Intergenerational Educational Mobility in Brazil*

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Abstract

Brazil has a reputation for being a low intergenerational mobility country, yet nearly all estimates of mobility in Brazil measure *relative* mobility, preventing meaningful subgroup comparison. I estimate bottom half educational mobility, a new mobility measure that enables comparison of upward mobility across racial groups and time, for children born in the 20^{th} century in Brazil. I find that mobility stagnated for children born between 1910 and 1960, and improved significantly for those born between 1960 and 1990. I show the large gap between black and white upward mobility in 1960 closed significantly by 1990, but a similar gap between black and white downward mobility persisted over the same time period. Together, these results provide some evidence that educational mobility may not be central to racial wage disparities or a lack of income mobility in Brazil.

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1 Introduction

Brazil is known for its "extreme inequality" (Assouad et al., 2018) and research repeatedly finds the country has close to (if not) the lowest level of intergenerational mobility in international comparisons (Behrman et al., 2001; Blanden, 2011; Leone, 2019). The situation may be improving, as recent work finds the strength of the association between parent and child income rank has fallen (Dunn, 2007; Leone, 2019). While this result sounds encouraging, previous measures of mobility like rank-rank association cannot distinguish between upward and downward mobility or show how upward mobility varies by race; consequently, prior work cannot provide a direct answer to central questions about mobility in Brazil like: (1) where do we expect a child of a parent at the bottom of society to end up, (2) how does that child in Brazil compare to similar children in other countries, and (3) does that child's race play a large role in where they end up?

The literature on intergenerational mobility in Brazil is limited in part because there is only one public nationally-representative dataset that measures and links parent and child income or education level. This dataset — the National Household Sample Survey (PNAD) — only contains information about parent education (not income), and until recently, few methods were available to estimate *upward* mobility with this limited data. The answers to the aforementioned questions lie at the heart of societal fairness, and according to canonical models of intergenerational mobility (Becker and Tomes, 1979), they may shape racial inequality in Brazil in the long-run.

I estimate educational upward mobility with a new measure, bottom half mobility,[1] on the aforementioned dataset and find that educational upward mobility in Brazil has improved considerably from the 1950 birth cohort to the 1980 birth cohort. I show

[1]Bottom half mobilitiy is the expected education rank of a child born to a parent in the bottom half of the education distribution (Asher et al., 2021).

that upward educational mobility for the 1980 birth cohort in Brazil is comparable to upward income mobility in the US, but not as high as upward income mobility in Norway (Asher et al., 2021). I also find that *black* upward educational mobility was substantially lower than *white* upward educational mobility for children born in the 1960s, but this difference largely disappears by the 1980s. On the other hand, the gap between black and white downward mobility persists over the same time period. Taken together, these estimates of upward educational mobility provide some evidence that educational mobility may *not* be central to racial wage disparities or a lack of income mobility in Brazil.

2 Literature Review

Nearly all prior estimates of intergenerational mobility in Brazil measure mobility as the slope of parent income rank when regressing child income rank on parent income rank (hereafter, rank-rank gradient), where rank is the relative percentile (between 0 and 100) of a parent or child in their respective income distribution. The consensus from this literature is that income mobility, when measured by rank-rank gradient, has improved substantially from the 1950s birth cohort to the 1980s birth cohort (Dunn, 2007; Ribeiro, 2017). Many authors attribute this trend to declining returns to education (Ferreira and Veloso, 2006; Dunn, 2007; Leone, 2019). The rank-rank gradient measure comes with two large limitations: (1) lack of comparability across subgroups and (2) inability to distinguish *upward* and *downward* mobility.

Prior intergenerational mobility work in Brazil compare subgroup *relative* mobility. Consider Ferreira and Veloso (2006), who find that black mobility is "better" than white mobility in Brazil; Ferreira and Veloso (2006) find that there is less transmission of social status in the black population than in the white population in Brazil.

This notion of mobility does not tell us how black children do *compared to* white children holding constant parent social status; are black children really *better off*? In more precise terms, given black and white parents at the bottom of the education distribution, where are each of their kids expected to end up?

Rank-rank gradient also mixes upward and downward mobility. High rank-rank gradient (low mobility) suggests a steep slope on the parent-child rank relationship; this steep slope could be due to low upward or downward mobility, or both. Since many of the fairness questions that the mobility literature seeks to answer are about upward mobility (i.e. where children of parents at the bottom end up), summarizing both upward and downward mobility in one metric may hinder efforts to answer these questions precisely.

