Regional inequalities in Germany: evolution and factors associated with the convergence process

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Abstract

Since its reunification in the early 1990s, Germany has been adopting several public policies aimed at establishing equivalent living conditions throughout the country. In this paper, we describe the evolution of the regional inequalities in Germany and we discuss, based on official documents and academic papers, the factors associated with the convergence process observed throughout the last thirty years. The documents indicate that, over this period: *i)* there was a convergence process between the former West and East Germany; *ii)* regional inequalities continue to persist in the country; *iii)* the convergence process, yet continuous over the entire period, was more intense in the first years after reunification. Initially, the elimination of barriers to capital and people mobility motivated an accelerated reduction of the inequalities. Subsequently, national policies with unbalanced regional impacts and explicit regional policies contributed to the reduction of the inequalities. We argue that some elements observed in Germany may be used as a reference for Brazil, where regional inequalities have been high and resilient for several decades.

Keywords: Germany. Reunification. Regional inequalities. Convergence.

Desigualdades regionais na Alemanha: evolução e fatores associados ao processo de convergência

Resumo

Desde a reunificação do país no início da década de 1990, a Alemanha vem adotando uma série de políticas públicas para equalizar os padrões de vida em seu território. Neste trabalho, descreve-se a evolução das desigualdades regionais na Alemanha e discutem-se, com base em documentos oficiais e em artigos acadêmicos, os fatores associados ao processo de convergência observado ao longo dos últimos trinta anos. Os documentos analisados indicam que, nesse período: *i)* houve um processo de convergência entre as regiões correspondentes às antigas Alemanha Ocidental e Alemanha Oriental; *ii)* ainda persistem desigualdades regionais na Alemanha; e *iii)* o processo de convergência, embora contínuo ao longo de todo o intervalo, foi mais acelerado nos primeiros anos após a reunificação. Em um primeiro momento, a eliminação de barreiras aos fluxos de capital e de pessoas e os subsídios aos investimentos na antiga Alemanha Oriental motivaram uma acentuada redução das desigualdades. A partir de então, políticas de abrangência nacional com impactos regionais assimétricos e políticas regionais explícitas contribuíram para a redução das desigualdades regionais. Argumenta-se que alguns elementos observados na Alemanha podem servir de referência para o Brasil, onde os níveis de desigualdades regionais são elevados e resilientes há muitas décadas.

Palavras–chave: Alemanha. Reunificação. Desigualdades regionais. Convergência.

Desigualdades regionales en Alemania: evolución y factores asociados al proceso de convergencia

Resumen

Desde la reunificación del país a principios de la década de 1990, Alemania ha adoptado una serie de políticas públicas para igualar los niveles de vida en su territorio. En este trabajo se describe la evolución de las desigualdades regionales en Alemania y, basándose en documentos oficiales y artículos académicos, se discuten los factores asociados al proceso de convergencia observado en los últimos treinta años. Los documentos analizados indican que, durante este período: *i)* hubo un proceso de convergencia entre las regiones correspondientes a las antiguas Alemania Occidental y la Alemania Oriental; *ii)* las desigualdades regionales aún persisten en Alemania; y *iii)* el proceso de convergencia, aunque continuó a lo largo de todo el período, fue más acelerado en los primeros años posteriores a la reunificación. En un primer momento, la eliminación de las barreras al flujo de capitales y personas y los subsidios a las inversiones en la antigua Alemania Oriental llevaron a una fuerte reducción de las desigualdades. Desde entonces, las políticas nacionales con impactos regionales asimétricos y las políticas regionales explícitas han contribuido a la reducción de las desigualdades regionales. Se argumenta que algunos elementos observados en Alemania pueden servir como referencia para Brasil, donde los niveles de desigualdades regionales han sido altos y resilientes durante muchas décadas.

Palabras clave: Alemania. Reunificación. Desigualdades regionales. Convergencia.

1 Introduction

After World War II, Germany was divided into an eastern portion, aligned with the Soviet bloc and the Warsaw Pact, and a western portion, aligned with the capitalist countries of Europe and the North Atlantic Treaty Organization (NATO). This division lasted until 1990 when the states that comprised the former German Democratic Republic (GDR), corresponding to East Germany, joined the Federal Republic of Germany (FRG), corresponding to West Germany. Thus, a little over thirty years ago, the country was reunified as a result of what official German government documents call the "peaceful revolution" (BMWi, 2021, p. 29).[1]

At that time, the economic, social, and environmental indicators of the two regions were significantly different. Authors such as Landua and Zapf (1991) described the newly unified Germany as "two societies, one nation". Landua, Spellerberg, and Habich (1991) pointed to "the long road to unity" due to the different quality of life indicators in the "old" federal states" (corresponding to the former West Germany) and the "new" federal states" (corresponding to the former East Germany).[2] According to data consolidated by the Federal Ministry for Economic Affairs and Energy ("*Bundesministerium für Wirtschaft und Energie*" or "*BMWi*"), the per capita gross domestic product (GDP) of the new states added to the federation

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[1] Sinn (2002, p. 113) refers to the reunification of Germany as a "political miracle".

[2] In 1991, these authors emphasized that "the former GDR still differs considerably from the former Federal Republic in terms of aspects of well-being. This affects not only the objective living conditions but also the subjective evaluations, demands, orientations, concerns, and fears. Regarding the political objective of creating equal living conditions in the East and the West, the information about the claims of the GDR citizens and the evaluation of their living conditions is, therefore, of great importance" (Landua; Spellerberg; Habich, 1991).

and Berlin was less than 50% of the country's average in 1991.[3] If Berlin is excluded from this set, the indicator drops to less than 40% (BMWi, 2021, p. 19). Several other indicators reaffirm the general picture of deep regional inequalities in unified Germany in the early 1990s.

