Late and unequal: measuring enrolments and retention in Brazilian education, 1933-2010

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Abstract

This article presents a new dataset of enrolment rates and grade distribution ratios (GDR) in Brazil between 1933 and 2010, in addition to enrolment rates and GDR of Brazilian states from 1955 to 2010. To our knowledge, there were no estimates of enrolment rates by states for such a long period in Brazil. Enrolment rates and GDR in northern and north-eastern states were meagre and comparable to the lowest Latin America performers, and even the most advanced Brazilian states lagged behind the early leaders of the region, such as Argentina and Uruguay, up to the turn of the century. Given a certain enrolment rate, Brazilian states were expected to present lower GDR than Latin American countries on average.

Keywords: education, enrolments, economic history, regional inequality

Este artículo presenta un nuevo conjunto de datos de tasas de matriculación y tasas de distribución de grados (GDR) en Brasil entre 1933 y 2010. También presentamos tasas de matriculación y GDR por estados brasileños de 1955 a 2010. No hay estimaciones de las tasas de matriculación por Estados por un período tan largo en Brasil. Las tasas de matriculación y las GDR en los estados del norte y noreste fueron bajas y comparables con las de menor rendimiento en América Latina. Incluso los estados brasileños más avanzados se quedaron atrás de los líderes de la región hasta el cambio de siglo. Dada una cierta tasa de matriculación, los estados brasileños presentaran GDR más bajas que los países latinoamericanos en promedio.

Palabras: educación, matrículas, historia económica, desigualdad regional

1 Introduction

Brazil is a case of persistent dismal education outcomes. Dating back to the early nineteenth century, the political elite was aware of the backward schooling situation in Brazil (Colistete 2016). According to Rui Barbosa, a well-known Brazilian statesman, "the truth [...] is that we are a people of illiterates" (Barbosa 1947, p. 8). In the early twentieth century, Brazil lagged behind countries such as Argentina, Chile and Mexico in terms of enrolment rates (Lindert 2004). Moreover, Brazil universalised enrolments in primary school about a century after the United States and Canada, the early leaders on the continent (Engerman and Sokoloff 1997). In 1930, approximately two-thirds of the adult population was illiterate in Brazil (Astorga, Bergés and FitzGerald 2005).

Although literacy rates substantially increased, Brazilian education remained backwards in comparative terms. In 2010, the average schooling of a Brazilian adult aged 15 or more reached 7.8 years, a figure behind the averages of several poorer Latin American countries (Barro and Lee 2013). In addition, Brazil has consistently presented one of the worst indicators in standardised proficiency tests including the Program for International Student Assessment (PISA), an exam promoted by the Organisation for Economic Cooperation and Development (OECD) that tests the reading, mathematics, and science abilities of 15-year-old students around the world (OECD 2016).

However, national figures hide divergences within the country. Due to its size, the country is well-known for its glaring regional inequalities and numerous studies have attempted to explain how historical factors shaped income inequality between Brazilian regions (Furtado 1959, Leff 1972; Denslow 1973; Monasterio 2010; Naritomi, Soares and Assunção 2012; Mattos, Innocentinni and Benelli 2012; Reis 2014; Funari 2017). Furthermore, many studies have highlighted the role of human capital in the economic backwardness of North-East Brazil

(Pessôa 2001; Barros 2012; Oliveira and Silveira Neto 2016). However, research evaluating the causes of long-term educational performance in different states is scarce. Among the exceptions, Wegenast (2010) specifically addressed schooling and argued that land ownership inequality was closely related to current educational results in different Brazilian regions. Musacchio et al. (2014) argued that the current ranking of educational outcomes between states stemmed from trade shocks during the First Republic (1889-1930). In turn, Komatsu et al. (2019) reported that regions with a higher proportion of descendants of slaves currently show more inequality in years of schooling.[1]

To some extent, this paper supports the findings of previous studies on educational inequality between Brazilian regions. However, none of the papers on regional differences dealt with education quality measures. As clearly demonstrated by Hanushek (2008) in the context of long-run economic growth in Latin America, *quality* is clearly more important than *quantity*, since years of schooling vary across the country. Therefore, this paper aims to measure both the *quantity* and *quality* of education in Brazil and its states from 1933 to 2010. Furthermore, we also attempt to compare Brazilian states to other Latin America countries, since some Brazilian states are larger than several neighbouring countries.

This paper proposes at least two contributions to the literature on the economic history of education in Brazil. First, the paper provides a historical dataset containing national and state-level information on (a) enrolment rates and (b) distribution of enrolment across grades. By adding new sources, we constructed a novel dataset on enrolment rates in Brazil between 1933 and 2010, in addition to building a data series on enrolment rates by state from 1955 to 2010. Moreover, we use an additional variable that measures enrolment distribution across grades by states in Brazil. The "grade distribution ratio" (GDR), devised by Frankema and Bolt

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[1] In within-state contexts, Summerhill (2010) found that land concentration did not affect long-run economic performance in São Paulo State. On the other hand, Carvalho Filho and Colistete (2010) reported a negative association between land concentration and educational outcomes in the same region. Witzel de Souza (2018) and Rocha et al. (2017) documented that immigration patterns were related to education outcomes and long-term development.

(2006), provides information on retention in a nutshell.[2] In the absence of proficiency examinations in the past, other types of quality measures, such as GDR, are crucial for evaluating the history of schooling in underdeveloped countries - particularly in the case of Brazil. Frankema (2009) used the GDR to analyse schooling evolution in Latin American countries. Here, we applied the GDR to Brazilian states and regions and found that the North and North-East regions have consistently lagged behind since the 1950s.[3]

Furthermore, we compare the education outcomes of Brazilian states to the ones presented by neighbouring countries. We improved the methodology of Frankema (2009) to compare enrolment rates between Latin American countries and included Brazilian states in the analysis. Comparing Brazilian states to Latin American countries matters because some Brazilian states share more similarities with neighbouring countries' historical experience than with other Brazilian states (for example, the southern border presents more similarities with the Pampa economy than with north-eastern states).[4] In the case of GDR, figures of Brazilian states were undoubtedly low even considering Latin American standards. We also demonstrated that Brazilian states were conditionally expected to present lower GDR than Latin American countries, on average, given a certain enrolment rate. In other words, *retention* was a more severe problem in Brazil than in neighbouring countries as early as 1970. These results validate other studies on high repetition rates in Latin America and Brazil (Schiefelbein 1975; Ribeiro 1991). Even as early as 1970, enrolment rates were insufficient measures to assess education systems of Latin American countries, particularly in the case of Brazil.

Our findings corroborate research on the economic backwardness of North-East and North regions: states in these areas presented worse outcomes both in terms of primary level enrolment rates and retention (GDR) during the analysed period. In fact, some north-eastern

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[2] "Retention" here is defined as "the proportion of students in grade *j* +*n* in year *t*+*n* with respect to students in grade *j* in year *t*" (Schiefelbein 1975, p. 468). The GDR is close to this definition of retention.
[3] Besides the subnational political units (states and the Federal District), Brazil has five geographical regions: North, North-East, South-East. South and Centre-West. Table 1 at Section 2 provides information on the states that belong to each region.
[4] We thank one of the referees for highlighting this point.

states presented similar enrolment rates and lower indicators of progression compared to the ones presented by the poorest Latin American countries.

Hence, the present paper is organised as follows: after this introduction, we describe data and sources for constructing the dataset in section 2. In section 3, we present enrolment rates and GDR by states and Brazilian regions throughout the entire period. In section 4, we undertake a comparative description of enrolment rates and GDR between Brazilian states and Latin American countries in 1970. Section 5 consists of concluding remarks.

2 Data and sources

2.1 Enrolments

The number of enrolments is available in several sources of the *Instituto Brasileiro de Geografia e Estatística* (IBGE) and *Ministério da Educação e Cultura* (MEC). The most well-known source is *Anuário Estatístico do Brasil* (AEB), the Brazilian Statistical Yearbook. An electronic version compiling data from several waves of the AEB is available online (IBGE 2003).[5] However, the AEB did not contain enrolments by states; therefore, we added additional sources from MEC.

State-level enrolments are only available for primary education (grades 1-8) from 1955 to 2010. A report authored by Goldenberg (1990) is the major source of state-level enrolments by grades in primary education. From 1995 onwards, enrolment data is available on the National Institute of Education Research (INEP) website, a research centre of the Ministry of Education.[6] Other documents were used for further verification, although there is missing information on the number of total enrolments and enrolments by grade in 1988, 1989, 1990

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[5] As it was readily available, this source had already been used in the dissertation of Paulo Maduro (2007).
[6] *Instituto Nacional de Estudos e Pesquisas Educacionais* (INEP).

and 1994.[7] In order to ensure statistical consistency through time, we used Brazilian states as defined in 1940. Table 1 shows a list of Brazilian geographical regions and states with their abbreviations in 1940 and 2010.