Level-based estimates of upward mobility — like the chance a child completes primary school given that their parents did not (Alesina et al., 2021) — may be comparable across subgroups, but they are not comparable across time or countries (Asher et al., 2021). If X and Y represent parent and child education rank (each between 0 and 100), then in Alesina et al. (2021), the aforementioned measure corresponds to $E(Y > 52|X \in [0, 76])$ for Mozambique and $E(Y > 18|X \in [0, 42])$ in South Africa. Differences between the level-based estimates of upward mobility for Mozambique and South Africa could be due to differences in mobility *or* aggregate changes in the distributions of education. Similarly, when comparing this type of measure over time within the same country, one might find "mobility" is improving when in actuality children on average are just becoming more educated. In short, level-based measures mix mobility with aggregate changes in the distribution of education.

Defining X and Y again as parent and child rank, the preeminent modern mobility measure, $p_{25} = E(Y|X = 25)$, estimates the expected rank of a child of parents at the 25th rank in the parent distribution (Chetty et al., 2014); this measure focuses on

upward mobility, and is comparable across subgroups, time and contexts, but requires detailed linked parent-child income data. As a result, it cannot be precisely estimated in Brazil using publicly available data (Leone, 2019).

A new measure, bottom half mobility ($E(Y|X \in [0, 50])$), attempts to mirror the benefits of p_{25} (comparability across time, space, and communities), and can be tightly bounded using interval-censored (binned) education data (Asher et al., 2021). In fact, in countries like the US where we observe a linear relationship between parent and child rank, bottom half mobility is roughly equivalent to p_{25} (Asher et al., 2021). Bottom-half educational mobility is defined as the expected education rank of a child of parents in the bottom half of the education distribution. So far, this method has only been used to estimate upward mobility in India (Asher et al., 2021).

3 Methods

I estimate bottom and top half educational mobility — the expected education rank of a child born to parents in the bottom or top half of the education distribution — across birth cohorts and race. The intuition behind the specific procedure used to obtain these bounds is explained in Appendix Figure 1.[2] These bounds are valid under two assumptions: first, that there is a latent continuous parent education rank distribution, and second, that expected child rank is weakly increasing in latent parent rank (Asher et al., 2021).

For a general discussion of the latent rank assumption, see Asher et al. (2021). The monotonicity assumption cannot be directly verified since parent and child ranks are unobserved, but empirical work from a variety of contexts validates a level-based analog of the rank monotonicity assumption: child socioeconomic outcomes are strongly

[2]For more detail on how the bounds are obtained, see Asher et al. (2021).

increasing in parent outcomes for education in India (Asher et al., 2021) and for a variety of measures of socioeconomic status in 35 other countries (Dardanoni et al., 2012). I verify this level-based analog of the monotonicity assumption also holds for all cohorts and subgroup-cohorts in my data. I estimate bottom half mobility with father-son and father-daughter pairs instead of mothers-son or mother-daughter pairs because there are fewer observations with mother education reported, and when divided into cohorts or subgroup cohorts, the wide mother education bins produce bounds on bottom half mobility that are too wide to be meaningful.

4 Data

The National Household Sample Survey (PNAD) is a nationally representative survey that the Brazilian Institute of Geography and Statistics (IBGE) conducts on non-census years; in 1996 and 2014, PNAD included a social mobility supplement that asked questions about the education level of an individual's mother and father when the individual was 15 years old. PNAD social mobility supplements appear to be the only public nationally representative linked parent-child education or income data in Brazil. I pool data from PNAD 1996 and 2014 and restrict my sample to individuals who are at least 24 years old since mobility estimates from co-resident parent-child pairs may be biased (Francesconi and Nicoletti, 2006; Emran et al., 2015; Asher et al., 2021).

For education levels, I construct new measures of education since Brazil's education system fundamentally changes across cohorts (see Table A1 from Leone (2019)); before 1972, students go to preschool (3 yrs.), primary (4 yrs.), lower high (4 yrs.), high school (3 yrs.), and then college; from 1971 to 2009, students attend preschool or early childhood education (3-7 yrs), 1st Degree (8 yrs.), 2nd Degree (3 yrs.), and

then college. Since PNAD offers separate answer choices for all of these levels for each version of the education system, I construct a unified measure of education level. My key variables as defined as follows:

1. Education levels: (1) No education , (2) Pre-school, (3) at least some primary/middle school, (4) at least some high school, (5) at least some college

2. Race: White, black, asian, indigenous. Note that respondents can mark their race as white, black, mixed-race, asian, and indigenous, but in line with prior work with PNAD studying race and socioeconomic status (Ferreira and Veloso, 2006; Loveman et al., 2012), I recode mixed-race as black and focus on white and black subgroups since asian and indigenous respondents make up roughly 1% of the sample.