The equalization of living conditions across the country became strategic for the local government, not only for economic reasons but also to prevent political tensions. Even the German constitution contains a commitment to reducing regional inequalities.[4] Thirty years after reunification, "the policy of the German Federal Government is to continue to achieve equal living conditions throughout Germany, to reduce existing disparities and to prevent them from becoming permanent". For this purpose, according to the document, "the German government uses many approaches, including regional and economic policy [...]" (BMWi, 2019, p. 11).

The aim of this paper is to describe the evolution of regional inequalities in Germany and discuss the factors associated with the convergence process observed over the last thirty years. Thus, it seeks to analyze how regional inequalities have adapted to the institutional changes observed in Germany since reunification in the early 1990s. This analysis can serve as a reference for the formulation and improvement of development policies in Brazil, where inequality levels have been high and resilient for many decades (see, for example, Silveira-Neto and Azzoni, 2012). Methodologically, the work relies on the analysis of official documents and academic articles published on the subject. The official documents are mainly the local government reports on the status of German unity. The articles were initially selected based on search tools and subsequently based on the references indicated in the first identified works.

The work is segmented into three more sections besides this introduction. In section 2, the foundations that support the analysis are gathered (basically corresponding to a brief review of regional inequality indicators and the factors associated with their evolution). Section 3, segmented into two parts, essentially reflects the two established objectives: subsection 3.1 describes the evolution of regional inequalities in Germany since 1991, and subsection 3.2 discusses the factors that contributed to the observed trajectory. Finally, section 4 presents the concluding remarks of the work and discusses possible connections between the regional inequalities observed in Germany and in Brazil.

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[3] In line with the definitions used in official documents, this article considers that East Germany consists of the new federal states – Brandenburg (BB), Mecklenburg-Vorpommern (MV), Saxony (SN), Saxony-Anhalt (ST), and Thuringia (TH) – and Berlin (BE), while West Germany consists of the old federal states excluding Berlin: Baden-Württemberg (BW), Bavaria (BY), Bremen (HB), Hamburg (HH), Hesse (HE), Lower Saxony (NI), North Rhine-Westphalia (NW), Rhineland-Palatinate (RP), Saarland (SL), and Schleswig-Holstein (SH). Throughout this article, the names of the states and geographical names, in general, have been preserved in their original spelling.

[4] A provision of Article 106 of the German Constitution establishes that "the coverage needs of the Federation and the States must be harmonized in such a way that an equitable balance is achieved, an excessive burden on taxpayers is avoided, and the uniformity of living conditions in the federal territory is maintained" ("*die Deckungsbedürfnisse des Bundes und der Länder sind so aufeinander abzustimmen, dass ein billiger Ausgleich erzielt, eine Überbelastung der Steuerpflichtigen vermieden und die Einheitlichkeit der Lebensverhältnisse im Bundesgebiet gewahrt wird*"; available at https://cutt.ly/n9m8QZE. Accessed on January 26, 2023).

2 Foundations: regional inequality indicators and associated factors

As evidenced in the introduction of this paper, the analysis of regional inequalities in Germany is based on two main points: *i)* a brief review of regional inequality indicators; and *ii)* the analysis of the factors associated with their evolution (and, therefore, the causal relationships that can be established between economic and social variables, public policies, and these indicators). The following subsections address these two subjects.

2.1 Regional inequality indicators

The simplest and most intuitive quantitative indicator of regional inequality corresponds to some type of relationship between a measure of development of two jurisdictions or two reference sets of jurisdictions.[5] For example, an intuitive way to report regional inequalities in Germany is to divide the GDP per capita of the part corresponding to the former East Germany by the GDP per capita of the country as a whole (or, alternatively, by the GDP per capita of the part corresponding to the former West Germany). In some cases, inequalities are reported based on the ratio involving the least and most developed regions (for example, the ratio between the GDP per capita of the poorest municipality and the GDP per capita of the richest municipality in the country). In Brazil, it is common to reaffirm the persistence of regional inequalities based on the stability of the ratio between the GDP per capita of the Northeastern region and the average GDP per capita of the country (which has oscillated around 50% for several decades).

In spite of its limitations, this indicator is widely used in official documents (mainly because it is particularly intuitive) and in academic articles that aim to broadly qualify regional inequalities in a given country. However, it is evident that an indicator of this type cannot capture movements within the analyzed regions or even variations involving other jurisdictions not directly used in the calculation of the ratio. For example, the ratio between the indicators of the richest and poorest municipalities may remain stable while other municipalities converge to closer values among themselves. This convergence process would not be captured by an indicator that does not employ data from intermediate municipalities in its calculation. To address problems of this nature, one can use the weighted coefficient of variation proposed by Williamson (1965, p. 11) or the Theil index.

Based on the statistical definition of the coefficient of variation, the weighted coefficient of variation "measures the dispersion of regional income per capita levels relative to the national average while each regional deviation is weighted by its share in the national population" (Williamson, 1965, p. 11). Williamson (1965) used this definition to compare regional inequalities in different countries using states (or provinces) as units of analysis. However, other types of jurisdictions (for example, municipalities, districts, or similar jurisdictions) can also be used. At any rate, international comparisons of regional inequalities are tricky, as they depend on the

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[5] In addition to quantitative indicators, there are also "visual" indications of regional inequalities that use, for example, georeferencing to record, in different shades, some development indicator of the jurisdictions that make up a country.

idiosyncratic (and, to a large extent, arbitrary) way in which different countries are segmented into different types of jurisdictions.