Table 1 - Brazilian States, 1940 and 2020

Region	States in 1940	States in 2020
North	Amazonas (AM)	Acre (AC)
		Amazonas (AM)
		Roraima (RR)
		Rondônia (RO)
	Pará (PA)	Amapá (AP)
		Pará (PA)
North-East	Alagoas (AL)	Alagoas (AL)
	Bahia (BA)	Bahia (BA)
	Ceará (CE)	Ceará (CE)
	Maranhão (MA)	Maranhão (MA)
	Paraíba (PB)	Paraíba (PB)
	Pernambuco (PE)	Pernambuco (PE)
	Piauí (PI)	Piauí (PI)
	Rio Grande do Norte (RN)	Rio Grande do Norte (RN)
	Sergipe (SE)	Sergipe (SE)
South-East	Espírito Santo (ES)	Espírito Santo (ES)
	Minas Gerais (MG)	Minas Gerais (MG)
	Rio de Janeiro (RJ)*	Rio de Janeiro (RJ)
	São Paulo (SP)	São Paulo (SP)
South	Paraná (PR)	Paraná (PR)
	Rio Grande do Sul (RS)	Rio Grande do Sul (RS)
	Santa Catarina (SC)	Santa Catarina (SC)
Centre-West	Goiás (GO)	Goiás (GO)
		Tocantins (TO)**
	Mato Grosso (MT)	Mato Grosso (MT)
		Mato Grosso do Sul (MS)

Notes: * The former Distrito Federal before 1960 was located in the South-East, while after the construction of Brasília, the new capital, the Distrito Federal moved to the Centre-West.
** Tocantins is part of the North region.

A legal change in 1971 required our dataset to be adapted, as Law 5,692/1971 reorganised the existing grades into different educational stages. This change in legislation increased the first schooling level by adding four grades and merging the former primary (*ensino primário*) and lower secondary levels (*ensino médio - primeiro ciclo*). The new eight-

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[7] Our major sources on education data are the following entries: (MEC 1977a; MEC 1977d; MEC 1977b; MEC 1977e; MEC 1977c; MEC 1977f; MEC 1959a; MEC 1959b; IBGE 1940-; MEC 1985; Goldenberg 1990; INEP 2003; MEC 1974).

year level was named *ensino de primeiro grau* and relabelled as *ensino fundamental* in 1996 (henceforth "new primary education"). Consequently, the lower secondary level was separated from the upper secondary level in 1971. The three-year *ensino médio - segundo ciclo* was renamed *ensino de segundo grau* in 1971 and then *ensino médio* after 1996 (henceforth "new secondary education").

The 1971 change entailed a grade redistribution between different educational stages despite the total number of schooling years remaining unchanged, making the construction of datasets difficult. There is relatively complete aggregate data on the old primary education (*ensino primário*) until 1970. From 1970 onwards, aggregate data regarding the new primary education (*ensino fundamental*) is available. Nevertheless, we made all necessary adaptations to construct a continuous dataset, as Maduro (2007) had also done even though he did not explicitly acknowledge it.[8] There are slight differences between ours and Maduro's dataset, particularly in the 1970s and 1980s. Besides finding and organising national enrolment data, we collected data on enrolments by state and grade. Data on state-level enrolments allows us to look at regional differences within a continental country, while data on enrolment by grade provides us information on the concentration of enrolments in the first grades, evidence of high incidence of repetitions and dropouts.

2.2   School-age population

Population figures are based on official demographic censuses (IBGE 1940-2010). There are several ways of interpolating population data. We followed Souza (2016) and used cubic spline

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[8] Maduro (2007) presents a graph of enrolment rates in primary education considering eight grades from 1933 to 2004. However, data presented in his appendix provides enrolments in the older primary education (four grades) until 1970.

functions to avoid kinks in the census' years.[9] Previous studies have used other kinds of interpolation, although we expected only slightly different results among the estimates.

Since 1940, Brazilian censuses have presented population by single years of age. From the 1970 Census onwards, population by single years of age are available through electronic means and microdata. Before 1970, electronic means only provided population by five-year age groups. Maduro (2007) only used five-year age groups for the whole period. In order to construct the 7-14 age group, Maduro took three-fifths of the 5-9 age group plus the total population of the 10-14 group. Similarly, he obtained the 15-17 age group by taking three-fifths of the 15-19 group. By doing so, Maduro assumed that population distribution across single years of age within a five-year age group was uniform, which is inaccurate if birth rates are increasing or decreasing. Nonetheless, hard copies of the 1940, 1950 and 1960 Censuses contain population by single year of age. Although those data suffer from age heaping problems, particularly regarding ages ending with 0 or 5, directly picking the age group of interest (e.g. the number of children aged between 7 and 14 years) is certainly a better option than using proportions of five-year age groups to finally build the age group of interest.[10]

In order to obtain inter-census estimates, we interpolated the age groups of our interest through a cubic spline function. Furthermore, we opted for the default spline method available on the *splinefun* package in the R software and the FMM method, which stands for the work of Forsythe, Moler, and Malcolm (1977) according to the *splinefun* package documentation. The cubic spline interpolation applied provides internally consistent estimates: summarising state-level interpolated data equals nation-wide interpolations. The same consistency principle also

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[9] We thank Pedro Souza for valuable help on that matter.

[10] Alternatively, we could have employed Sprague coefficients. However, the Sprague methodology did not yield reliable results using recent censuses as reference data (more accurate in terms of data collection). Therefore, we opted for the cubic spline interpolation.

applies to different age groups; thus, we did not have to worry about interpolating the entire population between Censuses.[11]

2.3 Grade distribution ratio (GDR)

Frankema and Bolt (2006) developed the "grade distribution ratio" (GDR) approach, which is defined by the following equation:

$$GDR_{1-N} = \frac{\sum_{i=(n+1)}^{N} g_i}{\sum_{i=1}^{n} g_i} \times \frac{n}{N-n} \tag{1}$$

in which *N* is the total number of grades, *n* is a grade between 1 and *N* and g_i is the share of students enrolled in grade *i*.

In order to analyse the distribution of enrolments by grade at the new primary education (*ensino fundamental*) in Brazil, we considered the range between grades one and eight. Frankema (2009) used national figures of several Latin American countries. Here, we make two extensions. First, we computed a complete national series of GDR figures in Brazil from 1955 to 2010. Secondly, we did the same for Brazilian states. We followed Frankema (2009) for international comparisons and used the GDR between the first and sixth grades. Therefore, data is widely available for those grades across Latin American countries since primary education is comprised of the first six grades in most educational systems:

$$GDR_{1-6} = \frac{\sum_{i=4}^{6} g_i}{\sum_{i=1}^{3} g_i} \tag{2}$$

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[11] According to the *splinefun* function documentation, the FMM method fits an exact cubic "through the four points at each end of the data, and this is used to determine the end conditions".

If we assume that "the influx of people is constant over time, the ratio of grades 4 to 6 over 1 to 3 expresses the chance that a pupil in grades 1 to 3 reaches the higher grades 4 to 6 without repeating grades or dropping out" (Frankema 2009, p. 377).[12]

As stated in the introduction of this section, the GDR has the advantage of being a summary indicator, facilitating comparative analyses. On the other hand, the standard GDR methodology does not consider demographic changes. A way of tackling this problem is through a slight modification of the formula. However, this is not necessary if the countries and regions in the analysis are approximately in the same demographic transition stage. In the case of Latin America, we do not expect demographic factors to lead to considerable distortions in a cross-country or cross-regional analysis.[13]

3 Enrolment rates and retention in Brazil, 1933-2010

In the first subsection, we present yearly estimates of enrolment rates for the whole country. Enrolments by states and regions are presented subsequently. In this section, we use subdivisions under Brazilian legislation since 1971.

## 3.1 Gross and net enrolment rates in Brazil

Information on gross enrolments in Brazil is available since 1933. Since we did not have population by single years of age before 1940, we estimated enrolment rates between 1940

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[12] In some years, some schools offered a "literacy grade" (*série de alfabetização*) prior to the first grade. In the GDR calculations, these students were included in the denominator. Since the introduction of this extra grade crowded-out pupils from attending the first grade, it is correct to include them in the GDR denominator. Moreover, not including them does not change our results in qualitative terms.

[13] We could have devised a "GDR frontier" if we had data on the number of new students in the first grade in each year, as wisely suggested by Peter Sims. Deviations from that frontier would be a better comparative measure. Unfortunately, data on new students are not trustworthy until the mid-1990s, as emphasised by Schiefelbein and others.

and 2010. Between 1933 and 1939, we kept the estimates of Maduro (2007). Our national estimates of enrolment rates in the new primary education are similar to the series of Maduro, as shown in Figure 2 (Pearson correlation of 0.997). Discrepancies between the estimates are somewhat larger in the 1970s and 1980s. According to both estimates, the country achieved 100 per cent of gross enrolment rates in the early 1980s. The similar results in national estimates of enrolment rates in the new primary education (and *ensino médio*, see Online Appendix A) make us confident in our estimates by states and regions, presented in the next subsection.[14]