5 Results

5.1 Bottom and Top Half Mobility in 20th Century Brazil

Between 1910 and 1970, Brazil experienced three major regime changes, yet bottom half mobility remained relatively constant (roughly around [35,39]), moving from [35.9,39.7] for sons born in the 1910s to [35.7,39.4] for sons born in the 1960s. In the decades (1970-1990) during and immediately after the military dictatorship (1964-85), mobility improved substantially ending up at [41.2,42.1] for sons born in the 1980s (Table 1 and Figure 1). This trend of stagnant mobility between 1910 and 1960 and increasing mobility between 1960 and 1990 is robust to estimation with father-daughter pairs (Figures 1-2), though father-daughter mobility is slightly lower for daughters born in 1910s ([33.3,37.7]) and slightly higher for daughters born in the 1980s ([42.9,44.0]).

Figures 1 and 2 illustrates these trends, supporting the conclusions from prior rank-rank income mobility estimates (Behrman et al., 2001; Blanden, 2011; Leone, 2019) that intergenerational mobility improved substantially in Brazil between 1960 and 1990. At the same time, these results add an alternate explanation for improvements in *income* mobility; where prior work attributes these improvements to declining returns to education, these results suggest that changes in educational mobility may have also played a role.

Over the same period (1910-1990), downward (top half) mobility — the expected education rank of a son/daughter born to a father in the top half of the education distribution — remains relatively constant (roughly around [61,65]), though figures 1 and 2 show that both upward and downward (bottom and top half) mobility appear to dip downward for children in the 1960s. Just as with bottom-half mobility, father-daughter top half mobility is slightly higher than father-son top half mobility for children born in the 1980s. This consistent slight difference in father-daughter vs. father-son mobility may be a small encouraging signal of improvements in gender equity.

Contrary to the conventional narrative of comparatively low mobility in Brazil, bottom half educational mobility for children born in the 1980s in Brazil appears to be similar to income mobility in the US ($p_{25} = 42$, Asher et al. (2021)) and slightly lower than income mobility than in Denmark ($p_{25} = 46$, Asher et al. (2021)).

Estimates of educational rank-rank gradient from the same data would suggest that the intergenerational persistence of education rank has remained relatively constant (at a gradient of between $\approx .462$ and $\approx .513$) from 1930-1990 (Appendix Figure 2). These results runs contrary to the trends in bottom half mobility, and the difference between the two may be a product of how rank-rank gradient pools data from the top and bottom of the parent distribution of education to summarize *upward*

and *downward* mobility with one estimate. The hidden assumption behind pooling top and bottom parent data is that the parent-child rank-rank relationship is linear (Asher et al., 2021), but this linearity assumption does not appear to fit the data (Appendix Figure 3), and so the rank-rank gradient estimates may not pick up underlying changes in upward mobility. I also estimate p_{25}, the preeminent income mobility measure in the US (Chetty et al., 2014), but due to the interval-censored nature of education data, I obtain bounds that are too wide to be meaningful (Appendix Figure 4).

5.2 Variation in Mobility by Race

Figure 3 shows how a large gap (roughly 6 ranks) between black and white bottom half mobility in 1950 closes substantially by 1980. In contrast, Figure 4 shows how the moderate (roughly 3 ranks) gap in black vs. white downward mobility in 1950 persists into 1980. The convergence in upward mobility by race and lack of convergence for downward mobility distinguishes Brazil from the US, where black children experience persistently worse upward and downward income mobility across generations compared to whites, in-effect entrenching racial disparities (Chetty et al., 2020). The convergence in upward educational mobility for black and white sons in Brazil may be a potential alternate explanation for Brazil's converging black-white wage gap, which conventionally is attributed to declining differences in returns to education (Vaz, 2020).

6 Conclusion

I present estimates of national educational mobility for children born in Brazil in the 20th century. The results are consistent with previous income rank-rank gradient

estimates in showing improvements in mobility between 1960 and 1990, but add the context that mobility stagnated from 1910 to 1960. Furthermore, these estimates of educational mobility suggest that despite a comparatively high income rank-rank gradient (low income mobility), upward educational mobility in Brazil is comparable to upward income mobility in the US.