The Theil index is widely used due to its additive decomposition. For example, the national interstate inequality index (JE) can be obtained from the sum of the national interregional inequality index (JR) with the weighted average by the fractions of the national population represented by each region g of their respective regional interstate inequality indices ($\bar{J}$). Thus, the inequalities among the 27 federative units in Brazil result from the sum of the inequalities among the five macro-regions (N, NE, CO, SE, and S) and the inequalities within these regions. This kind of approach can be useful to verify whether convergence movements result from the approximation between rich and poor jurisdictions or from the approximation between rich and rich and poor and poor jurisdictions, for example.

2.2 Factors associated with the evolution of regional inequalities

There is a broad and vast literature on inequalities between subnational jurisdictions, and this paper does not aim to review it. Specifically, in the case of Germany, a synthesis pointing out the multiple factors associated with the theme was proposed by Tobias Seidel in a 2018 presentation on the causes of regional inequality and the implications for regional policies in that country:

> [...] regional inequality is caused by differences in productivity, attractiveness, so-called amenities — location-bound attributes of quality of life such as climate or landscape — and frictions (for example, migration costs). On the one hand, the historically given geographic location determines where agglomerations with locational advantages emerge. On the other hand, attractive regions promise a higher level of utility and therefore attract more people.[6]

This synthesis points to a set of factors that explain interregional flows of capital and people that ultimately affect the evolution of regional inequalities and the convergence movements (including, of course, the movements observed in Germany over the past thirty years).

Strictly theoretical perspectives from the growth literature suggest that there would be a natural tendency toward convergence between subnational jurisdictions, as the perfect mobility of capital and people, along with the assumptions of perfect competition, would generate a kind of equalization of well-being indicators. According to Oliveira and Silveira Neto (2016, p. 76), economies with a lower per capita capital stock tend to grow at a higher rate than economies that are already closer to the long-term equilibrium level. This would occur because capital and labor would tend to migrate to regions where they are scarcer, given the differences in relative prices. In the absence of these assumptions, the convergence process may simply not occur due to, for example, the so-called agglomeration economies or

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[6] SEIDL, T. "*Ursachen regionaler Ungleichheit und Implikationen für die Regionalpolitik*", conforme a matéria "*Regionale Ungleichheit hat viele Facetten*". Available at https://cutt.ly/V1TzR21. Accessed on November 30 2022.

social capital, which would motivate the concentration of activities in more developed regions (Perroux, 1955; Myrdal, 1957; Hirschman, 1958).[7]

Authors such as Barro and Sala-i-Martin (1991) analyze the economic growth of the states of the United States and conclude that "the overall evidence weighs heavily in favor of convergence: both for sectors and for state aggregates, per capita income and product in poor states tend to grow faster than in rich states". These authors come to similar conclusions for 73 regions of Western Europe (located in the former West Germany, the United Kingdom, Italy, France, the Netherlands, Belgium, and Denmark) and use these results to predict the convergence process of the former East Germany. In this case, the authors point out that "the results are not very encouraging" because "the convergence process will occur, but only at a slow pace". Based on the assumptions adopted by Akerlof et al. (1991), Barro and Sala-i-Martin (1991, p. 154) conclude that "it would take 35 years for half of the initial East-West gap to be eliminated".

However, regional inequalities do not result only from spontaneous movements of capital and people, as public policies also influence them. Among these policies, we can highlight: *i)* national policies with asymmetric regional impacts; and *ii)* explicit regional policies.

The first case refers to public policies with no explicitly territorial focus, but that, due to specific characteristics of the jurisdictions, affect them differently. For example, social policies focused on the poorest population benefit more the regions that concentrate this social stratum. In Brazil, this is the case, for example, of income transfer programs, whose resources are mainly destined to the less developed regions, but only because these regions concentrate their beneficiaries (and not because they are located in a predetermined portion of the national territory).

Explicit regional policies, on the other hand, involve the adoption of a territorial criterion for the allocation of resources. These include, for example, tax or financial incentives aimed at specific parts of the country's territory. In Brazil, such policies involve incentives granted by regional development superintendencies or constitutional financing funds, for example.[8]

In summary, the evolution of regional inequalities can be attributed to: *i)* spontaneous flows of capital and labor resulting from differences in relative prices; *ii)* national policies with asymmetric regional impacts; and *iii)* explicit regional policies. It is clear that the last two factors also affect interregional flows of capital and people. In these cases, however, the movements result from direct government intervention, whereas in the case of the first factor, spontaneous movements are assumed. Thus, possible reductions in regional inequalities cannot be attributed only

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[7] Hall and Ludwig (2009), for example, attribute the persistence of regional inequalities in Germany until the mid-2000s to Myrdal's (1957) cumulative circular causation.

[8] According to Cavalcante (2019), "a general definition of regional development policies is essentially tautological. Indeed, these policies are basically those whose objective is to promote the development of less developed regions. This general definition, however, conceals a series of difficulties in clearly delineating regional development policies, especially when attempting to distinguish them from industrial policies and social policies". This leads him to propose that regional policies would be those that have an explicit focus on a predetermined portion of the territory, as opposed to those that do not have, among the requirements for access to their resources, a focus on a predetermined portion of the territory.

to explicit regional policies, and spontaneous movements and movements resulting from non-explicitly regional policies must also be taken into consideration.

Such perceptions are implicit in analyses such as that of Silveira-Neto and Azzoni (2012), who decomposed regional inequalities in Brazil into nine components aggregated into two main categories: labor-related and non-labor-related. The authors conclude that, between 1995 and 2006, social programs (Bolsa Família and Continuous Cash Benefit) were responsible for 24% of the reduction in inequality, although they accounted for less than 17% of household disposable income. The authors highlight that these results are impressive "since the goals of the programs are clearly nonspatial" (Silveira-Neto; Azzoni, 2012). Similarly, Oliveira and Silveira Neto (2016) and Mendes (2022), for example, discuss the role of non-explicitly regional policies in reducing regional inequalities in Brazil.