Figure 1: Gross enrolment rates, new primary education (*ensino fundamental - EF*), Brazil, 1933-2010
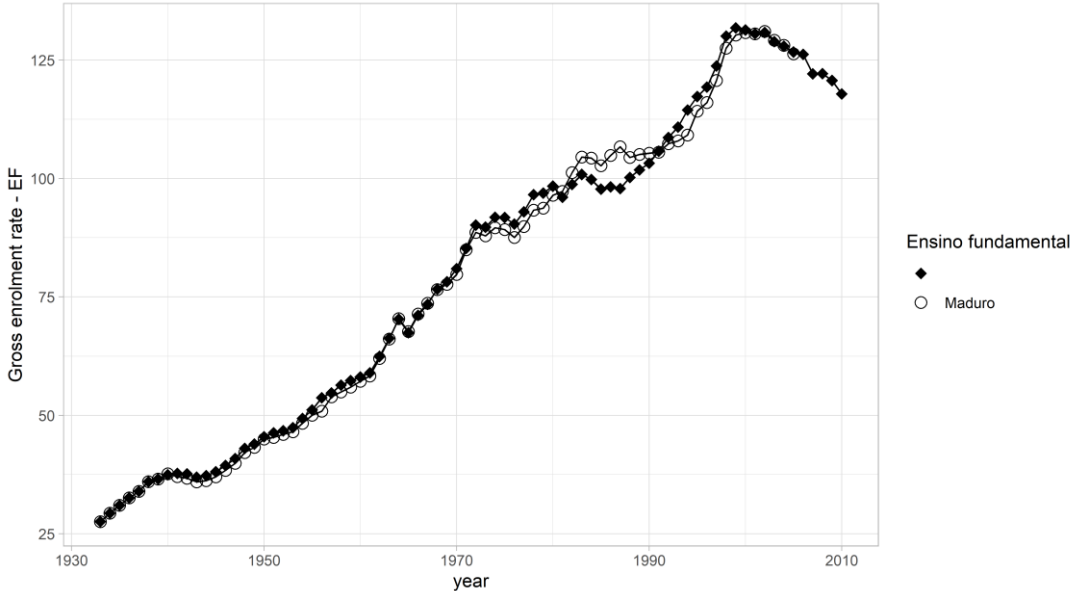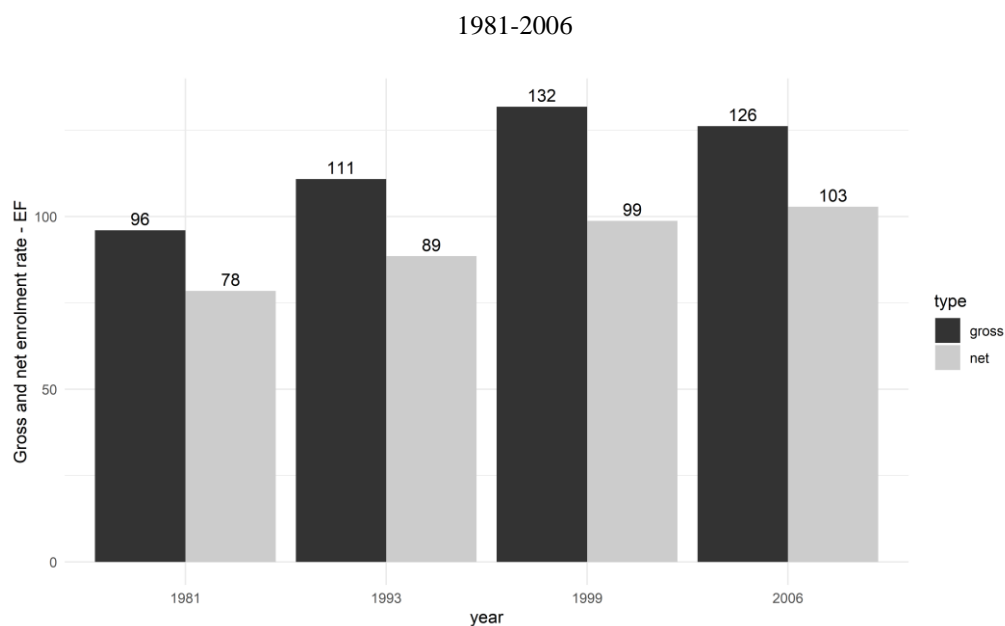

Source: see Section 2.

Maduro (2007) did not provide any estimates on net enrolment rates, which are only found consistently from 1979 onwards for the new primary education (eight grades). Net enrolment rates are defined as the "total number of students in the theoretical age group for a given level of education enrolled in that level, expressed as a percentage of the total population in that age group".[15] If net enrolment rates are low, it shows us that few students of a given age group were enrolled in the schooling level they were supposed to be.

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[14] Online Appendix C covers details of state-level estimates, which may present some problems in some specific observations.

[15] Available at: http://uis.unesco.org/en/glossary-term/net-enrolment-rate/

Figure 2: Gross and net enrolment rates, selected years, new primary education (*ensino fundamental* -EF),

1981-2006

Source: see Section 2.

As depicted in Figure 2, even though the gross enrolment rate achieved 100 per cent in the early 1980s, net enrolment rates show that more than one-fifth of the children aged between 7 and 14 were not enrolled in the new primary education in 1981. The universalisation of the first level was achieved in practice only during the 1990s. The information in Figure 2 shows that net enrolment rates achieved 99 per cent in 1999.[16]

3.2   Enrolment rates by states and regions

Assessing the situation of Brazil without looking at its regions and states is a major problem considering the size of the country, glaring inequality between regions and their diverse historical backgrounds.[17] The relative backwardness of the North-East region *vis-à-vis* the South-East (and between the northern and southern parts of Brazil, in general terms) has been

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[16] We have also estimated gross and net enrolment rates for secondary education (three grades). Since this paper is not about secondary education, we decided to leave such data in Online Appendix A.

[17] Some Brazilian states are larger than many Latin American countries. For instance, the southernmost state of Rio Grande do Sul is more than three times larger than its neighbour Uruguay in demographic terms (11.3 million and 3.4 million inhabitants, respectively). In the North region, the territory of Amazonas State (1.56 million km^2) is larger than the area of any country in Latin America except for Argentina (2.74 million km^2) and Mexico (1.96 million km^2). Brazil's area is actually larger than the continental portion of the United States (8.51 million and 7.82 million km^2, respectively).

widely acknowledged. The South-East portion of the country has been richer, more industrialised and urbanised, while the North-East has been the poorest region of the country since at least the mid-nineteenth century (Baer 1964; Williamson 1965; Leff 1972; Desnlow 1973; Monasterio 2010; Barros 2012; Naritomi et al. 2012; Carvalho Filho and Monasterio 2012; Reis 2014; Pereira 2020).

There are two major lines of explanation for the origins of high regional inequality in the country. Several scholars have attributed spatial inequality in the Americas to the adoption of extractive institutions (Engerman and Sokoloff 1997; Acemoglu et al. 2001; Gallego and Bruhn 2012). To some extent, this story could be extended to within-country regional divergences and applied to the north-south divide in Brazil. Other studies have associated the wider gap between regions and countries to trade shocks (Coatsworth 2008; Williamson 2009; Arroyo-Abad 2013). In the Brazilian case, the end of the sugar and cotton cycles, which are mostly grown in the North-East) was followed by a coffee export boom in the South-East (Leff 1972; Pereira 2020). Leff (1972) argued that Dutch disease effects and high transportation costs in nineteenth-century Brazil led to lower incomes in the North-East.

Pereira (2020) did not find any evidence for exchange rate effects and argued that unbearable export taxes decreased profits: the relative backwardness in the North-East region would have started before the coffee boom. In summary, institutional aspects, trade-related effects or a combination of the two negatively affected the North-East region – which may have included the ability to provide adequate schooling (Musacchio et al. 2014). Furthermore, the South and South-East regions also benefited from immigration, which increased the demand for schooling since some immigrants came from countries where schooling was more widespread among the population (De Carvalho Filho and Colistete 2010; De Carvalho Filho and Monasterio 2012; Rocha et al. 2017).

Along the twentieth century, industrialisation did not reverse these patterns – as persistence played a larger role (Monasterio 2010). The growing manufacturing industry concentrated in the South-East and consolidated the dominant position of the region. Some studies have highlighted that a combination of agglomeration economies and human capital from immigrants interacted and made the South-East a suitable place to centralise industrial activities (Cano 1977; Versiani 1993). In spite of the large migration from the North-East to the industrial South-East after 1950, there was only a slow convergence among Brazilian sub-units (Azzoni 2001; Reis 2014). Some scholars pointed out that, despite regional development policies, the priority given to highways at the expense of railroads also contributed to the low productivity of more distant rural areas in the North and the Centre-West (Reis 2014). Furthermore, the North-East region's GDP per capita was about a quarter of the South-East's product per head around 1950. Although the gap decreased through time, this ratio was still about a third in the early 1980s. In the extreme cases of each region, São Paulo State's GDP per capita (the wealthiest state) was almost eight times larger than the GDP per capita of Maranhão (the poorest state) in the early 1970s (Azzoni 1997). Taking stock, from the late nineteenth century on, the distribution of per capita income remained relatively stable (Monasterio 2010).

The story was not much different regarding educational indicators, as highlighted by the enrolment gap between rich and poor regions in Brazil in Figure 3. Considering only the new primary education, gross enrolment rate in the modern South-East was about 65.2 per cent, while in the mostly rural and backward North-East it was only 32.9 per cent in 1955.[18] National estimates were somewhere in the middle (51.1 per cent). Two decades later, the country had already developed a large and diversified manufacturing sector of durable goods. In 1975, the industrial South-East had already surpassed a gross enrolment rate of 100 per cent, although

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[18] Online Appendix C briefly discusses exceptional shortcomings of the data, but the large majority of the state-level information is trustworthy.

North-East's rate was only 74.8 per cent - including older students retained in that level for whatever reason.