Additionally, I show black-white upward mobility gap appears to close between 1950 and 1980, but the black-white downward mobility gap persists over the same time period. While a relatively small sample size represents a barrier to inferring the cause of these differential trends, future work should explore why the black-white gap in downward mobility persists. These results, together with declining returns to education, suggest that racial disparities in socioeconomic status today may not be due to racial disparities in educational mobility, and that policy aimed at ameliorating Brazil's racial disparities may do better if directed at non-educational causes of inequality (for example, job marked discrimination (Arcand and D'hombres, 2004)).

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7 Figures

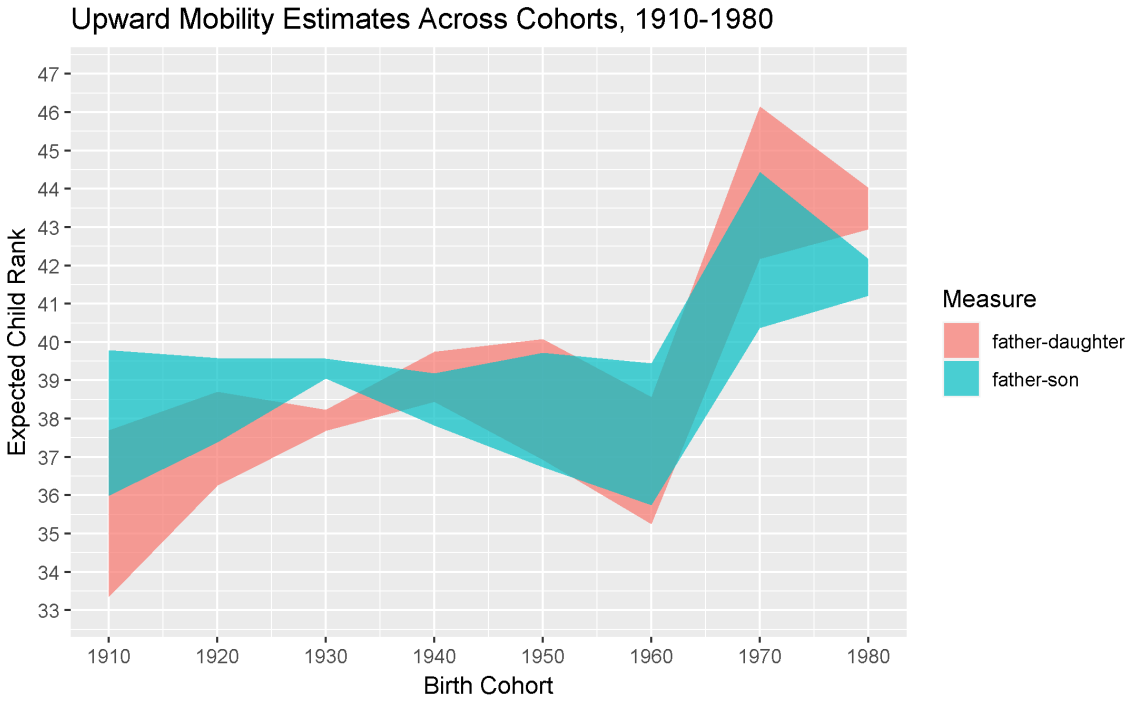

Figure 1: Estimates of upward mobility from father-son and father-daughter pairs for 10-year birth cohorts from 1910 to 1980. Upward mobility is the expected national education rank of a son/daughter born to a father in the bottom half of the parent education distribution. Data: PNAD 1996, 2014.