3 Evolution of inequalities and factors associated with the convergence process

This section essentially reflects the two main objectives established in the introduction of this paper. Subsection 3.1 describes the evolution of regional inequalities in Germany since 1991, and subsection 3.2 discusses the factors that contributed to the observed trajectory.

3.1 Evolution of regional inequalities in Germany

Table 1 indicates the GDP per capita of Berlin, of the old federal states, of the new federal states (including Berlin), of the new federal states (excluding Berlin), and of Germany as a whole.

Table 1 – Gross Domestic Product at Current Prices per Capita, Germany, 1991-2020

| Year	Berlin	Old federal states	New federal states (including Berlin)	New federal states (excluding Berlin)	Germany	New federal states (including Berlin) / Germany	New federal states / Germany
1991	19,815	22,767	9,758	7,395	19,829	49.21%	37.29%
1995	24,970	25,126	16,690	14,681	23,302	71.62%	63.00%
2000	25,929	27,840	18,556	16,792	25,892	71.67%	64.85%
2005	26,741	30,057	20,565	19,041	28,134	73.10%	67.68%
2010	31,474	33,842	24,277	22,418	31,942	76.00%	70.18%
2011	32,739	35,573	25,384	23,456	33,554	75.65%	69.91%
2012	32,762	36,163	25,903	24,072	34,135	75.88%	70.52%
2013	33,215	36,885	26,623	24,833	34,861	76.37%	71.23%
2014	34,395	38,193	27,812	25,997	36,149	76.94%	71.92%
2015	35,741	39,113	28,592	26,601	37,046	77.18%	71.81%
2016	37,551	40,140	29,558	27,306	38,067	77.65%	71.73%
2017	39,099	41,532	30,829	28,465	39,438	78.17%	72.18%
2018	41,157	42,586	31,824	29,127	40,485	78.61%	71.95%
2019	42,886	43,567	33,008	30,127	41,508	79.52%	72.58%
2020	42,221	41,940	32,422	29,553	40,088	80.88%	73.72%

Source: BMWi (2021, p. 94).

As evidenced in the two last columns of Table 1, the ratio of the GDP per capita of the new federal states (including Berlin) relative to the national average increased from a little below 50% in 1991 to over 80% in 2020. The 30-percentage-point growth concentrated in the first decade (by 2000, this indicator had already reached nearly 72%). When Berlin is excluded, the ratio rises from about 37% in 1991 to nearly 65% in 2000 and about 74% in 2020. These data make it clear that *i)* there has been a convergence process between the regions corresponding to the former GDR and FRG over the past thirty years; and *ii)* regional inequalities continue to persist in Germany (although at much lower levels than those observed thirty years ago), constituting what Schnabl and Sepp (2020, p. 397) called "unvollständige Konvergenz" or "incomplete convergence".

A graphical representation of these data (Figure 1) clearly shows that the convergence process, although continuous throughout the interval, was much more accelerated in the first years after reunification.

Figure 1 – GDP per capita of the new federal states (including Berlin) ("neue Länder und Berlin") and the new federal states ("neue Länder") relative to the national average, 1991-2020
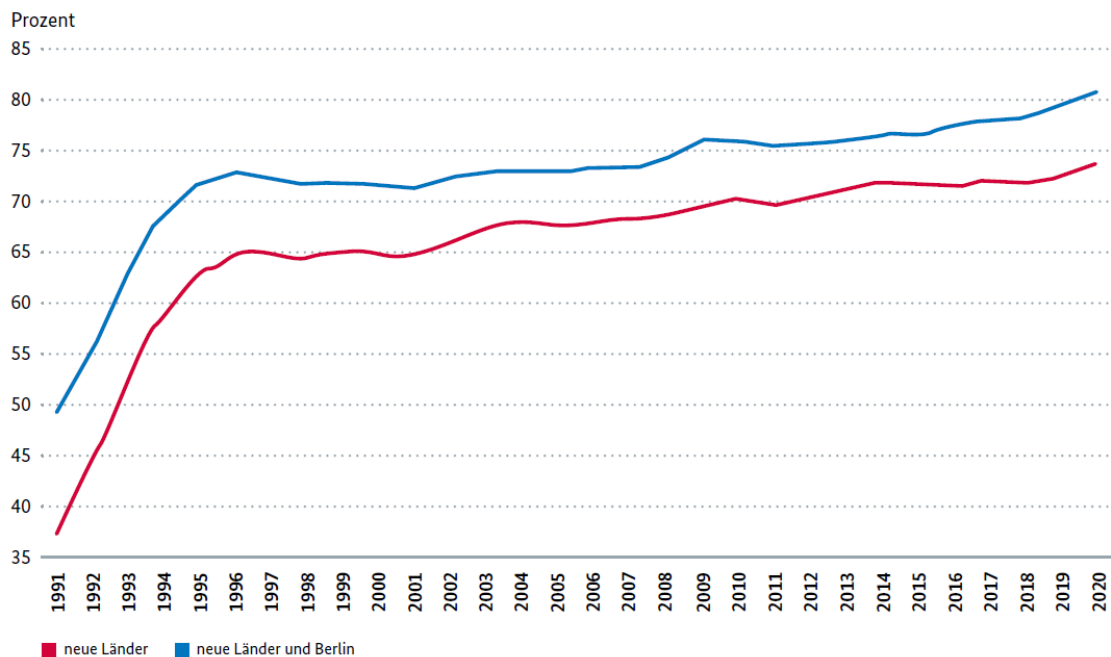

Source: BMWi (2021, p. 19).

