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Examining educational inequality across the economic life cycle in Brazil on the basis of 2018 national transfer accounts

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Abstract

This study examines educational inequality throughout the economic life cycle in Brazil on the basis of age-disaggregated data from 2018 national transfer accounts and household heads' education levels. The analysis confirms patterns observed two decades ago, revealing marked disparities in the life cycle deficit —the gap between labour income and consumption— across education groups. Young people in less educated households rely heavily on public transfers to meet their consumption needs. Meanwhile, older persons across all education groups depend heavily on public transfers. With declining child populations, the findings emphasize that education investment is a vital policy tool to enhance labour income, reduce dependency on public transfers and support a more sustainable welfare system.

Keywords: education, equality, educational policy, national accounts, income, demographic ageing, Brazil.

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Resumen

En este estudio se analiza la desigualdad educativa a lo largo del ciclo de vida económico en el Brasil, a partir de datos desagregados por edad de las cuentas nacionales de transferencias de 2018 y los niveles educativos de los cabezas de familia. Se confirman los patrones observados hace dos décadas, que revelan disparidades pronunciadas en el déficit del ciclo de vida —la brecha entre los ingresos laborales y el consumo— en función del nivel educativo. Los jóvenes de los hogares con menor nivel educativo dependen en gran medida de las transferencias públicas para cubrir sus necesidades de consumo, y lo mismo sucede en el caso de las personas mayores de todos los niveles educativos. Ante el descenso de la población infantil, la inversión en educación es un instrumento de política esencial para aumentar los ingresos laborales, reducir la dependencia de las transferencias públicas y promover un sistema de bienestar más sostenible.

Palabras clave: educación, igualdad, política educativa, cuentas nacionales, ingresos, envejecimiento de la población, Brasil.

Resumo

Este estudo examina a desigualdade educacional durante o ciclo de vida no Brasil com base em dados desagregados por idade de contas nacionais de transferência de 2018 e níveis de escolaridade dos chefes de família. A análise confirma padrões observados há duas décadas, revelando disparidades acentuadas no déficit do ciclo de vida (diferença entre a renda do trabalho e o consumo) entre níveis de escolaridade. Os jovens em famílias com menos instrução dependem muito de transferências públicas para satisfazer suas necessidades de consumo. As pessoas idosas em todos os níveis de instrução dependem muito de transferências públicas. Com a diminuição da população infantil, os resultados enfatizam que o investimento em educação é uma política vital para aumentar a renda do trabalho, reduzir a dependência de transferências públicas e apoiar um sistema de bem-estar social mais sustentável.

Palavras-chave: educação, igualdade, política educacional, contas nacionais, renda, envelhecimento do população, Brasil.

Introduction

Educational inequality remains a significant challenge for economic and social development, affecting individual opportunities, family well-being and the sustainability of the welfare state. Education is considered vital in improving social mobility and living standards, and influences consumption, labour income and other economic functions over the life course (Abio and others, 2017; The Global Goals, 2024). Inequalities in educational attainment have a significant impact on economic outcomes throughout life, resulting in disparities that persist across generations.

The national transfer accounts framework serves as a valuable tool for analysing generational economies within the context of national accounts (European Commission and others, 2009; Lee and Mason, 2011; United Nations, 2013; Abio, Patxot and Souto, 2023). It reveals the role of governments, markets and families in redistributing resources to address life cycle deficits —situations in which consumption exceeds labour income— across different life cycle stages. Typically, the working-age population's labour income is greater than its consumption, enabling it to support children and older persons through private or public transfers (Lee and Mason, 2011). In Brazil, the public sector plays a central role in transferring resources from the working-age population to older persons (Turra, 2000; Turra, Queiroz and Rios-Neto, 2011; Correa, Carrasco-Gutierrez and Turra, 2025; Schwarzer, Pereira and Paiva, 2009; Silva, Porsse and Bittencourt, 2022). In contrast, families assume most of the responsibility for supporting children.

While national transfer accounts provide essential insights into intergenerational transfers, average estimates may hide underlying social inequalities. Recent extensions of the national transfer accounts framework have explored the intersections between education and age, uncovering disparities in income, consumption and life cycle deficit among different education groups (Turra and Queiroz, 2005; Melo and Rios-Neto, 2020; Abio and others, 2017; Prskawetz and Hammer, 2018; Rentería and others, 2016; Spielauer and others, 2022). Populations with higher education levels tend to have higher labour income and greater surplus, indicating the connection between educational attainment and economic outcomes.