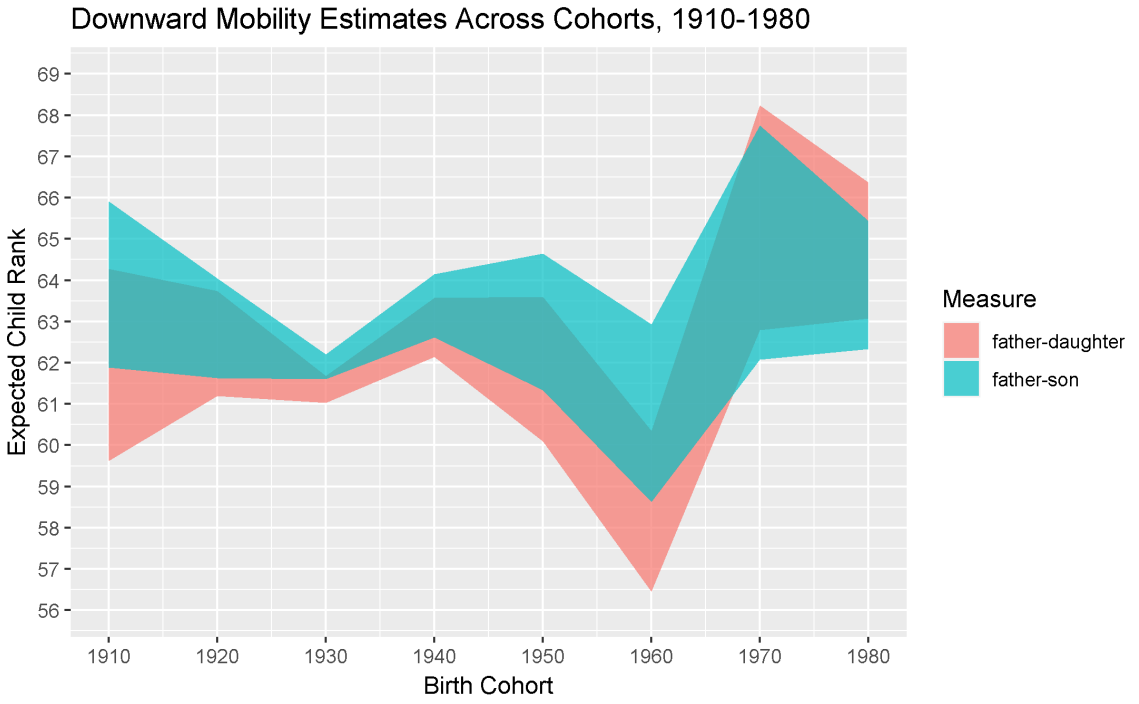

Figure 2: Estimates of downward mobility from father-son and father-daughter pairs for 10-year birth cohorts from 1910 to 1980. Downward mobility is the expected national education rank of a son/daughter born to a father in the top half of the parent education distribution. Data: PNAD 1996, 2014.

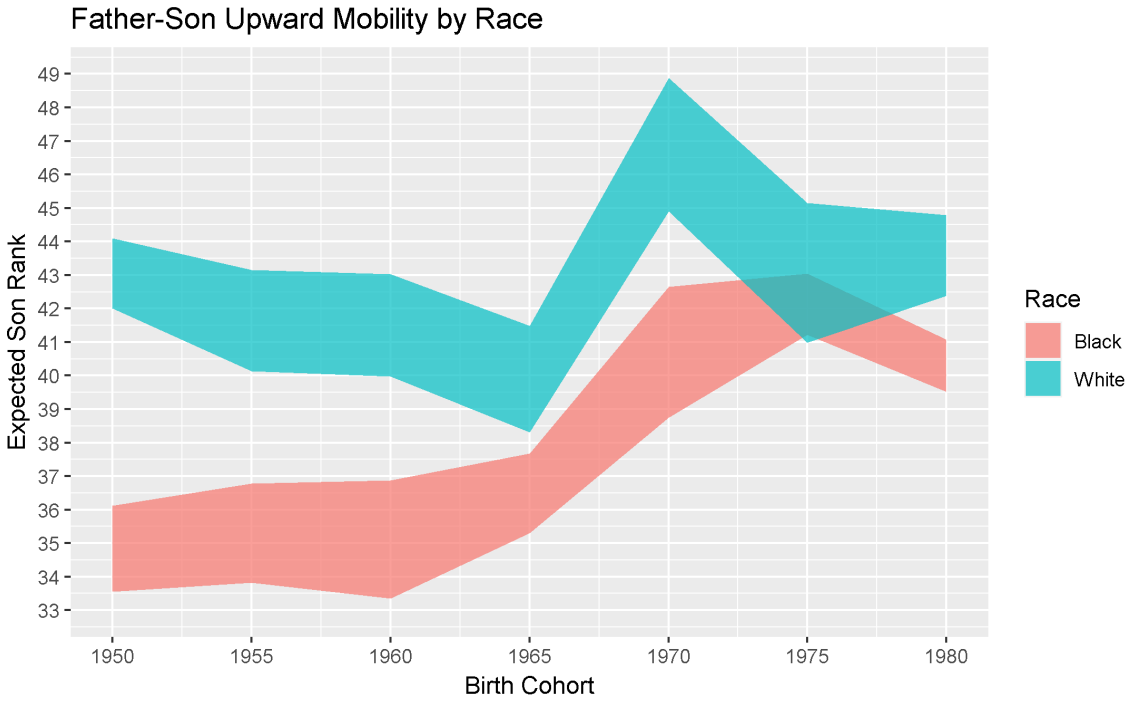

Figure 3: Estimates of upward mobility from father-son pairs by race for 5-year birth cohorts from 1950 to 1980. Upward mobility is the expected national education rank of a son born to a father in the bottom half of the parent education distribution. Data: PNAD 1996, 2014.