These movements explain why, in the early 2000s, it was already recognized that living standards in the region corresponding to the former GDR had approached the levels of the western part of the country. According to Sinn (2002, p. 114),

> The micro data analyzed by the Ifo Institute show that east German households' average net-of-tax incomes have surpassed 80% of the western level. Given the somewhat lower price level in the east, which primarily results from the low housing costs, this implies an average real household income of at least 90% of the west.

Overall, other indicators (such as wages, employment rates, income per capita in private households or life expectancy, for example) reaffirm these general conclusions (BMWi, 2021; 2019; Siegloch et al., 2021). Besides, data on wages, income, and pensions also reinforce the perception that the convergence process was more accelerated in the early years after reunification (BMWi, 2019, pp. 48-55).

Analyses based on smaller jurisdictions (i.e., using lower levels of aggregation) also reaffirm the perception that there has been a convergence process but that regional inequalities continue to persist in the country. For example, georeferenced maps with data on poverty rankings by districts in Germany at three different points in time virtually redraw the division between the former GDR and FRG, although the contrasts decrease over time (Figure 2).

Figure 2 – Regional distribution of poverty rankings, districts, Germany, 1995, 2003, and 2015
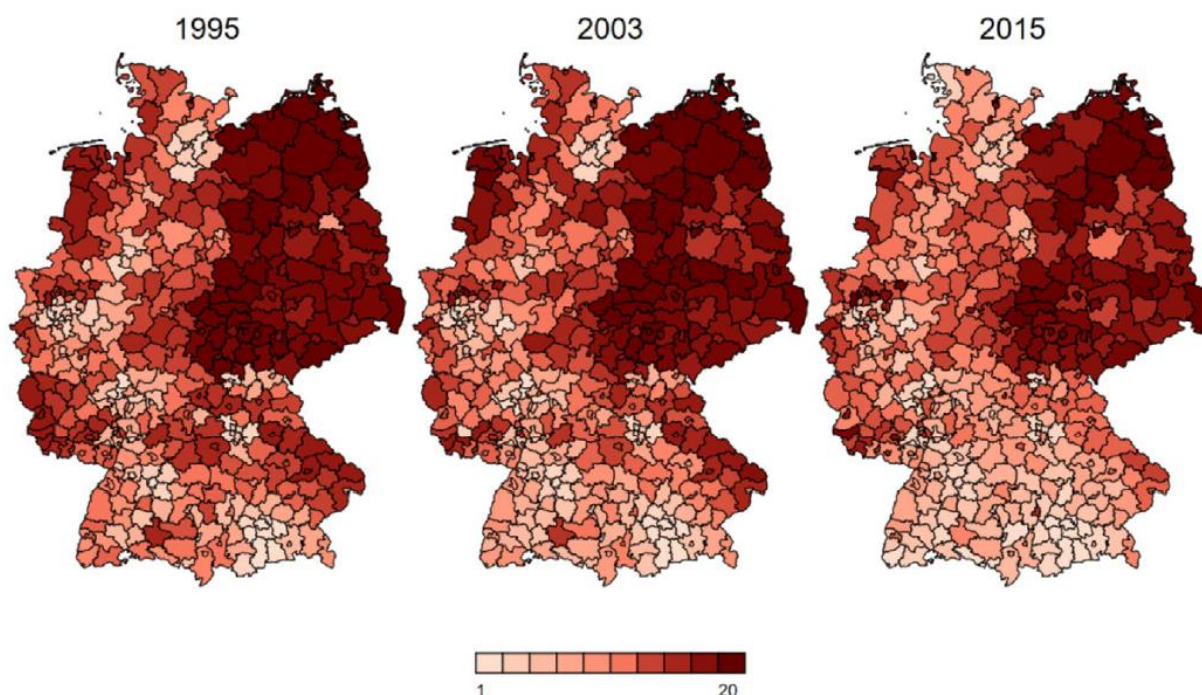
Darker colors represent lower socioeconomic status.
Source: Redler et al. (2021, p. 152).

As a result, although differences still persist between the new and the old federal states, the development indicators of the eastern portion of the country's territory are compatible with those of various Western European countries.[9] In this context, official documents indicate that the perception of the population in the east about reunification is mostly positive (more than ⅔ affirm that their lives have improved since then) (BMWi, 2019). Nevertheless, there remains a noticeable level of dissatisfaction regarding political matters. Data from a recent survey conducted by the Federal Government show that:

- 57% of eastern Germans feel like second-class citizens.
- Only about 38% of those surveyed in the east perceive reunification to be a success.
- Among those under 40 years old, this number drops to only 20%.
- Almost half the people in the east tend to be more dissatisfied with the way democracy is functioning (BMWi, 2019, p. 13).

3.2 Factors associated with the convergence process

As indicated in section 2.2, the evolution of regional inequalities (and the possibly resulting convergence process) results from interregional flows of capital and people. These flows, in turn, result from the combination of a wide range of factors, segmented into three blocks: *i)* spontaneous flows of capital and labor

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[9] "Compared with the European level, current industrial production is impressive, and exceeds the level of many large western European countries" (BMWi, 2019, p. 21).

resulting from differences in relative prices; *ii)* national policies with asymmetric regional impacts; and *iii)* explicit regional policies. Clearly, there may be disagreement regarding the relative weight of the multiple factors affecting the convergence process, and this paper does not intend to propose new approaches on this topic. It seeks, in general terms, to summarize the view registered in the official documents and the academic articles cited in this section, even though it is recognized that dissenting interpretations may exist.