Turra and Queiroz (2005) were pioneers in studying intergenerational transfers as part of the national transfer accounts project, focusing on educational status using data from Brazil collected in 1996. The study revealed that the public sector was responsible for transferring resources to older persons, regardless of their educational attainment. In contrast, public transfers for children were more concentrated among those living in low-education households. This uneven distribution of resources across generations by the public sector helped to perpetuate poverty and inequality. However, Brazil has experienced significant demographic, political, social and economic changes over the past two decades. Income transfer policies targeting children and young people were developed and

implemented to combat poverty. With the decline in total fertility rates, public and private investments in children have increased, notably through the expansion of the educational system (Correa, Carrasco-Gutierrez and Turra, 2025). There have also been some partial social security reforms to limit the increase in public transfers to older persons.

Therefore, it is important to revisit the patterns identified in 1996 using more recent data to understand how these changes may have influenced intergenerational transfers across different education groups. To that end, we enhance the original national transfer accounts framework (United Nations, 2013) by examining estimates based on the education level of the household head, using both population and economic data from Brazil in 2018. Our initial hypothesis is that families with a higher socioeconomic status may both produce and consume more. Moreover, the patterns identified nearly two decades ago are still prevalent, and the power imbalance between economic groups and generations continues to favour adults and older persons over children, particularly those living in poorer households, despite efforts to create more balanced public policies in Brazil.

A. Related literature

Literature on national transfer accounts has evolved since the release of the methodological manual by the United Nations in 2013, with a focus on disaggregation by socioeconomic measures and gender. According to Tovar and Urdinola (2014), research on intergenerational transfers can reveal how social protection can be directed towards economically vulnerable populations, ultimately reducing poverty rates, particularly through public cash transfers. In Latin America, intergenerational transfers account for more than 30% of total consumption, as noted by the authors. Many researchers have emphasized the role of intragenerational differences in addressing social inequalities within populations. As Rosero-Bixby (2024, p. 1) points out, "[national transfer account] averages might be misleading or meaningless for the majority of the population when extreme inequalities exist".

The connection between education and national transfer accounts has been significant inside and outside Latin America. For example, Abio and others (2017) analysed national transfer accounts on the basis of the education level of the household head in Spain for 2006. The authors showed that educational attainment, a relatively stable household head characteristic, is a more reliable proxy for estimating permanent socioeconomic status than annual income. This relates to income being subject to fluctuations due to economic cycles, employment changes or other short-term and life cycle factors. Education level as a critical variable allows a better understanding of a household's long-term economic potential and living standards. This is often reflected in the cumulative effects of education on earning capacity and job stability. The study on Spain found that households with higher education levels tend to produce and consume more, contribute more to the public system through tax payments and rely less on public transfers. Consequently, education is crucial for the sustainability of the welfare state in an ageing society. Similar findings have been

reported in other research from around the world on national transfer accounts with a focus on education (Abio and others, 2017; Oosthuizen, 2024; Prskawetz and Hammer, 2018; Rentería and others, 2016 and 2024; Spielauer and others, 2022).

In Latin America, Mejía-Guevara (2015) argued that differences in socioeconomic status could explain essential nuances of the reallocation of intergenerational flows in Mexico. The author used household heads' highest level of education as a proxy for socioeconomic status, classifying it into four different groups. The results indicated that significant reallocations among socioeconomic status groups could not be effectively analysed using the traditional national transfer accounts age averages. The age-specific labour income and consumption in the country were only half the national averages in the lowest socioeconomic status group, while they far outstripped these averages in the highest socioeconomic status group (Mejía-Guevara, 2015). Amarante and others (2021) found disparities in net public transfers by education level in Uruguay. According to the authors, "under plausible scenarios of educational expansion, net public flows result in a higher surplus in public accounts" (Amarante and others, 2021, p. 1). In Peru, Olivera (2023) showed that the expansion of tertiary education between 2007 and 2019 reduced inequality. Younger individuals, in particular, have benefited from the country's economic growth over the years, despite the worse living conditions faced by the older and less educated populations.