Figure 3: Gross enrolment rates, new primary education (*ensino fundamental* - EF), North-East and South-East regions, Brazil, 1955-2010
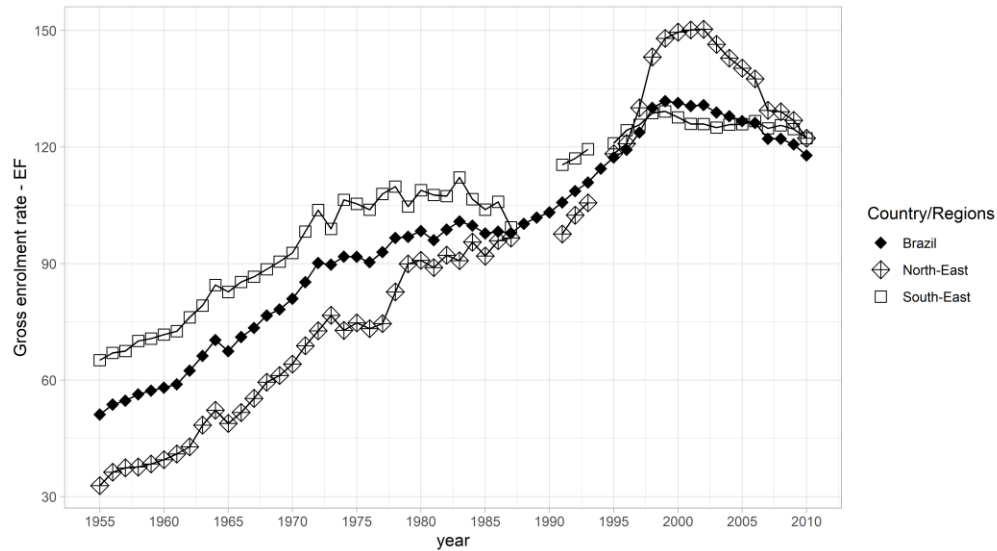
Source: see Section 2.

The Centre-West's performance was not much different from the North and North-East regions, while South-East and South were on the lead (Figure 4). Despite the South region receiving more European immigrants in proportion to its population, the more industrialised and urbanised South-East presented similar enrolment rates during the period under analysis. Fifteen years later, the Centre-West had caught up with its southern neighbours and distanced itself from the northern states. At the end of military rule, almost all states had surpassed 100 per cent regarding gross enrolment rates, but some backward states in the North-East such as Ceará and Maranhão States were far from reaching their counterparts.

Figure 4: Gross enrolment rates, new primary education (*ensino fundamental* - EF), Brazilian states, 1955, 1970 and 1985
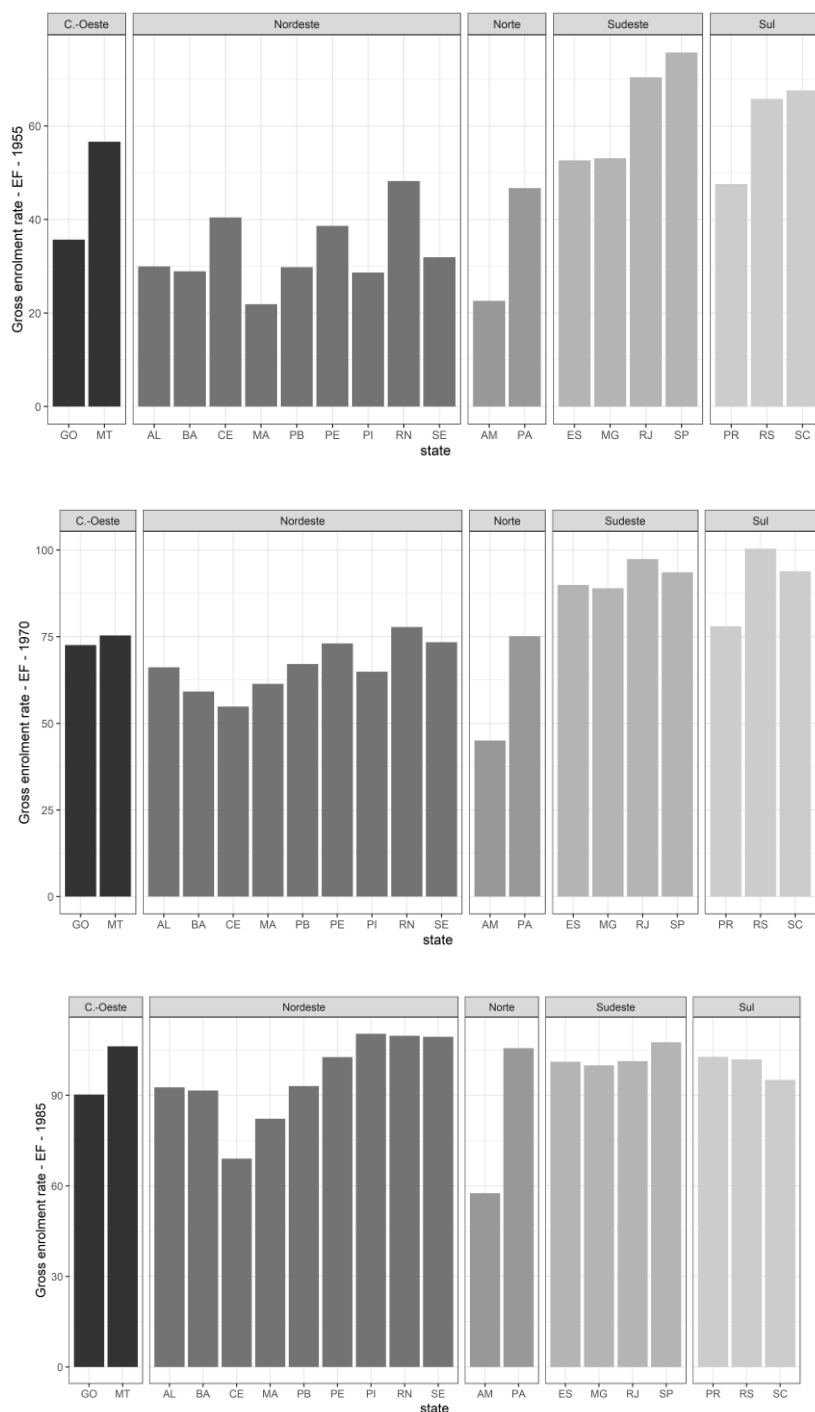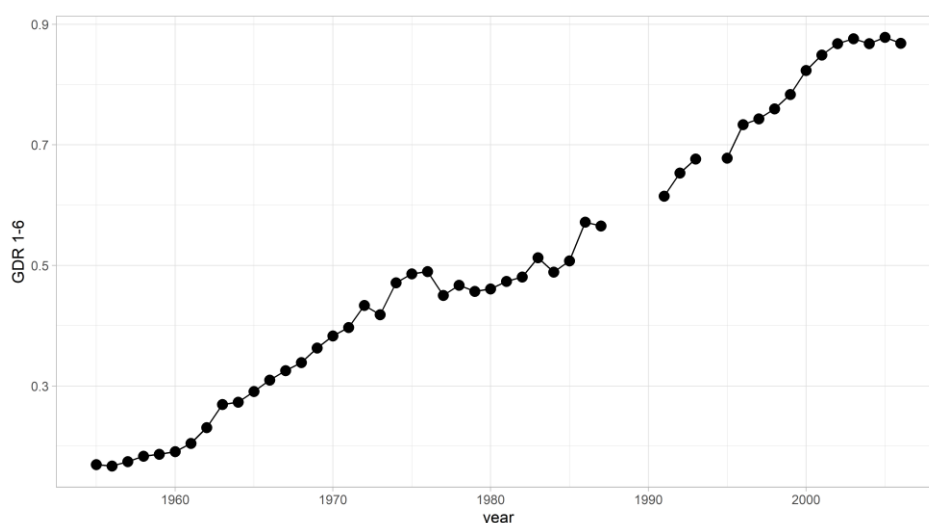

Source: See Section 2.

Note: States are identified by their abbreviations. See Table 1 for a list of Brazilian states (with abbreviations) and regions.

There was an acceleration of enrolment rates in the mid-1980s, including the regions depicted in Figure 4. Some scholars have argued that the turn to democracy and enactment of a new constitution in 1988 had a positive role in improving educational indicators.[19]

3.3   Enrolments by grade and GDR

Gross enrolment rates were already low without taking into consideration the distribution of pupils across grades in Brazil. Taking into account enrolments by grade, the system was inefficient according to international standards. Some Brazilian states, mostly in the northern and north-eastern areas, have historically presented a pattern of enrolment flows comparable to the lowest Latin American performers. The comparative analysis of the GDR for Brazilian states bluntly exposes the country's educational backwardness as a whole and the dismal situation of some specific regions.

Figure 5: GDR, 1-6 grades, new primary education (*ensino fundamental* - EF)*,* Brazil, 1950-2010
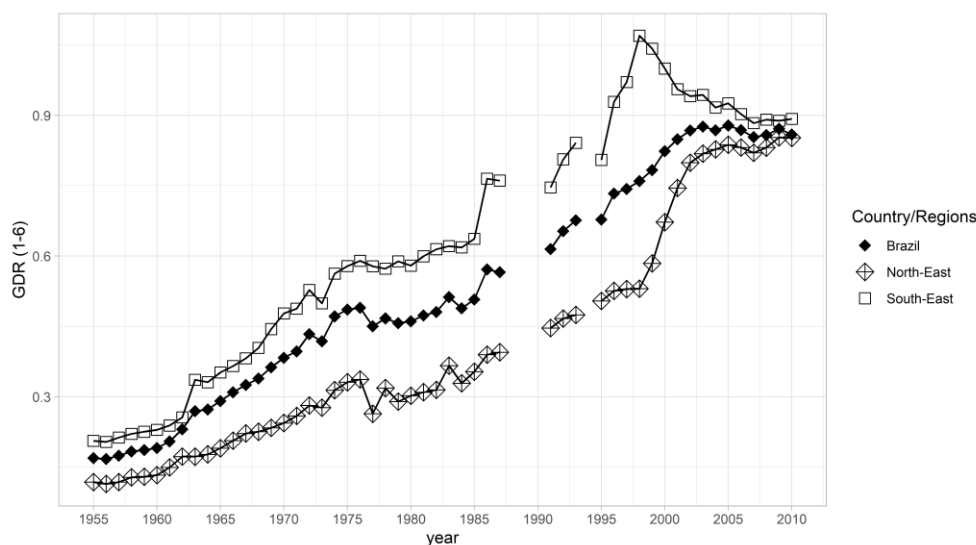

Source: See Section 2.

