotion favoring states in the Southeast, incentives to ethanol as fuel benefiting São Paulo state, etc.). Thus, it is important to consider how tools developed to solve particular problems, be they sectoral or social, have influenced the pattern of regional inequality in the country.

One important area of regional science research in Brazil relates to the development of large-scale integrated modeling systems for impact analysis. By inserting a core Computable General Equilibrium Model (CGE) in a broader modeling framework, Brazilian scholars have been able to suppress some of the shortcomings of isolated models. Applications for transportation policies have dealt with market imperfections in the Brazilian spatial economy by introducing non-constant returns and non-iceberg transportation costs in an interregional CGE model integrated with a geographic information system (GIS) transportation network model (Haddad and Hewings 2005). In the case of Brazil, as well as in many developing countries where transportation costs are high and accessibility low compared to European or North American standards, handling market imperfections becomes imperative, as does the need to address internal spatial issues from the perspective of Brazil's increasing involvement with external markets.

Projects of spatially connective infrastructure have been assessed using this methodology, which provides insightful results concerning the various trade-offs that emerge. Haddad et al. (2011) make it clear that for policies of domestic integration in the country, given different policy options, decision-makers face nontrivial choices; different projects perform differently in different dimensions, usually presenting outcomes with different (p. 437) hierarchies related to multidimensional policy goals. This is also true for other types of infrastructure investment. For instance, the choice of ports for government investment would have, potentially, significant implications for the hinterlands serving those ports, as well as for other areas that may be able to access them once the investments have been completed, along with very strong regional development policy implications (Haddad et al. 2010).

Despite being still fettered to the reins of the perfectly competitive modeling paradigm, Almeida et al. (2010) add to the previous results by revealing that, methodological differences aside, the evidence concerning the nature of the relationship between the provision of transport infrastructure and regional equity is controversial due to a

fundamental characteristic associated with this issue. In other words, even with the same theory or model, method, and its specification, one may continue to obtain different results concerning this relationship. This outcome arises because this relationship crucially depends on where the transport infrastructure is located. In addition to methodological considerations, there seems to exist authentic spatial reasons that might yield controversial results. Indeed, transport infrastructure is strongly region-dependent. The spatial structure of the provision of transport infrastructure matters in this question, since it plays a fundamental role in determining the effects on the economic system, as shown in a model developed for the state of Minas Gerais, Brazil.

Large-scale integrated modeling systems have also been developed for regional impact analysis of energy policies in Brazil (Santos et al. 2013). Simulations of the long-run regional impacts of electric power tariff policy in Brazil have shown that the heterogeneity of energy intensity and the differentials of energy substitution drive the spatial impacts of changes in electric power prices. On the other hand, the recent trend of spatial dispersion of electric power prices might contribute to a decrease in long-run economic growth and to an increase in regional inequalities in Brazil.

Since the 1990s, the energy sector has been the subject of a variety of reform initiatives that are changing the market structure and energy price levels. These reforms have also been triggered by the implementation of neoliberal policies in the Brazilian economy. Energy policy in the country has stimulated energy diversification to increase the inter-fuel substitution. Some studies have attempted to understand the new patterns of sectoral and regional consumption of energy that have emerged in the country (Carvalho et al. 2013; Perobelli and Oliveira 2013). Emphasis on renewable energy has implications for food security in the country, since biofuel production in Brazil relies heavily on processing sugarcane. There is an ongoing debate regarding the risks associated with diverting farmland or crops for biofuel production to the detriment of the food supply. The expansion of sugarcane cultivation in Brazil, spurred particularly by increased demand for ethanol, has triggered the need to evaluate the economic, social, and environmental impacts of this process, both on the country as a whole and on the growing regions. Despite some evidence that the presence of sugarcane cultivation in these areas is not relevant to determining their social conditions (Chagas et al. 2012), positive demand shocks upon the sugarcane agro-industry have a greater impact with respect to (p. 438) income upon the less developed regions of the country (North) compared to the Center-South (Costa et al. 2006; Martínez et al. 2013).

In the context of the fiscal adjustment process of the 1990s, the role of the central government in directly stimulating productive activities has been replaced by strategies of socioeconomic inclusion. Seemingly non-spatial government policies in the form of spatially blind social programs have played an important role in the recent decline in regional income inequality in Brazil (Silveira-Neto and Azzoni 2011, 2012). However, regional inequality continues to be very high and this issue will continue to be on the research agenda for many years to come. Important components of income and particularly wealth inequality are still unknown in the case of Brazil. The distribution of

property rights and rents on natural resources need to be better understood (Goeschl and Iglioni 2006). Furthermore, a more complete picture of income and wealth distribution is still needed. As has been shown by Piketty (2014), there can now be no doubt that the phenomenon of inequality is not predominantly about the inadequacy of the skills of lagging workers. Understanding the process of wealth accumulation across regions may change drastically our prescriptions of regional policies.