Germany's economic reunification involved establishing parity between the West German mark and the East German mark ("GDR mark") for wages and prices up to certain limits. The parity, in this case, was a sort of subsidy to the former GDR, as exchange rates reached up to 11 : 1 in the black market.[10] Additionally, in the 1990s, the documents point to an intense flow of capital from the west to the east and an intense movement of people in the opposite direction. As described by Barrel and Velde (2000, p. 271),

> The sudden formation of the German Monetary Union was followed by large transfers to East Germany, migration of workers to West Germany, reorganization and privatization of East German firms. This has quickly led to a partial closing of the organizational, idea, and object gaps that existed between East and West Germany (Barrel; Velde, 2000, p. 271).

The combination of these movements is obviously behind the accelerated convergence process then observed. In particular, the flow of capital from FRG to GDR can be observed by analyzing investment rates in the two regions. Sinn (2002, p. 115) notes that while the investment rate (or, in the terms used in the work, "the share of investment in GDP") in the former West Germany was about 20% in the 1990s, in the former East Germany it was 40%, with peaks close to 50% between 1992 and 1995. Reflecting these movements, according to data recorded by Sinn (2002), the peak investment per employed person in the former East Germany relative to the former West Germany occurred in the mid-1990s (Figure 3). These movements possibly reflect the intense privatization process that occurred in the former GDR after reunification. This process was conducted by a public company (Treuhandanstalt) specifically created for this purpose.

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[10] "An average of 4,000 marks was exchanged per person at an exchange rate of 1 to 1. Until then, they had been exchanging up to 11 East German marks for one deutschmark on the black market". Available at https://cutt.ly/q7TGXXV. Accessed on April 11, 2023.

Figure 3 – Investment per employed person, East Germany relative to West Germany, 1991-1999
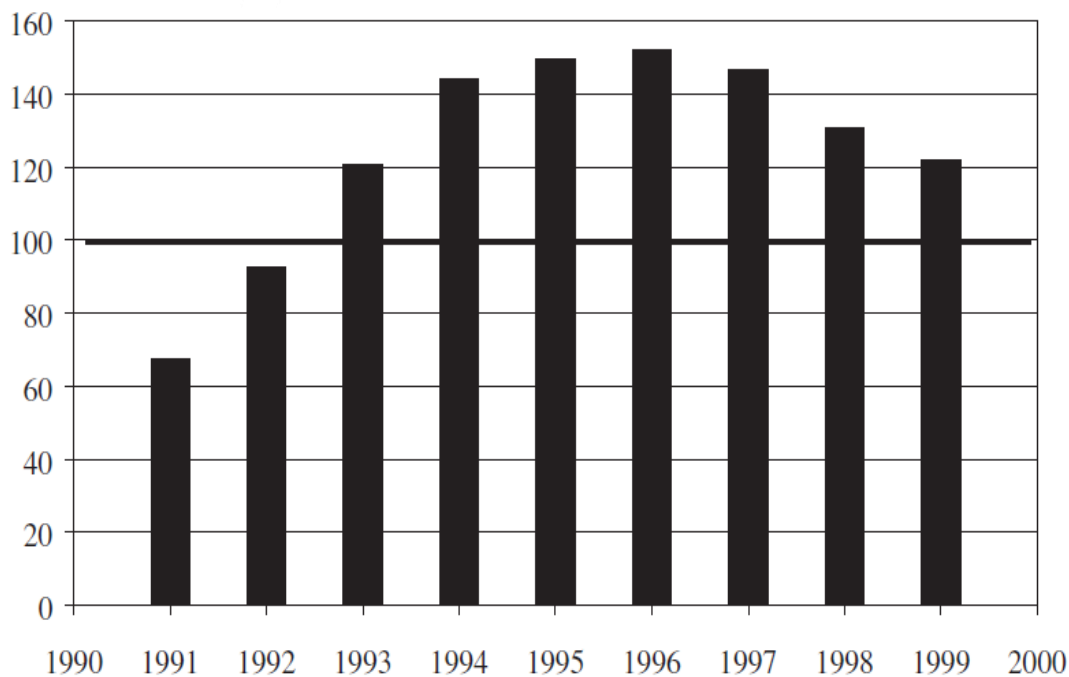
Source: Sinn (2002, p. 115).

Simultaneously to the clear flow of capital from the west to the east, people followed the opposite direction in the first years after reunification. This reflects the higher wage levels in the destination region. Indeed, official documents indicate that since reunification there has been a strong migratory movement from East Germany to West Germany (about 1.2 million people), especially to the southern part of the country (BMWi, 2019, p. 12).[11]

The income convergence process did not result only from investment flows and remuneration of active workers but also from "pensions, social aid, and unemployment insurance benefits" (Sinn, 2002, p. 114). Sinn (2002, p. 114-115) also highlights that in East Germany "household pension income is higher than in West Germany, since the labor force participation of women is higher". The establishment of parity between the currencies also contributed to this process, as pensions in the former GDR had an immediate real increase after reunification. This shows how non-explicitly regional policies and the demographic characteristics of the two regions contributed to the convergence process in the 1990s.

In summary, the elimination of barriers to capital and people flows and subsidies for investments in the former East Germany motivated an accelerated reduction in inequalities. These movements suggest that capital and people flows resulted both from "spontaneous" differences in relative prices and from public policies, as shown in the following topics:

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[11] More recently (i.e., since 2017), however, "the net migration to the non-city states of East Germany has also been positive compared to West Germany" (BMWi, 2019, p. 12).

- Relative prices (e.g., lower real estate prices in the former East Germany) and wage levels obviously impacted capital and people flows. Additionally, a migratory movement motivated by non-explicitly economic factors in the moments immediately following reunification cannot be ruled out.