Instead of calculating the GDR, we could have taken several indicators such as repetition and dropout rates for all countries. Unfortunately, those indicators are not widely

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[19] There was an apparent reversal of patterns: North-East's gross rates of enrolment became clearly higher than South-East's figures in the late 1990s. Since primary education was universalised in the late 1990s, higher gross rates in North-East is chiefly a result of larger retention of children aged more than 14 years in that level.

available. Since the GDR is a synthetic indicator that comprises repetition and dropouts, it is a helpful tool for comparative analysis. The evolution of both enrolment rates and GDR of the new primary education through time is demonstrated in Figure 5. From the mid-1970s to the late 1980s, GDR growth stalled. A possible explanation for the GDR stagnation could be a positive shock on enrolments in the first grades in times of demographic growth. However, there was no acceleration on enrolment rate growth - on the contrary, the enrolment rate increases also stalled during that period. Rather than a rise in enrolments leading to GDR stagnation, the reverse hypothesis is more likely: an increase in repetitions and/or dropouts have probably led to a slowdown in enrolment rate growth. Regional GDR (Figure 6) reveal that the slowdown affected both South-East and the poorer North-East from the mid-1970s to at least the mid-1980s.

Figure 6: GDR, 1-6 grades, new primary education (*ensino fundamental* – EF)*,* Brazil, North-East and South-East, 1955-2010

Source: See Section 2.

If a sudden increase in enrolments cannot explain the slowdown, then other candidates must be considered. First, the Brazilian military regime expanded access to tertiary education from 1968 onwards, which depleted resources from lower levels and may have led to lower outcomes (Ames 1973; Brown 2002). Secondly, central government decisions on tax policy

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impoverished subnational governments throughout the 1970s, directly affecting resources available for basic levels (Kang and Menetrier 2020). Even with the 1971 schooling reform, which gradually abolished the entrance examination to the lower secondary level, GDR stagnated.

Nevertheless, the contemporary literature asserts that retention was caused more by high repetition rates than by dropouts at least in the early 1980s. Statistical data from the Brazilian Ministry of Education mistakenly ascribed a greater weight to dropouts for explaining the lack of school progression. According to Schiefelbein (1975), this was not a Brazilian exclusivity: there was a general underestimation of repetition rates in Latin American countries. Based on data from sample household surveys in the early 1980s, some Brazilian scholars forcefully argued that repetition rates in Brazil were much higher than claimed by official statistics.[20] Pupils that stopped attending school before the end of the school year were not considered repeaters in the following year's statistics because of a mistaken assessment system (Fletcher 1985; Klein and Ribeiro 1991; Fletcher and Castro 1993).

According to Sergio C. Ribeiro (1991), the probability of a new first-year grade student progress to the next grade was close to zero in the North-East region. Indeed, said region's situation was absolutely dismal: in 1960, over 60 per cent of the pupils enrolled at the primary level were concentrated in the first grade. In the industrial South-East, 40 per cent of the eight-grade primary level students were enrolled as first-graders in the same year. Notably, the North-East reached South-East's figures just two decades later (Figure 7).

These findings seem consistent with the literature on regional inequality in Brazil. Our results indicate that persistence also held for education outcomes. States that have persistently presented dismal education outcomes were located in the North-East region. More prosperous

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[20] Teixeira de Freitas (1947) had already called attention to the problem of repetition in the Brazilian school system, but his findings were largely ignored until the 1980s (Klein and Ribeiro 1995).

states presented better outcomes regarding enrolment rates and retention in the South-East and South regions at the primary level. In addition to within-country inequalities, the next section shows that Brazil was a backward country in school progression compared to other Latin American countries.

Figure 7: Distribution of enrolments by grade, new primary education (*ensino fundamental* – EF), North-East and South-East regions, Brazil, 1960 and 1980
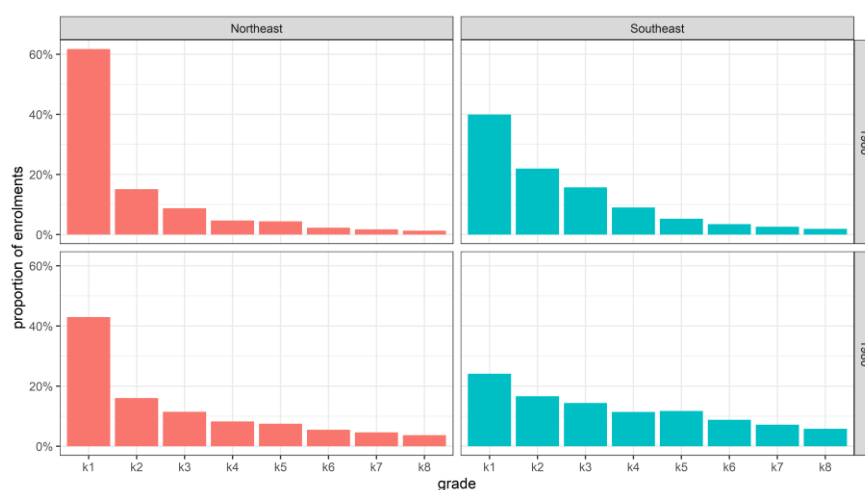
Source: See Section 2.

4   Education in Brazilian states and Latin America: a comparative perspective

Enrolment rates in Brazil were comparatively low, taking international standards into account. While Argentina had nearly universalised the first schooling level around 1950, Brazilian enrolment rates were about 67 per cent according to Frankema (2009). Countries such as Ecuador and the Dominican Republic, which were clearly not among the region leaders, presented higher enrolment rates. In fact, only poorer Central American countries had lower rates than Brazil.

However, we must consider that primary education was composed of four or five grades in some countries (e.g., Brazil until 1971) while completing the first educational stage required

more years in others (e.g., eight grades in Bolivia or Chile). Aware that comparing primary level enrolment rates between a four-year and eight-grade levels present limitations, texts in UNESCO Statistical Yearbooks warned that comparisons should be performed with care. In order to improve the comparative analysis, we made a slight change in the indicators. Rather than using each country's definition, we decided to use total enrolments in the first six grades - no matter if they belonged to the first or the second educational stage according to each country's regulation. Enrolment rates of the first six grades are comparable across countries.[21]

The UNESCO Statistical Yearbooks provided only the percentage of students enrolled in each grade relative to the total enrolments in that schooling level. In some years, when the total number of enrolments by level was available, we retrieved the absolute number of enrolments by grade. We found information on total enrolments, the proportion of enrolment by grade in both primary and secondary levels (as defined by each country) and the school-age population from nearly all Latin American countries in 1970 and 1980, allowing us to compare both enrolment rates and GDR across countries in the region.

The difference between our calculations using only the first six grades and Frankema (2009) calculations of gross enrolment rates in 1970 are described in Table 2. Frankema adapted each country's denominator by multiplying the population between 5 and 14 years old by $10/n$, where n is the number of grades of the first schooling level in each country. This explains why his estimates are expected to be constantly above our numbers (Table 2). According to our new estimates, Brazil's gross enrolment rates (1-6 grades) were slightly higher than Honduras and Bolivia, but worse than El Salvador. In this list of countries, Brazil was ranked fourteenth in a list of 18 countries.

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[21] We capped at six grades of the basic cycle for two reasons: (i) the large majority of Latin American countries had six grades in the primary level and (ii) this corresponds to what UIS (2012) standardises as primary education (ISCED 1).

The same data source allows us to compare GDR across countries in 1970 (Table 2). According to the data, the Brazilian pattern of enrolments across grades was comparable to the ones presented by Colombia (0.38 and 0.37, respectively), while Latin America had already achieved 0.57. The relatively advanced South and South-East regions had a GDR of 0.42 and 0.48, respectively, which is not much different from poorer economies such as Paraguay (0.43) and El Salvador (0.46). Simultaneously, the North-East region presented a dismal index of 0.24, not even close to any Latin American country in the database.

Table 2: Gross enrolment rates (first six grades and primary level according to each country) (%) and GDR 1-6, Latin America and Caribbean countries (selected), 1970

Country	Enrolment rate (1-6)	Rank	Enrolment rate (Frankema 2009)	Rank	GDR 1-6
Argentina	71	7	105	8	0.70
Bolivia	56	16	68	17	0.44
Brazil	59	14	87	14	0.38
Chile	81	2	119	1	0.69
Colombia	65	11	103	10	0.37
Costa Rica	82	1	112	2	0.68
Dominican Rep.	66	9	107	5	0.34
Ecuador	71	6	97	11	0.54
Guatemala	37	18	58	18	0.33
Honduras	57	15	93	13	0.33
Mexico	73	5	104	9	0.52
Nicaragua	46	17	80	16	0.35
Panama	71	8	110	3	0.59
Peru	76	3	107	5	0.56
El Salvador	61	13	87	14	0.46
Trinidad y Tobago	64	12	107	5	0.87
Uruguay	73	4	110	3	0.79
Venezuela	66	10	95	12	0.65
Spearman correlation (enrolment rates):	0.849				

Source: Goldenberg (1990); UNESCO (1973); Frankema (2009).