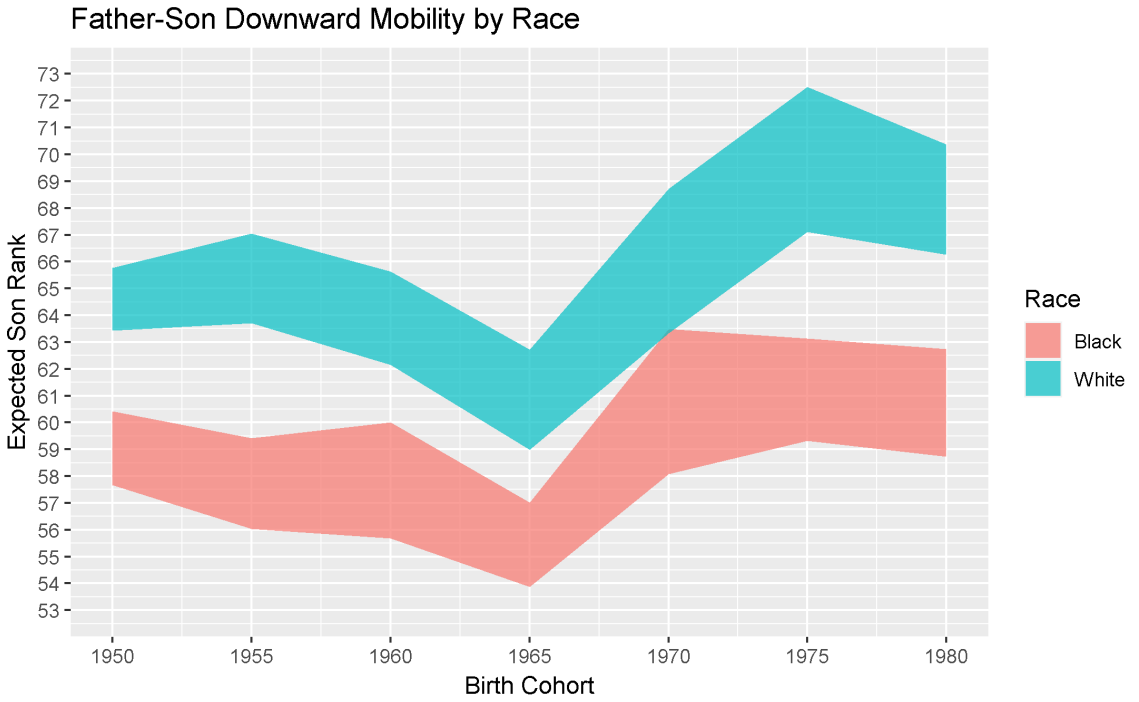

Figure 4: Estimates of downward mobility from father-son pairs by race for 5-year birth cohorts from 1950 to 1980. Downward mobility is the expected national education rank of a son born to a father in the top half of the parent education distribution. Data: PNAD 1996, 2014.

8 Tables

Upward Mobility Over Time

Birth Cohort	Father-Son Upward Mobility	Father-Daughter Upward Mobility
1910s	[35.9,39.7]	[35.9,39.7]
1920s	[37.3,39.5]	[33.3,37.7]
1930s	[39.0,39.5]	[36.2,38.6]
1940s	[37.8,39.1]	[37.6,38.2]
1950s	[36.7,39.7]	[36.9,40.0]
1960s	[35.7,39.7]	[35.2,38.5]
1970s	[40.3,44.4]	[42.1,46.1]
1980s	[41.2,42.1]	[42.9,44.0]

Table 1: Upward mobility are the expected national education rank of a son/daughter born to a father in the bottom half of the parent education distribution. Data: PNAD 1996, 2014