Rosero-Bixby (2024) examined the national transfer accounts in Ecuador on the basis of socioeconomic status for the years 2006 and 2011 to investigate whether the rapid ageing of the population would lead to increasing inequalities in the country. The author used the highest level of education in a household as a proxy for socioeconomic status because it met three criteria: (i) it served as a household-level indicator, (ii) it was exogenous to the economic flows measured by national transfer accounts and (iii) it was unaffected by age. Individuals were categorized into four education quartiles: low, mid-low, mid-high and high. The study found that the national transfer account averages did not accurately reflect the economic life cycle of the low-socioeconomic status half of the population, which depended more on transfers from higher-socioeconomic status households or oil export revenue. Additionally, high-socioeconomic status households invested significantly more in human capital formation than low-socioeconomic status households, particularly regarding private health and education.

In Brazil, in addition to the pioneering work by Turra and Queiroz (2005), Melo and Rios-Neto (2020) examined data from the 2008–2009 Household Expenditure Survey to calculate the age profile of consumption and labour income across different education levels (less than primary, primary, secondary and post-secondary). They followed the United Nations (2013) methodology to assess the effect of education on Brazil's demographic dividend. The results revealed significant inequality in both consumption and labour income: as educational attainment increased, so did both consumption levels and labour income. Notably, the group with post-secondary education exhibited much higher consumption and labour income levels than the other education groups. Furthermore, the

authors demonstrated that educational expansion has been and will continue to be a major contributor to the economic gains during Brazil's demographic dividend period, surpassing the impact of changes in the age structure.

B. Methods

The original national transfer accounts framework disaggregates national accounts by age, and the arrangement of national accounts identities emphasizes the difference between labour income Y^l and consumption C, known as the life cycle deficit (as shown on the left side of equation (1)) and its components (United Nations, 2013). The aggregate life cycle deficit corresponds to the aggregate consumption that cannot be covered by aggregated labour income in the economy for a particular year. The same interpretation applies to each age i in the analysis. Cross-sectional per capita estimates are often associated with consumption and labour income for an average individual over the life cycle.

$$\underbrace{\sum_m \sum_n \sum_i C_{m,n,i} - \sum_z \sum_i Y^l_{z,i}}_{\text{Life cycle deficit}} = \underbrace{\underbrace{\sum_m \sum_n \sum_i \tau^+_{m,n,i} - \sum_m \sum_n \sum_i \tau^-_{m,n,i}}_{\text{Net transfers}} + \underbrace{\sum_m \sum_i Y^A_{m,i} - \sum_m \sum_i S_{m,i}}_{\text{Asset-based reallocations}}}_{\text{Age reallocations}} \quad (1)$$

The life cycle deficit must be financed through intertemporal or intergenerational reallocations, as shown on the right side of equation (1). Markets, households and the government are the main channels for these reallocations. For example, parents can transfer resources (outflow transfer τ^-) to their children (inflow transfer τ^+), while an adult can use savings S or asset income Y^A to cover future consumption. Consumption is traditionally decomposed into n functions (e.g. education, health, collective goods and services, and housing). However, there are different economic functions for public transfers (education, health, collective goods and services, general pensions, public servants' pensions, other in-kind transfers and other in-cash transfers) and private transfers (education, health, consumption other than education and health, savings and interhousehold transfers). Lastly, labour income is derived from z types: earnings or self-employment.

The original national transfer accounts methodology has been expanded to decompose data on the basis of various social factors, such as education, to analyse intragenerational disparities. Abio and others (2021) emphasize the importance of deciding whether to classify individuals on the basis of individual education level or the education level of the household head. In our study, we opted to use the latter, as we believe it is a more stable and better proxy for the socioeconomic status of other household members throughout their life cycles, including children (Abio and others, 2017 and 2021; Tovar and Urdinola, 2014; Turra and Queiroz, 2005). Moreover, in longitudinal analyses, the education level of the household head is also more effective in tracking households over time (United Nations, 2013).

We assume that the educational distribution of macro aggregates (national accounts) mirrors the educational distribution of proxy aggregates in the micro dataset (household surveys). The total amount of net private transfers (flows between the private sector and the rest of the world) was evenly divided among education groups, with one third allocated to each group. All age-related curves from 0 to 90 years or older were smoothed using Friedman's SuperSmoother, except in the case of education (United Nations, 2013, p.159). Aside from education and health, in-kind public transfers were distributed equally across all ages (United Nations, 2013, p.103).