Enrolment and GDR data are jointly mapped in Figure 8: the left map presents enrolment rates, while the right one contains GDR. The categories are defined by the quintiles of the distribution of country-level data (including Brazil). The relative disadvantage of the North-East and North in both variables is quite notable. Moreover, the GDR map shows that nearly all states in these regions presented ratios comparable to the lowest quintile of countries. The densely populated areas of São Paulo and Rio de Janeiro lessen the problem, increasing

the country's overall indicators. Nevertheless, the population of other regions are not negligible, as demonstrated by Figure 9.

Figure 8: Gross enrolment rates 1970, grades 1-6, Latin American countries and Brazilian states, 1970
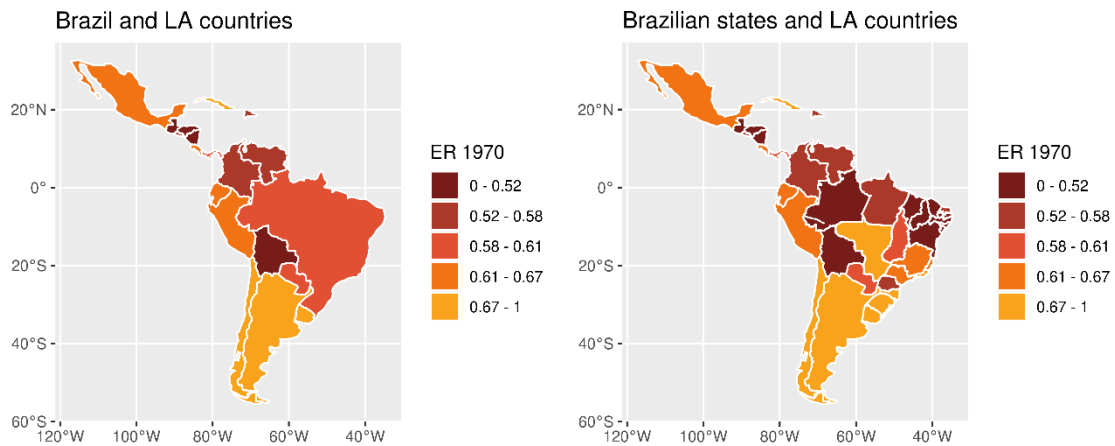
Source: See Section 2.

The same data in another useful setting for analytical purposes is shown in Figure 9.[22] First, each observation's size reflects the total population aged between 5 and 14 years in each country or Brazilian state. Most Brazilian states had larger populations than several Latin American countries. In addition, some states had meagre enrolment rates and GDR. According to our data, Brazilian states were expected to present lower GDR than neighbouring countries given a certain enrolment rate level. As highlighted in Figure 10, the result is qualitatively the

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[22] In fact, there is also considerable inequality within states, and even cities and neighbourhoods in Brazil. Analysing that is beyond the scope of this paper, but certainly an important matter, particularly in Brazil. Some historical studies have analysed educational outcomes in a more micro-level perspective (De Carvalho Filho and Colistete 2010; De Carvalho Filho and Monasterio 2012; Summerhill 2010; Naritomi, Soares and Assunção 2012). I thank Flavio Comim for this comment.

same ten years later, even though enrolment rates increased comparatively more in some Brazilian states *vis-á-vis* Latin American countries between 1970 and 1980.

Maps in Online Appendix B show the evolution of GDR in Brazilian states *vis-à-vis* Latin American countries between 1960 and 2000. Indeed, several Brazilian states lagged behind Latin American countries for decades. Brazil caught up with the Latin American average only in the turn of the century, when our comparative analysis of this indicator ends. Moreover, Brazil achieved a GDR of 0.82 in 2000, which is close to the Latin American average of 0.83 in the same year. Both the South-East and South had already achieved a GDR above 1.00. However, the North-East region lagged behind (0.67), and the North region's situation was even worse (0.57). While national GDR was similar to the ones presented by Paraguay or Colombia, southern, south-eastern and central-western states were distinctly ahead of the rest of Latin America.

It is worth analysing the situation of some specific states, such as the north-eastern state of Ceará. Enrolment rates until the sixth grade in Ceará was 38.2 per cent (considering the 5-14 aged population), a figure even larger than the one presented by Guatemala (36.7 per cent). However, GDR in Ceará was 0.24, a figure substantially lower than the Guatemalan GDR (0.33) in 1970. Such a problem was widespread in northern and north-eastern states. Both enrolment states and GDR in those states were below other countries in similar latitudes such as Ecuador and Peru, although the GDR problem was more intense.[23] All the states in the lower-left portion of Figures 9 and 10 belonged to the North-East or North regions.

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[23] These findings corroborate Brazilian educator J. R. Moreira, who wrote the following in a report: "[...] retardation in the primary schools reaches alarming proportions, expanding and enlarging the school age group, multiplying the first grades, crowding the classroom, and dividing the school periods into two, three or even four sessions because there are not enough funds to build more schools" (UNESCO 1958).

Figure 9: Gross enrolment rates and GDR, grades 1-6, Latin American countries and Brazilian states, 1970.
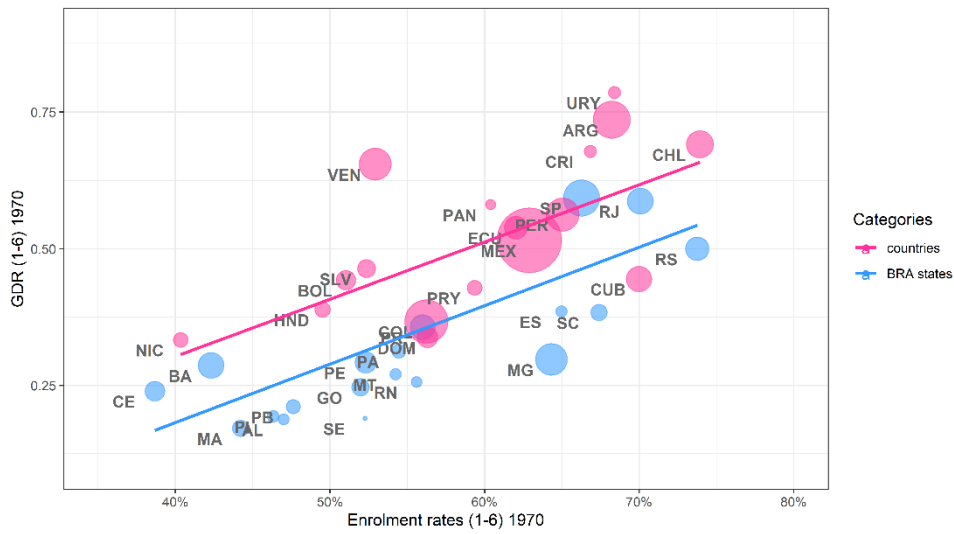
Source: See Section 2.

Figure 10: Gross enrolment rates and GDR, grades 1-6, Latin American countries and Brazilian states, 1980
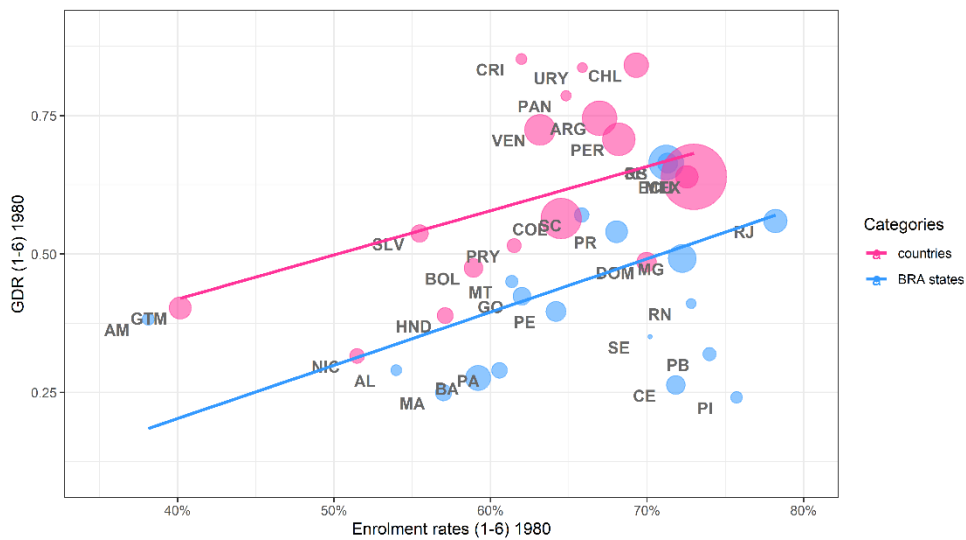
Source: See Section 2.

Note: Espírito Santo State was not included as it clearly presented an unlikely enrolment level given its historical trend in 1980. See Online Appendix C.