Brazil, as is the case with many developing countries, has experienced a rapid process of urban expansion around the CBD⁷ of its main cities that was not followed by the implementation of an adequate infrastructure, thus causing important urban problems (Haddad and Nedović-Budić 2006; Menezes et al. 2013; Silveira-Neto et al. 2015). Recent experimentation with integrated modeling of metropolitan systems has proven relevant for assessing the consequences of apparently local phenomena related to the city of São Paulo: floods (Haddad and Teixeira 2015) and local transportation infrastructure (Haddad et al. 2015). The key message is that one needs to consider interactions both inside and outside a prime metropolitan system to recognize the role they play in an integrated interregional system. The lack of redundancy in the economic infrastructure of developing countries (i.e., the inability to have alternatives to solve problems of logistics, communication, or energy in the advent of unexpected events) poses interesting research questions for regional scientists in Brazil.

As an example of a global phenomenon, ongoing global climate change will have potential consequences for the competitiveness of regions in the future. Resource-oriented activities, such as agriculture, mining, timber, and so on, and the related processing industries, deal with different restrictions as compared to footloose activities. The immediate impact of climate change will very likely be more intense on activities more dependent on nature. However, the repercussions of these effects will be felt in other sectors as well, thus affecting the composition of regional income and household consumption, with an influence on the tertiary sector of the main cities in the region, and finally reaching the industrial sectors supplying regional demand. Thus, it is expected that the initial stimuli from natural resource-based industries will eventually result in major changes in the economy of the region as a whole (Azzoni and Haddad 2012). The most vulnerable regions to climate change are traditionally the less-developed areas of the country: the Amazon and the Northeast (Barbieri et al. 2010). This is a challenging interdisciplinary research area, bringing various challenges to regional scientists in the (p. 439) country. It could provide opportunities in the form of increased integration between institutions, more accurate data through information sharing and interdisciplinary approaches, and a greater understanding of the potential impacts of climate change on Brazil to ensure the most effective responses by the relevant political, economic, and social sectors.

As detailed by Hoffmann (Chapter 22 in this volume), income inequality has been diminishing lately, though it remains at elevated levels. Together with the stabilization of the economy and the appreciation of the minimum wage, part of the explanation for this is the implementation of social policies, including cash transfers to poor families. As

Silveira-Neto and Azzoni (2011) demonstrate, although the largest part of the reduction in regional inequality is associated with the functioning of the market, the social programs implemented account for more than 24% of the reduction in regional inequality. This is impressive, since the amounts transferred account for less than 1.7% of disposable income. Thus, the social programs have unintended regional impacts of a larger magnitude, as compared to the explicit regional programs.

20.8. Concluding Remarks

As a country with a large territory, Brazil presents pronounced regional disparities. Economic activity and the population are concentrated in a small part of the territory. Even within this reduced area, the geographical distribution is highly uneven. Besides concentration, regional inequalities are marked in the country in terms of per capita income, education, access to public services, and so on. This scenario of concentration and inequality is quite persistent, as the data available indicate. This chapter has explored some aspects of this phenomenon. Besides providing a description of the observed disparities and their evolution, we have presented some insights into regional competitiveness and how it has evolved over time, convergence of per capita income, and regional integration. We conclude with a discussion of regional policy, both intended and unintended.

The need for regional policies is controversial. First, it is necessary to determine if the observed disparities are the equilibrium situation of the economic system or not. In the latter case, implementing policy measures could correct market failures that lead to excessive concentration of inequality and, therefore, constitute an improvement in overall economic efficiency. However, if the observed level of disparities were the natural result of the operation of the economy—an equilibrium situation—then any form of intervention would result in some loss of efficiency. Which is the right answer is still debatable (Garcilazo et al. 2010; Gil 2010; Pessôa 2001; Neumark et al. 2014). This leads to the discussion of whether policies should be place-based or people-based; that is, if mechanisms such as those implemented in Brazil are the right tools to use.

Although the debate is still inconclusive, the evidence is eloquent in pointing to the failure of the traditional place-based regional policies implemented in the country.

(p. 440) The present levels of inequality are a testimony to that. However, this is not tantamount to concluding that policies should be people-based, such as the social policies implemented recently have been. It is true that people-based policies have been the most effective way of reducing regional inequality (although not as good at reducing regional concentration). However, it can also be that the place-based policies of the past suffered from implementation problems; that is, the policies were not well designed and/or there were inefficiencies in their implementation, hence their failure.

In either case, the fact is that regional disparities are important and persistent in the country. Whether for political or economic reasons, society has for better or worse devoted attention to this issue. However, success in reducing these disparities has yet to be achieved. The most effective ways of changing the observed regional concentration have been sectoral policies, such as the effort to make Brazilian agriculture more competitive, or social policies. The former opened opportunities for scarcely populated regions (the Midwest and lower North regions), far away from the populated poor Northeast. However, cash transfer programs have reduced inequality in a perceivable way. Economists must yet try harder to come up with the right answers on how to solve the “regional problem” in Brazil.

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Notes:

(1.) <http://www.ibge.gov.br/home/geociencias/cartogramas/ctb.html>.

(2.) IBGE, Arranjos Populacionais (2016).

(3.) Whose name, *Pau Brasil* (Brazilwood), in turn gives the country its name.

(4.) See Rands Barros, Chapter 21 in this volume, for specific discussion of the Northeast region.

(5.) The index varies between zero and 1; the higher the index, the better.

(6.) ONet, <https://www.onetonline.org/find/descriptor/browse/Abilities/>.

(7.) Central Business District.

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Regional Disparities

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