- Some national policies with asymmetric regional effects also seem to have impacted the flows described in the 1990s. This is the case, of course, of pensions, social programs, and unemployment insurance benefits pointed out by Sinn (2002, p. 114). Similarly, the slowing of the convergence process at the end of the analyzed period is attributed by some authors to the imposition of national minimum values that would be incompatible with the productivity of the former GDR. Barrell and Velde (2000, p. 275), for example, indicate that "wages rose much more rapidly than productivity in East Germany after unification".[12]

- Regarding explicit policies, the examined documents indicate that the largest investment flows (in the mid-1990s) and the subsequent cooling of this trend (at the end of the decade) are clearly associated with the investment subsidy law ("Fördergebietsgesetz"), which "offered very generous investment grants and depreciation allowances" and its replacement, in 1997, "by a much less generous law which no longer foresaw special depreciation allowances and offered smaller investment grants" (Sinn, 2002, p. 121). Another factor that contributed to the convergence movements was the German Unity Fund, "which provided the eastern states with a new financial foundation beginning in 1990",[13] later replaced by the so-called "Solidarity Pact". It is estimated that between 1990 and 1994, "the five new German states received a total of 82 billion euros from the German Unity Fund".

Since the late 1990s, the convergence process has continued but at a much slower pace (see Figure 1). Spontaneous flows no longer seem to have played such an intense role, as relative prices had naturally converged and migratory movements began to occur more slowly after the initial period of adjustment. The reduction in regional inequalities then appears to have resulted from national policies with asymmetric regional impacts and explicit regional policies.

In fact, compensation payments to equalize living conditions across the federal territory (as stipulated in the German Constitution) had already existed since the founding of the former FRG (focused, of course, on the states and municipalities that comprised it). A significant volume of financial resources has been mobilized for this purpose since the 1950s. In 2022, financial equalization between the German states amounted to approximately € 18.5 billion. The largest beneficiary was the federal capital (Berlin), which received € 3.6 billion, followed by Saxony (€ 3.3 billion), Saxony-Anhalt (€ 2.0 billion), and Thuringia (€ 1.9 billion), all located in the former East Germany. The largest beneficiary in the former West Germany was Lower Saxony, which received € 1.8 billion. On the other hand, the largest contributors were Bavaria (€ 9.9 billion) and Baden-Württemberg (€ 4.5 billion).[14]

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[12] According to Barrell and Verge (2000, p. 275), "the decline in relative investment, or return to more normal levels, is only one factor behind the decline in relative productivity growth in East Germany after 1996".

[13] Available at https://cutt.ly/m9llKuk. Accessed on January 24, 2023.

[14] Available at https://cutt.ly/e5rSjAe. Accessed on April 24 2023.

After reunification, the spotlight fell on the Solidarity Pact. Established in 1995, this instrument initially focused on financing infrastructure investments in the eastern states using federal government resources. However, the focus of investments gradually shifted over time. An official document from the federal government notes that "the focus in this area has certainly changed since German reunification", as initially "emphasis was placed on roads, running water, and local energy networks", whereas now the emphasis is on "national energy transportation and broadband supply" due to the energy transition and digitalization (BMWi, 2019, p. 58).

As noted by Locke (2019), to finance these investments, "the federal government contributed a bigger share of the sales taxes it collected and also agreed to compensate those states with sub-par financial resources through a special fund". The "solidarity surcharge" amounted, in 2015, to 5.5% of the normal income tax bill.[15]

There were two editions of the pact. The Solidarity Pact I involved the transfer of € 20.6 billion per year from the federal government to the eastern states and Berlin (Locke, 2019). The Solidarity Pact II, between 2005 and 2019, provided € 156.6 billion in resources for the regions corresponding to the former East Germany (Locke, 2019). Of this total, € 105 billion came from the federal government.[16] In summary, it is estimated that the sum of federal government resources associated with the two editions of the pact reached a total of approximately € 300 billion (Locke, 2019).[17]

In addition to the resources from the Solidarity Pact, the European Structural Fund was also used as an instrument to reduce regional inequalities in the country.[18] In the 2014-2020 period, 60% of the fund's resources allocated in Germany were directed to the former GDR (which represents only 20% of Germany's population). The amounts involved are indicated below:

> The EU Commission proposes for Germany a sum of € 17.7 billion in current prices (€ 15.7 billion in 2018 prices) of the EU structural funds for the next funding period (2021–2027). Compared to the current funding period (2014–2020), this is a decline of about 8% (in 2018 prices: 20.7%) (BMWi, 2019, p. 35).[19]

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[15] Available at https://cutt.ly/19kys1T. Accessed on April 24 2023.

[16] The remaining € 51 billion (listed as a target) corresponded to resources "in the form of disproportionate federal budget funding for the reconstruction of East Germany in the areas of economy, innovation/R&D/education, transportation, housing construction and urban development, EU structural funds, remediation of inherited pollution/site recovery, and sports" (BMWi, 2019, p. 22).

[17] That total corresponds approximately to (10 × € 20.6 billion) + € 105 billion = € 311 billion.

[18] The aim of EU structural policy is to strengthen economic, social, and territorial cohesion in the EU and reduce disparities in various levels of regional development "(BMWi, 2019, p. 34). This fund includes the European Regional Development Fund (ERDF), the European Social Fund (ESF), and the European Maritime and Fisheries Fund (EMFF). In particular, the ERDF "supports investments aimed at improving key potential factors of regional competitiveness in the global context" (BMWi, 2019, p. 34).

[19] "The European Commission proposes for Germany a sum of € 17.7 billion in current prices (€ 15.7 billion in 2018 prices) from the structural funds for the next funding period (2021-2027). Compared to the current funding period (2014–2020), this is a decline of about 8% (in 2018 prices: 20.7%)".