Lastly, all national transfer account estimates were computed on the basis of the education level of the person identified as the household head in the household survey. Initially, we categorized the number of education groups into four levels (less than primary, primary, secondary and post-secondary), in line with Melo and Rios-Neto (2020) for Brazil. However, we combined the first two categories to smooth the data: (i) primary education, which includes no education, nursery school, preschool, literacy classes, literacy programmes for adults and young people, elementary school and adult education at the elementary level; (ii) secondary education, which encompasses high school and adult education programmes that lead to a high school diploma; and (iii) post-secondary education, which includes individuals who have obtained a post-secondary degree, including those who have completed specialization courses, master's degrees or doctorates. In summary, post-secondary education refers to anyone with a post-secondary degree, secondary education includes those who have finished high school but who have not obtained a post-secondary degree, and primary education covers all education levels. These categories are in line with recent studies by Kelin, Istenič and Sambt (2023), Oosthuizen (2024), and Rentería and others (2024).

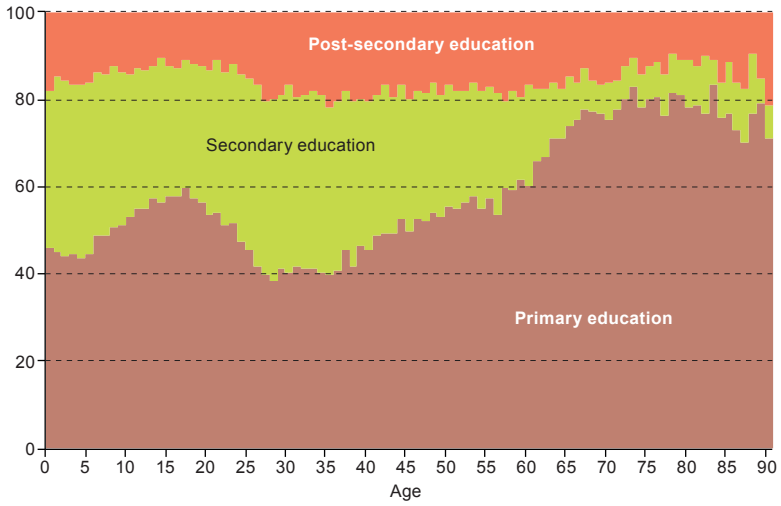
We used national accounts, administrative records, surveys and 2018 population estimates to calculate traditional national transfer accounts according to the United Nations manual (United Nations, 2013). We collected macroeconomic aggregates from the integrated economic accounts within the System of National Accounts, as provided by the Brazilian Institute of Geography and Statistics (IBGE) (IBGE, 2024a). We also gathered data on expenditures from the General Social Security Regime (RGPS) and the Civil Servants' Social Security Scheme (RPPS) to enhance our macroeconomic controls (Ministry of Social Welfare, 2024).

The next step involved using the Household Expenditure Survey to break down macro aggregates by age (IBGE, 2024b). This estimation required administrative records detailing per capita public expenditures on education from the National Institute of Educational Studies and Research Anísio Teixeira (INEP, 2024) and age-specific public expenditure records for outpatient and inpatient care from the Ministry of Health (2024). An age-related equivalence scale for private health consumption was also derived from the household health expenditure data collected in the 2019 National Health Survey (IBGE, 2024c). At the end of this process, population estimates from the household survey were adjusted to align with the 2018 population projections revision provided by IBGE (IBGE, 2024d).

Figure 1 shows the population distribution by age and the education level of the household head, based on the 2018 Household Expenditure Survey. On average, 52.7% of households had a head with primary education, 31.0% had a head with secondary education and 16.2% had a

head with post-secondary education. Most people lived in households where the head had not attained secondary or post-secondary education. However, younger people were more likely to belong to households where the head had completed secondary education, while older persons were more common in households whose heads only had primary education. This pattern reflects the late expansion of education in Brazil, particularly after the 1990s.