The same conclusion held for richer states. In addition to sharing similar climate conditions with Argentina and Uruguay, the southernmost state of Rio Grande do Sul was initially colonised by Spanish settlers since it was located west to the Tordesillas line. Like Uruguay, it specialised in cattle raising and received a huge flow of European immigrants

(mostly in the late nineteenth and early twentieth century). Moreover, Rio Grande do Sul and Uruguay shared not only a national border, but also the same enrolment rates (73 per cent of the population aged between 5 and 14 years in 1970). However, Rio Grande do Sul's GDR lagged substantially behind in 1970 (0.50 against 0.79 in Uruguay), only surpassing its neighbour in the 1990s. Apart from São Paulo, Rio de Janeiro and Distrito Federal (the industrial centre, the former capital and the new capital, respectively), all other states were below the Latin American expected mean given their enrolment rates.

5 Final remarks

In this paper, we provided national and state-level enrolment and retention indicators using a comparative perspective. Given the well-known regional inequality and the diverse historical experiences of different Brazilian regions, we also analysed Brazilian states. To tackle that, we built a new long-run dataset of education outcomes in Brazilian regions and states, since there was no long-run database on regional or state-level enrolment rates and GDR. For international comparisons, we reconstructed enrolment rates for Brazil and Latin American countries in 1970 and 1980. We also compared Brazilian states to Latin American countries using GDR as a further relative measure of education performance.

Although Brazil lagged behind several neighbouring countries in terms of enrolment rates, the GDR deserves a special mention: nearly all Brazilian states could be compared to the worst performers among Latin American countries in 1970 and 1980. Given a certain level of enrolment rate, Brazilian states were expected to present lower GDR. Furthermore, the poorer North and North-East regions were also those with lower enrolment rates and GDR. Despite being expected, the degree of educational backwardness of such regions may be surprising. In the early 1960s, those regions' situation was worse than in the poorest Latin American countries. Furthermore, the performance of advanced regions was not much better bearing in mind the undemanding Latin American standards.

The country's persistently low GDR reinforces the conclusion that the Brazilian education system has always been in trouble. Given the scarcity of historical data on education in Brazil, expanding data sources is crucial for continuing the research agenda, particularly for empirical research on long-run growth and inequality, since schooling is expected to have a considerable role in both variables. Moreover, the history of education performance matters not only for the instrumental role of education in generating economic growth but also as an integral part of human development – and Brazil has been a laggard in the latter aspect.[24] As Birdsall et al. (1996) had already underlined two decades ago, Brazil is a special case of low performance even compared to its neighbouring countries. Further investigation on child labour markets and other determinants of demand for schooling should be developed in the future, while supply drivers such as elite behaviour and institutional reasons must also be considered.

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[24] We thank one of the referees for reminding us of the relationship between education and the human development/capability approach. See Sen (1997) for an introductory view.

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A. Gross and net enrolment rates in upper secondary education, Brazil

Enrolment rates in *ensino médio* between 1940 and 2004 are plotted in Figure A1. The number

of enrolments is almost identical compared to Maduro (Pearson correlation of 0.999) (Maduro

2007). Here, we also kept the time span as constructed by Maduro (until 2004) for comparisons

(Maduro 2007).

Net enrolment rates are found from 1970 onwards in the case of *ensino médio*. In 1970,

only 5 per cent of the children aged between 15 and 17 were enrolled in the upper secondary.

Although improvements occurred, only a third of the children at this age group were in the

schooling level considered adequate for their age in 2000. In 2010, this figure was around 54
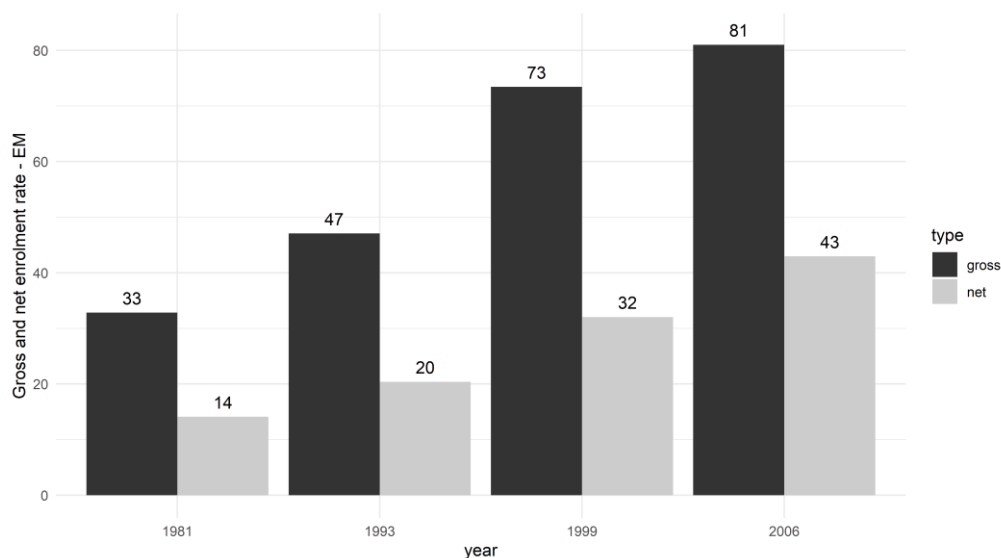
per cent (Figure A2).

FIGURE A1
Gross enrolment rates, new secondary education (*ensino médio* / upper secondary level -
EM), Brazil, 1933-2010
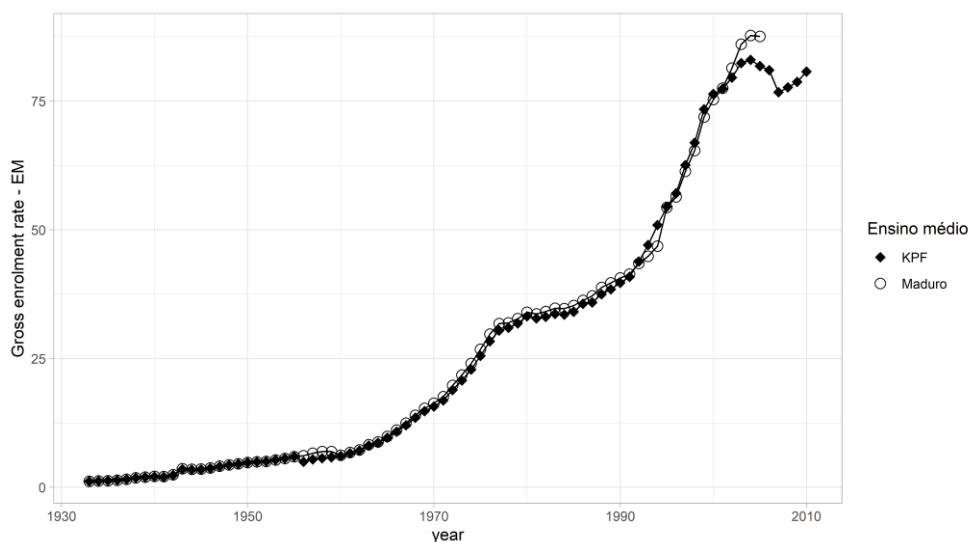
Source: Maduro (2007) and see Section 2.

FIGURE A2

Net and gross enrolment rates, *ensino médio* (upper secondary level), Brazil, 1981-2006

Source: see Section 2.

B. GDR in Brazilian states, 1960-2000

GDR in Brazil demands special attention. In 1960, the Latin American GDR was 0.41. Caribbean islands such as Trinidad y Tobago, Guyana and Barbados presented GDR above 0.80. Among Latin American countries, Argentina (0.63), Uruguay (0.58) and Panama (0.57) stood out (Frankema 2009). On the other hand, Brazil presented a GDR of 0.19 according to our dataset (Frankema found an even lower GDR: 0.17 in 1960). This index was comparable only to countries such as Nicaragua (0.18), Honduras (0.20) and Colombia (0.20). The first grid in Figure 15 illustrates this; Brazilian GDR was comparatively low, considering Latin American standards.

Applying GDR to Brazilian regions and states shows that the situation was even worse. In 1960, the North and the Northeast *both* had a GDR of 0.13, which is lower than any other small Central American country according to Frankema's dataset. The industrial Southeast presented a less unbalanced pattern of enrolment across grades (0.23), close to the result

presented by the Dominican Republic (0.24) but far from the results of neighbouring countries such as Uruguay (0.58) and Argentina (0.63). Hence, it becomes clear how unequal schooling was in different parts of Brazil since GDR in most states was lower than almost all Latin American countries. The wealthier states of São Paulo and Rio de Janeiro in the Southeast region presented relatively better indicators. The backward situation in the Northeast becomes clear in Figure 7, which shows the distribution of enrolments by the eight grades of the new primary education in the Northeast and the Southeast in 1960. Although the Southeast's results were already worrying, 60 per cent of pupils in the new primary education were enrolled in the first grade in the Northeast. This proportion cannot be clearly attributed to a mass schooling policy or any demographic phenomenon.

We carried out an extensive analysis of 1970 in the present study. In 1980, Brazil's GDR was 0.46, which is still much lower than the Latin American average (0.68). The Northeast (0.30) and the North (0.32) achieved levels similar to Nicaragua (0.32), which occupied the last position in the ranking of Latin American countries. The South and the Southeast (0.59 and 0.58, respectively) had better indicators than Paraguay and El Salvador, but still worse than Ecuador (0.64), Mexico (0.64) and even the Latin American average (0.68). Despite considerable improvements until 1980, the more impoverished regions still had a long way to go in order to overtake some poor Central American countries.