This reduction is attributed to the "catch-up" process in the former East Germany and the evolution of its GDP per capita levels.[20]

Explicit regional policies also had a credit-related dimension. According to data from the KfW Development Bank (KfW is the acronym of Kreditanstalt für Wiederaufbau or Credit Bank for Reconstruction), the institution had granted € 194 billion in credit by the mid-2010s. Furthermore, according to KfW, by the mid-2010s, approximately 10% of investments in the former East Germany came from the bank. The focus was "on the promotion of companies and start-ups alongside housing refurbishment and environmental investments".[21] Despite the evidently institutional nature of the document from which this information was extracted, it is clear that the explicit policies adopted in Germany relied on both fiscal and financial instruments.

Official documents from the federal government indicate that after the conclusion of the Solidarity Pact II, a new program negotiated in 2017 and initiated in 2020 aimed to reduce the financial burden on the states by € 10 billion annually. These resources would disproportionately benefit states that are "financially weak and poor in research" (BMWi, 2019, p. 22). This is possibly what the Organisation for Economic Co-operation and Development (OECD) refers to as an "extensive fiscal equalization system" aimed at reducing regional inequalities. Even so, the same OECD document notes that there is currently no regional policy per se in Germany.[22]

Nonetheless, the average annual amounts allocated to reducing regional inequalities in Germany (estimated at around € 10 billion) are comparable to those observed in Brazil. In fact, Cavalcante (2019) estimates that the costs of regional development policies in Brazil reached R$51.2 billion (approximately € 11.5 billion) in 2018. This suggests that, relative to GDP, Brazil would proportionally allocate more resources to regional development policies than Germany.

4 Concluding remarks

In this work, the evolution of regional inequalities in Germany was described and, based on official documents and academic articles, the factors associated with the convergence process observed over the past thirty years were discussed. The analysis aimed to highlight how regional inequalities in Germany have adapted to the institutional changes observed in the country since its reunification in the early 1990s. Initially, a brief review of regional inequality indicators and the factors associated with their evolution was presented. Based on these elements, the evolution of regional inequalities in Germany was described and the factors that contributed to the convergence process were analyzed.

Although there are detailed indicators of regional inequalities (capable of capturing movements within the analyzed regions), in the case of Germany, it is common to simply analyze the ratio between indicators of the old federal states (corresponding to the former West Germany) and the new federal states

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[20] The structural fund resources are allocated according to GDP per capita relative to the EU average. Most of the regions in former East Germany fall into the transition category (75% to 100% of the bloc's average).

[21] Available at https://cutt.ly/H9llZ8f. Accessed on January 01 2023.

[22] Available at https://cutt.ly/s9llByB. Accessed on January 24 2022.

(corresponding to the former East Germany). The literature review also indicated that the evolution of regional inequalities can be attributed to: *i)* spontaneous flows of capital and labor resulting from differences in relative prices; *ii)* national policies with asymmetric regional impacts; and *iii)* explicit regional policies.

The documents reveal that, over the thirty-year period, the ratio of the GDP per capita of the new federal states (including Berlin) to the national average increased from just under 50% in 1991 to just over 80% in 2020. The more than 30-percentage point-growth concentrated in the first decade (by 2000, this indicator had already reached nearly 72%). When Berlin is excluded, the ratio rises from about 37% in 1991 to nearly 65% in 2000 and about 74% in 2020. In summary:

- There was a convergence process between the regions corresponding to the former West Germany and East Germany;
- Regional inequalities continue to persist in the country (although at much lower levels than those observed thirty years ago); and
- The convergence process, although continuous throughout the period, was more accelerated in the early years after reunification.

Multiple factors contributed to the reduction of inequalities. While recognizing that dissenting interpretations may exist, the official documents and academic articles cited in this paper indicate that, initially, the elimination of barriers to capital and people flows and subsidies for investments in the former East Germany motivated an accelerated reduction in inequalities. These movements suggest that capital and people flows resulted both from spontaneous differences in relative prices and from public policies. From that moment onwards, national policies with asymmetric regional impacts and explicit regional policies (especially the so-called "Solidarity Pact") contributed to the reduction of regional inequalities in Germany.

It is estimated that the total resources associated with the two editions of the Solidarity Pact reached about € 300 billion (Locke, 2019). While these should be used with caution (because it is not detailed whether these are real or nominal values or to what extent the allocated amounts were actually applied), one could conjecture a uniform distribution of the € 300 billion over a period of about 25 years. Based on this assumption, the mobilized amounts would reach around € 12.0 billion per year. Official documents from the German federal government indicate that, after the end of the Solidarity Pact II, a new program negotiated in 2017 and started in 2020 was to reduce the financial burden on states by € 10 billion annually. This amount is similar to the estimated annual value during the two editions of the Solidarity Pact and is compatible with the absolute values of the costs of regional development policies adopted in Brazil.

As regional inequalities in Brazil have been high and resilient for several decades, one could assume that the policies adopted in Germany have proven more efficient than those adopted in the country. This hypothesis, however, would depend on an analysis of the multiple factors (beyond regional policies themselves) that contribute to the evolution of inequalities. In particular, when comparing Brazil with Germany, it can be preliminarily suggested that it is necessary to take into account the large educational differentials between the two countries, the territorial dimensions and the quality of transportation infrastructure (which makes economic integration in Germany much easier), and demographic aspects (especially age profiles and migratory movements). Despite these caveats, several elements

observed in Germany may serve as a reference for Brazil, where high and persistent regional inequalities require the adoption of more effective and consistent policies.

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