A Appendix

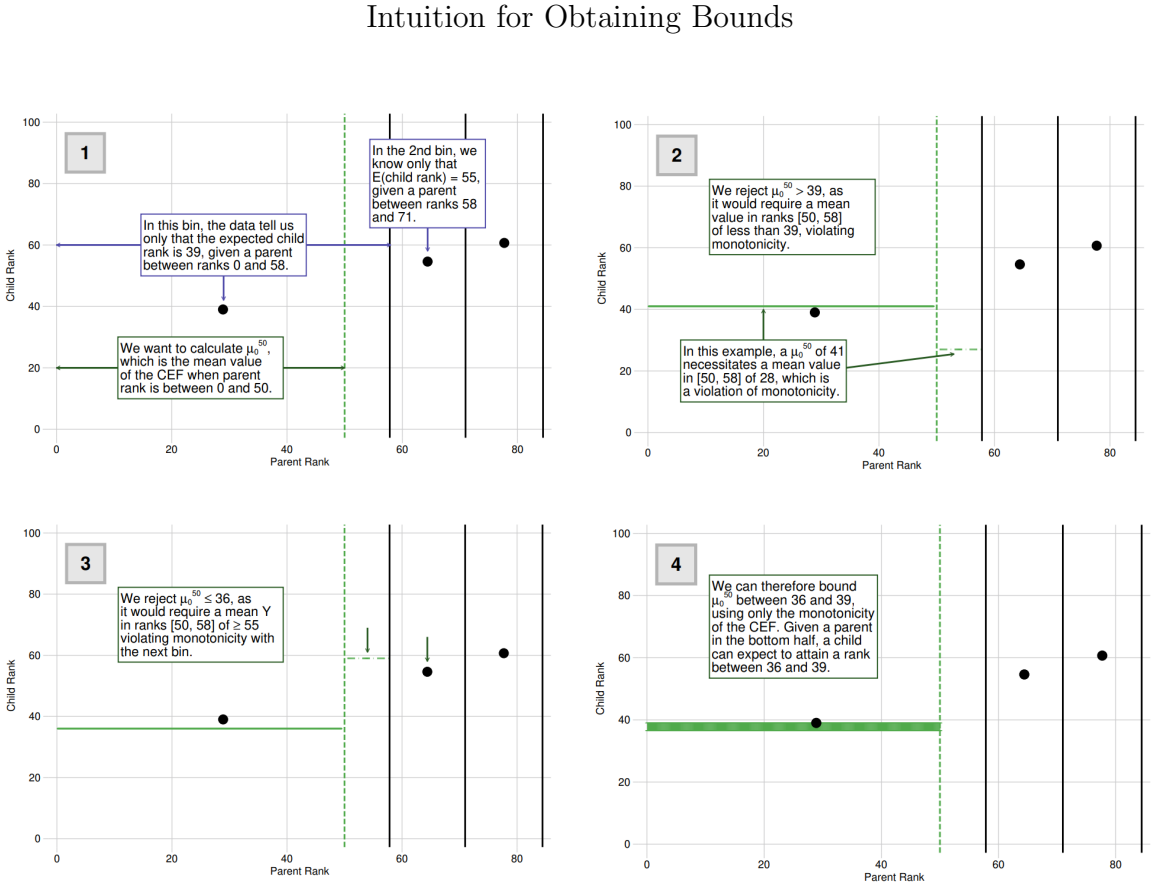

Figure 1: Figure 3 from Asher et al. (2021): Sample Calculation of μ_0^{50} for 1960–69 Birth Cohort