Figure 1
Brazil: population distribution, by age and household heads' education level, 2018
(Percentages)



Source: Prepared by the authors, on the basis of data from the Brazilian Institute of Geography and Statistics (IBGE).

C. Results

In 2018, Brazil recorded a life cycle deficit of 778 billion reais (R$) (see table 1). Only households whose heads had post-secondary education reflected a life cycle surplus. On average, each person in these households had a surplus of R$ 9,005. However, households headed by people with post-secondary education represented just 16% of the country's total population. As a result, the total surplus of R$ 305 billion from these households was insufficient to offset the life cycle deficit of R$ 1,083 billion in the less educated households.

The total labour income generated by individuals living in households where the head of the family had post-secondary education amounted to R$ 1.807 trillion, which represented 44% of overall labour income totalling R$ 4.148 trillion. On average, per capita labour income in these households was more than five times higher than that of individuals living in households where the head had only primary education. While per capita consumption also increased with higher levels of education, the disparities in consumption between different education groups were smaller, which helps to explain the life cycle surplus among individuals living in households where the head had post-secondary education.

Table 1
Brazil: life cycle deficit, by component and education level of household heads, 2018
(Per capita values in reais and aggregate values in millions of reais)

Account	Total	Primary education	Secondary education	Post-secondary education
Per capita values in reais				
Life cycle deficit	3 733	8 773	1 834	-9 005
Consumption	23 628	18 492	21 499	44 381
Public consumption	6 684	6 843	6 586	6 351
Education	1 610	1 631	1 753	1 268
Health	1 163	1 301	923	1 172
Collective goods and services	3 790	3 790	3 790	3 790
Other	121	121	121	121
Private consumption	16 944	11 649	14 912	38 030
Education	644	240	622	1 998
Health	1 119	594	830	3 378
Housing	2 790	1 874	2 373	6 564
Other	12 391	8 941	11 087	26 091
Labour income	19 894	9 719	19 665	53 386
Aggregate values in millions of reais				
Life cycle deficit	778 394	964 495	118 676	-304 777
Consumption	4 926 290	2 032 988	1 391 134	1 502 169
Public consumption	1 393 480	752 344	426 179	214 957
Education	335 689	179 364	113 415	42 909
Health	242 453	143 049	59 718	39 686
Collective goods and services	790 204	416 677	245 246	128 282
Other	25 134	13 253	7 801	4 080
Private consumption	3 532 810	1 280 644	964 954	1 287 212
Education	134 182	26 337	40 229	67 616
Health	233 328	65 253	53 737	114 338
Housing	581 763	206 063	153 540	222 159
Other	2 583 537	982 991	717 448	883 098
Labour income	4 147 896	1 068 493	1 272 458	1 806 945
Population	208 494 900	109 939 954	64 707 904	33 847 042

Source: Prepared by the authors, on the basis of data from Brazilian Institute of Geography and Statistics (IBGE), National Institute of Educational Studies and Research Anísio Teixeira (INEP) and Ministry of Health, DATASUS [online] https://datasus.saude.gov.br/informacoes-de-saude-tabnet/.
Note: "Collective goods and services" refers to collective public administration services in the national accounts and "Other" is a residual category.

Subgroups with higher education levels reallocated more resources to human capital investments, including education and health private transfers, compared to those with lower education levels. As a result, the public sector played a key role in providing additional education and health services to less educated families to buffer the private transfer differences. On average, per capita public consumption was higher among individuals from less educated households (R$ 6,843 for households where heads had primary education,