Brazilian figures were not available for 1990, so we selected 1991 indicators. Democracy seems to have influenced Brazilian elementary education since results became relatively better in the early 1990s (0.68 against 0.75 of Latin America). These figures seem consistent with the literature on late twentieth-century democratisation in Latin America and Brazil (Brown 2002; Brown and Hunter 2004). In regional terms, the Northeast and the North (both 0.45) were stuck at levels not substantially better than those of Nicaragua (0.41). In 2000, the centre-south portion of the country was clearly ahead the rest of Latin America. Finding the

reasons for such a transition in the 1990s in a comparative perspective is also an important research agenda.

FIGURE A3
GDR 1-6, Latin American countries and Brazilian states, 1960, 1980 and 2000.
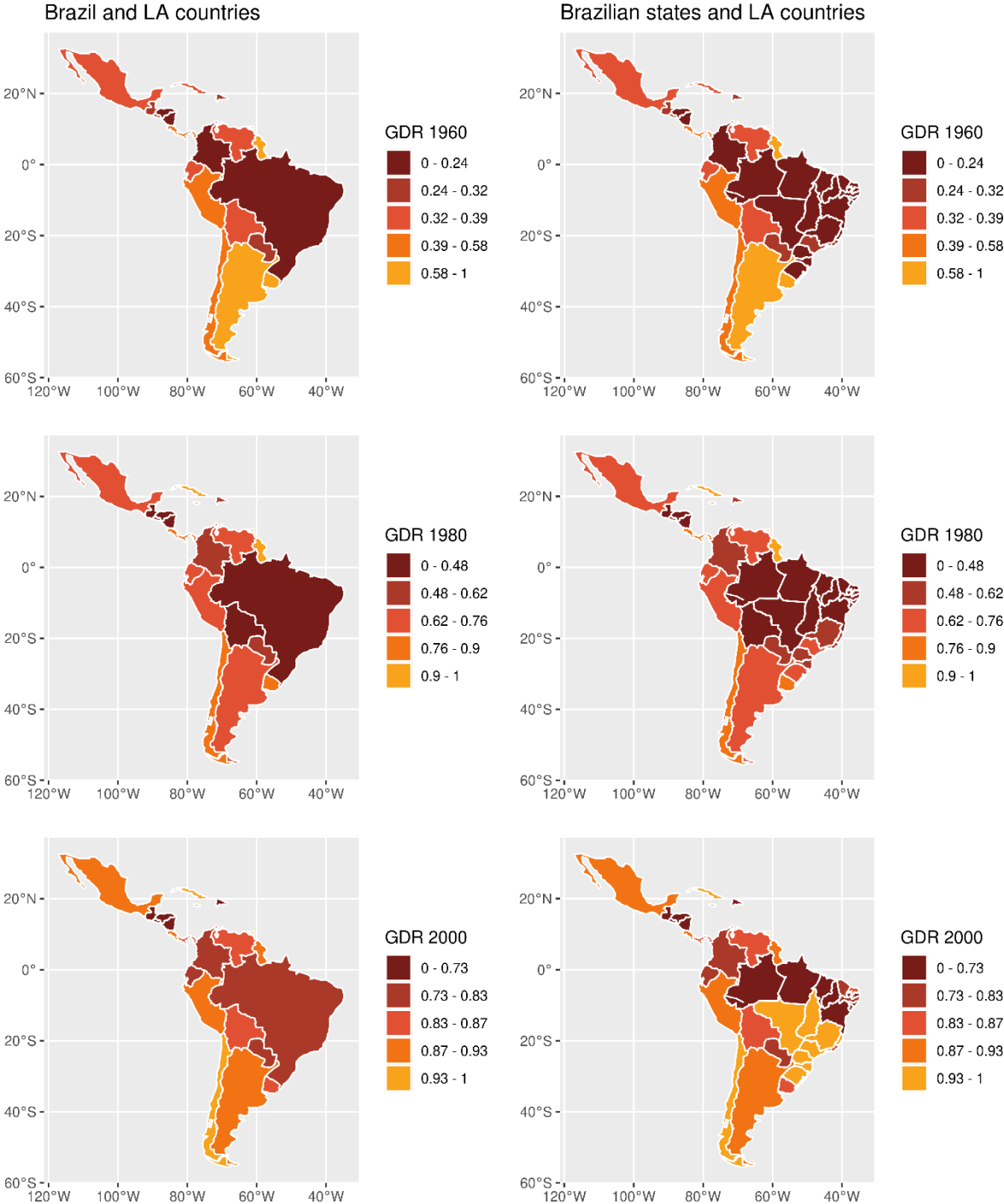
Source: see Section 2.

## C. Gross enrolment rates, states, 1955-2010

Estimates of gross enrolment rates are, to a large extent, based on Goldenberg (1990). Summarising state-level enrolments did not match national figures in several years, which led us to adopt a mathematical adaptation to make the dataset consistent. The differences between the original numbers and the standardised rate that we adopted are small (Figure 16).

Some outliers, such as Espírito Santo in 1980 and Goiás in 1981, draw our attention. Although these are apparent mistakes, it is not clear how we should proceed to correct the data. Minas Gerais reportedly adopted an extra school year that was not documented in Goldenberg (1990) in the late 1980s, explaining the sudden drop during that period. Even though we are confident about the large majority of the estimates, specific information for a particular year and state should be analysed with care.

FIGURE A4

Gross enrolment rates, new primary education (*ensino fundamental* - EF), states, Brazil, 1955-2010
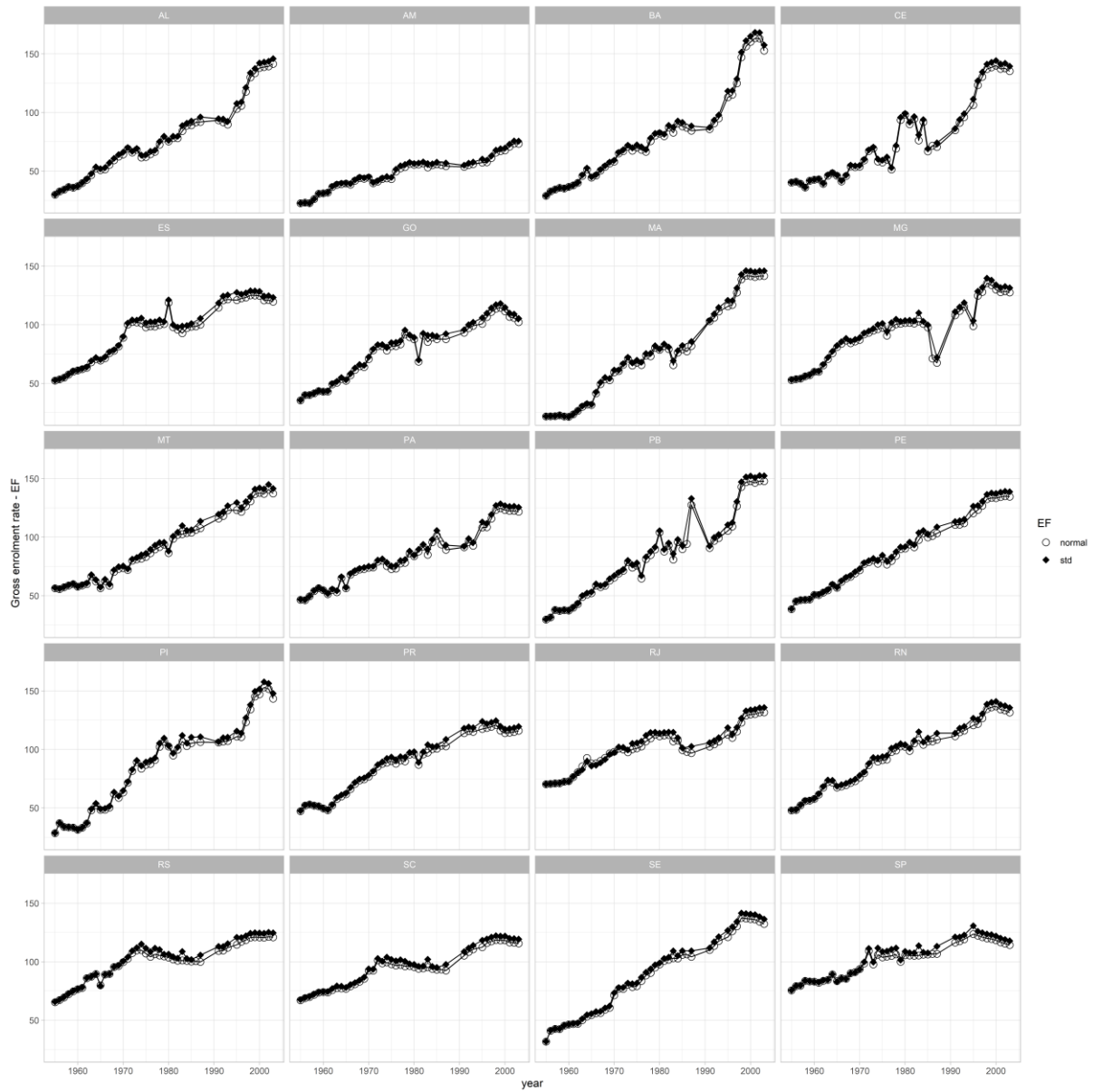
Source: mostly from Goldenberg (1990) (see Sections 2 and 3).