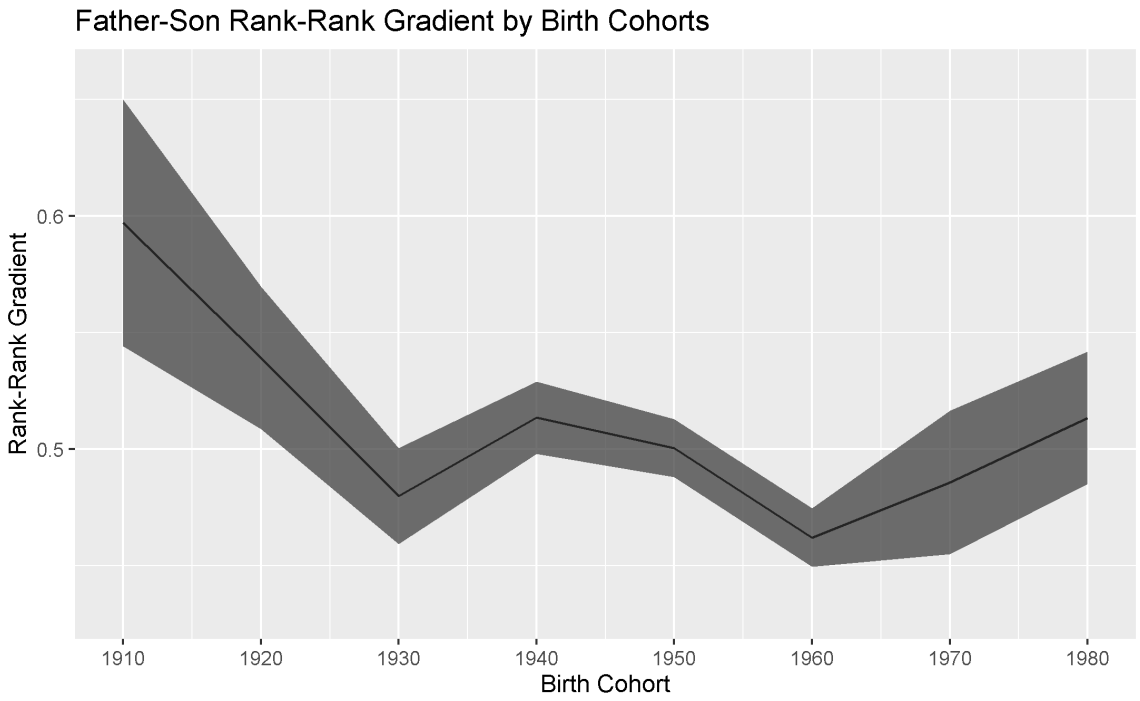

Figure 2: Rank-rank gradient obtained by regressing son education rank on father education rank. Shaded band represents 95% confidence interval. Data: PNAD 1996, 2014.

Father-Son Mobility: Raw Moments of the CEF, 1960 Cohort

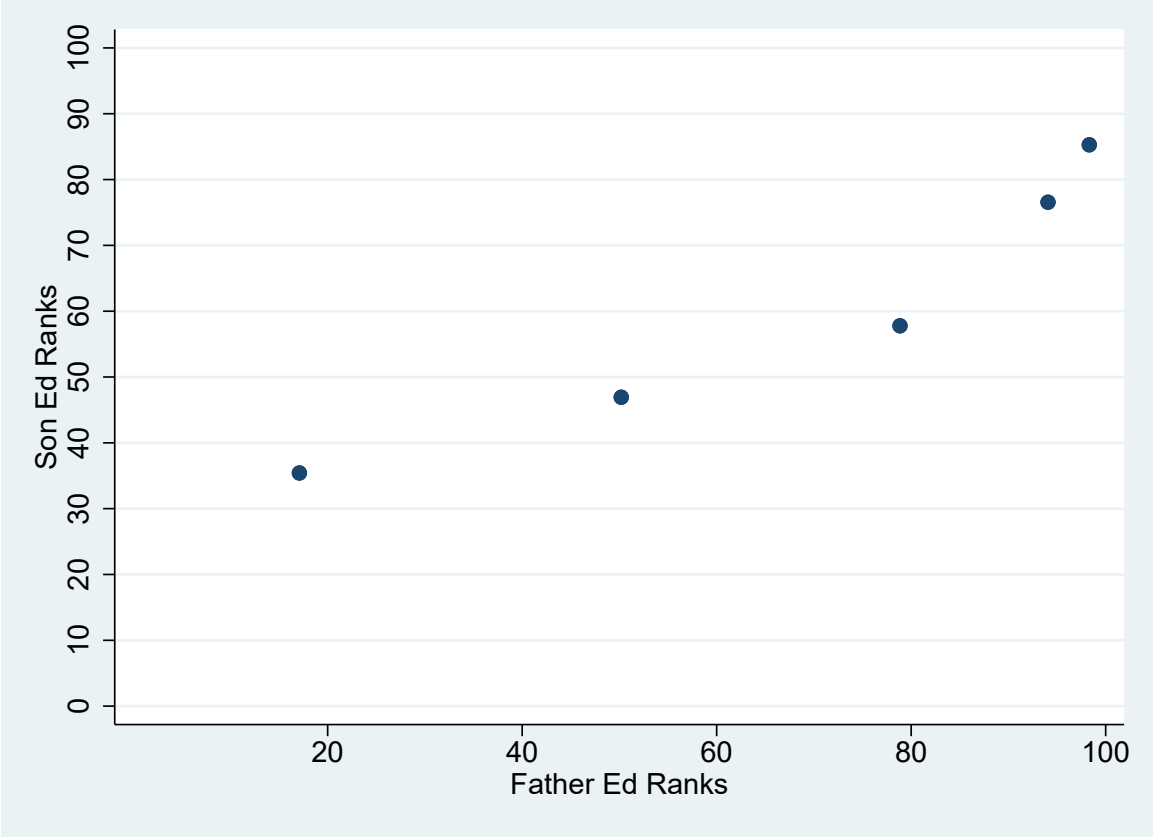

Figure 3: Observed moments from the latent conditional expectation function (CEF) corresponding to the expected son education rank conditional on father education rank. Data: PNAD 1996, 2014.

Figure 4: Bounds on p_{25}, the expected education rank of a son of a father with education rank 25. Data: PNAD 1996, 2014.