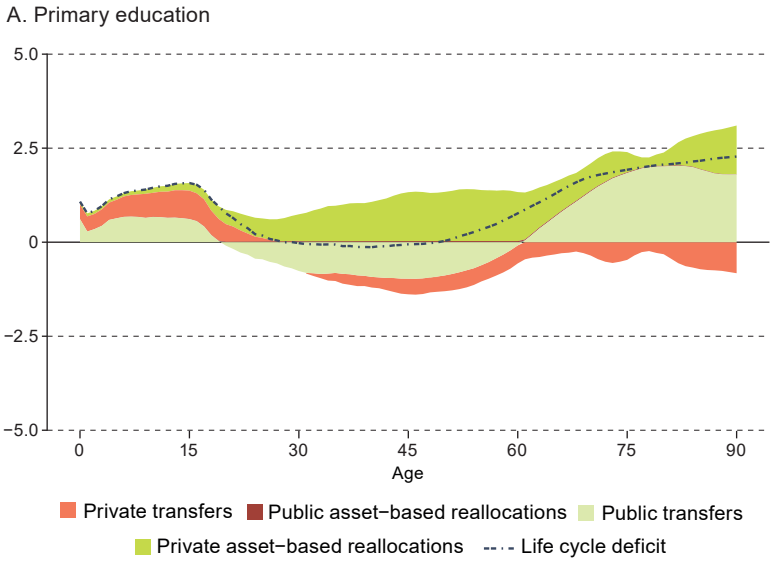
R$ 6,586 where they had secondary education, and R$ 6,351 where they had post-secondary education), as shown in table 1. The other forms of public consumption were collective goods and services, which in our model are distributed equally among the population subgroups.

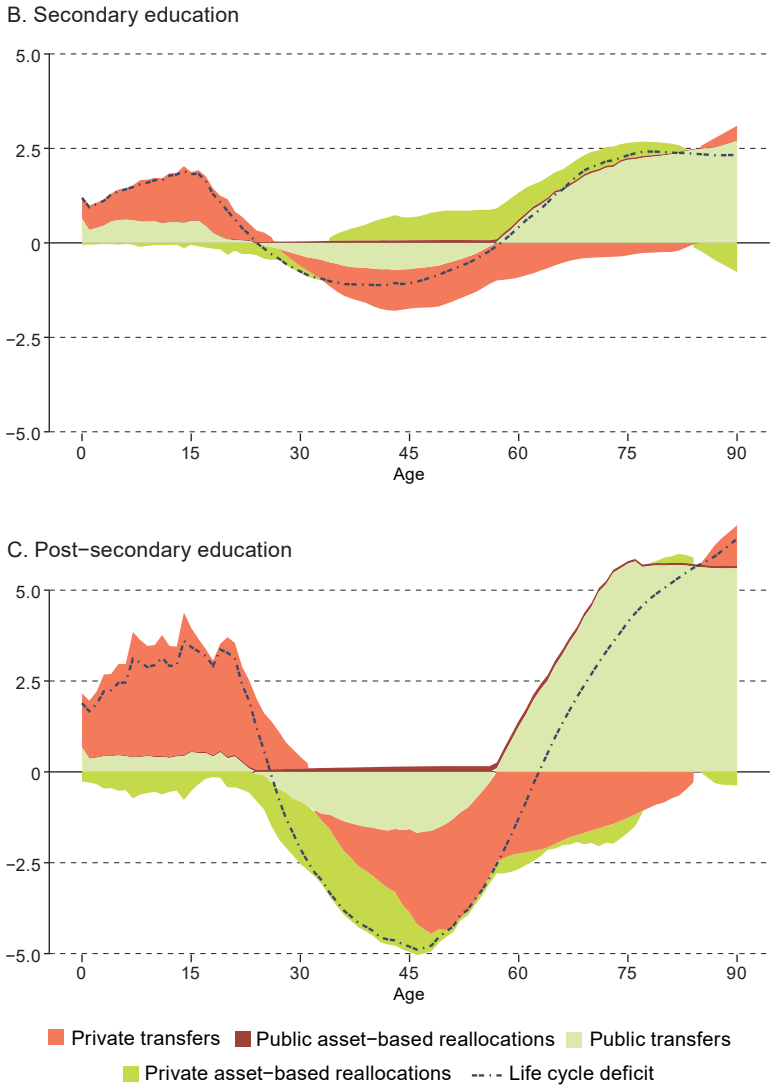
The per capita life cycle deficit based on education level followed a predictable pattern throughout the economic life cycle (see figure 2). At one end, children and older persons earned insufficient labour income to cover their consumption, resulting in a life cycle deficit. In contrast, the working-age population generated labour income that exceeded their consumption, leading to a life cycle surplus. However, individuals from households where the head of the family only had a primary education recorded a smaller surplus and it was distributed over fewer working years compared to other education groups. As education levels rise, the magnitude and duration of the economic surplus tend to increase. Individuals with secondary education typically start generating a surplus around age 25, while those with post-secondary education begin at age 26. Notably, the life cycle surplus lasts longer for households with post-secondary education, until age 62, compared to age 57 for those with only secondary education. On average, individuals in primary and secondary education groups do not generate enough resources to support children and older persons, resulting in intra-age transfers among individuals of different socioeconomic status.

Figure 2

Brazil: per capita life cycle deficit, by age, education level and type of financing, 2018

(Thousands of reais per month)





Source: Prepared by the authors, on the basis of data from Brazilian Institute of Geography and Statistics (IBGE), National Institute of Educational Studies and Research Anísio Teixeira (INEP) and Ministry of Health, DATASUS [online] https://datasus.saude.gov.br/informacoes-de-saude-tabnet/.

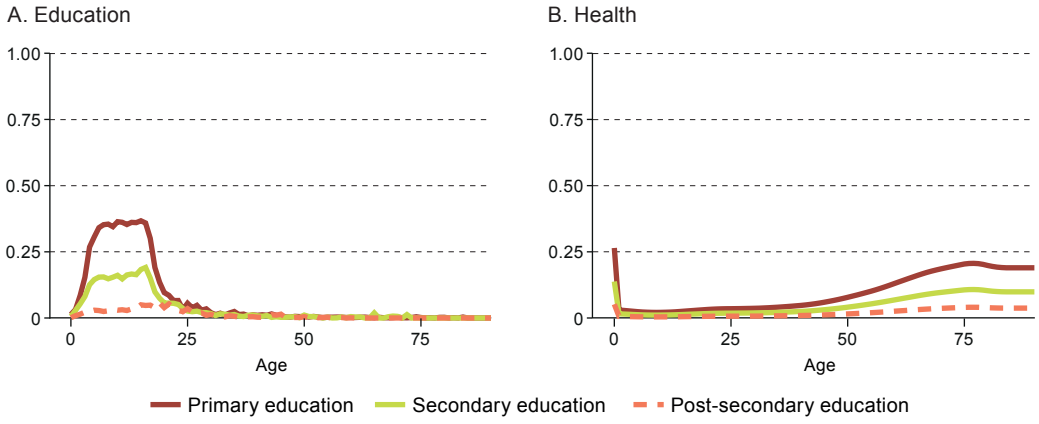
Among children, public transfers accounted for about half of total per capita consumption, helping to reduce the consumption gap between less educated and more educated households. However, these transfers were not enough to offset the higher private transfers to children in more educated households. As a result, children in less educated households received significantly less investment relating to per capita consumption. This disparity was especially pronounced at the highest education level: children in households where heads had post-secondary education had almost double the per capita consumption of those in other households.

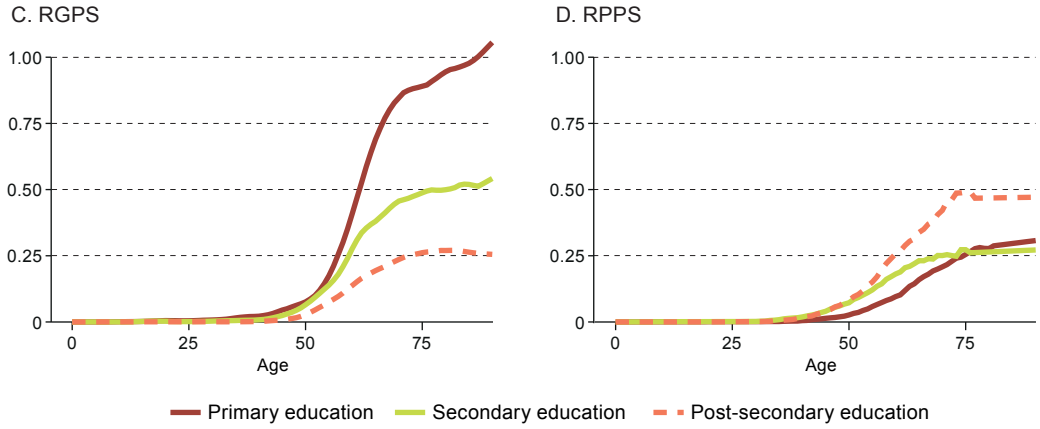
The per capita life cycle deficit among older age groups was higher than that among children. However, unlike in the case of children, public transfers became the primary source of funding for older persons across all education levels, indicating that older persons relied on public transfers regardless of their educational attainment. Nevertheless, public transfers did not decrease with higher education levels; instead, they increased among households with post-secondary education. One reason for this trend is the relationship between labour income and social security benefits, as individuals who contribute more to the system receive higher benefits. This also reflects the higher concentration of highly educated individuals in public sector jobs, which offer better retirement benefits than the private sector. On average, older persons placed a significantly greater financial burden on the public sector than children, and this disparity was even more pronounced among households with higher levels of education.

The types of public transfer vary significantly between children and the older population (see figure 3). Education, health, pensions (RGPS and RPPS), and collective goods and services account for 85.3% of total public transfers. Most public expenses directed towards children focus on two main types of in-kind transfer: education and health. During early childhood, there are higher public expenditures on health, likely due to the increased risk of mortality among newborns. After this critical period, public transfers concentrate primarily on providing education to children and young people, particularly during the primary and secondary education years. Individuals in households with post-secondary education typically consume less public education relative to their labour income. Moreover, the age profiles are older, indicating a relatively higher demand for public post-secondary education.

Figure 3

Brazil: per capita public transfers (inflows), by age and type of transfer, normalized on the basis of mean labour income of persons aged 30–49, 2018





Source: Prepared by the authors, on the basis of data from Brazilian Institute of Geography and Statistics (IBGE), National Institute of Educational Studies and Research Anísio Teixeira (INEP) and Ministry of Health, DATASUS [online] https://datasus.saude.gov.br/informacoes-de-saude-tabnet/.

As people age, the demand for public health services increases. In addition, cash transfers become a primary source of support for older persons. This support mainly comes from the two pension systems: RGPS (designed for the general population) and RPPS (meant for civil servants and military personnel). As mentioned earlier, there are significant differences between these systems based on education levels. For people with the lowest educational attainment, RGPS transfers are relatively larger, surpassing their average income during their most productive years. This indicates a pattern of intra-age transfers across different education groups. In contrast, the pensions provided to public employees are more substantial for households with higher education compared to those with lower education. Therefore, the trends among different education groups are reversed.

D. Conclusion

Our study confirms and builds on the findings of Turra and Queiroz (2005), who discussed the inequitable distribution of public transfers across generations and education groups in Brazil. After more than two decades of demographic, social and economic transformations, the core patterns they identified remain strikingly relevant. Public transfers still favour older persons, regardless of educational attainment, while children from less educated households continue to rely heavily on public support. As a result, social inequalities are perpetuated, despite efforts to expand investments in education and enact policies targeting poverty reduction.

Building on Correa, Carrasco-Gutierrez and Turra (2025), who estimated intergenerational transfers for Brazil in 2018, our results reveal nuances not captured in their analysis based on age only. By disaggregating intergenerational accounts on the basis of educational attainment, we demonstrate significant disparities within socioeconomic groups. This approach underscores the importance of educational attainment in shaping

consumption, labour income and life cycle deficits, showing that families with higher education levels consistently achieve life cycle surpluses, while less educated families remain economically vulnerable.

Our findings also align with those of Melo and Rios-Neto (2020), who emphasized the transformative potential of educational expansion to shape Brazil's economic gains during its demographic dividend period. Like their work, our results confirm the substantial life cycle surpluses generated by more educated households. However, by further decomposing the life cycle deficit and examining private and public reallocations, we add new dimensions to their findings, revealing the mechanisms through which education amplifies economic advantages and mitigates vulnerabilities across generations.

While Brazil has made strides in increasing investments in children and implementing policies to combat poverty, imbalances in public expenditures persist. Pensions for older persons continue to dominate fiscal priorities, limiting the potential for equitable redistribution across generations. The findings reinforce the enduring importance of policies aimed at addressing structural inequalities, particularly through education as a lever for promoting generational and socioeconomic equity. By revisiting the patterns observed in 1996 using 2018 data, we show that while demographic and policy changes have influenced intergenerational transfers, the fundamental disparities identified by Turra and Queiroz (2005) persist. Our study not only reaffirms their pioneering work but also complements and builds on the analyses of Correa, Carrasco-Gutierrez and Turra (2025) and Melo and Rios-Neto (2020), providing deeper insights into Brazil's generational economy and its long-standing inequities.

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