
Are there ethnic inequality traps in education?
Empirical evidence on intergenerational mobility for Brazil and Chile

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Abstract

This study searches for suggestive evidence of an ethnic inequality trap in educational attainment in Brazil and Chile. The research aims to cover an existing gap in the literature on inequality traps and proposes an empirical approach to assess certain conditions which suggest its existence. In general, the main results indicate that while average education and upward mobility have risen in both countries, ethnic disparities remain significant. In particular, the evidence is suggestive of an educational inequality trap for Afro-Brazilians, while the findings are less conclusive of a trap for indigenous individuals in Chile. These results reflect the need for targeted education policies for ethnic groups in two ways: compensation (or affirmative action) mechanisms to lower current inequality and increasing demand and supply at higher educational levels to prevent the persistence of low level outcomes and disparities throughout the educational distribution.

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Key words: inequality trap, education, ethnicity, opportunities, mobility, Brazil, Chile

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1 Introduction

Latin America is considered one of the most unequal regions in the world in terms of its income distribution (Gasparini *et al.*, 2011). However, the region is not only characterized by high income inequality but also by large disparities in access to education, land, basic services, and other dimensions of well-being. Moreover, the literature has suggested that this unequal situation may be traced back for decades and possibly even centuries (Edwards, 2009), despite burgeoning periods of economic growth and significant changes in the demographic, economic, social and political environment. This context is worrisome since persistent inequality has been documented as an underlying source of adverse effects on growth and development prospectives (Aghion *et al.*, 1999; Bourguignon and Dessus, 2009; Galor, 2011).

Recent research has suggested that at least some of this persistent inequality may be due to the existence of inequality traps (Rao, 2006; Bourguignon *et al.*, 2007a). An inequality trap is a circular process in which initial unequal opportunities (using Roemer's definition, 1998) lead to different outcomes between social groups, and also contribute to the persistence of those inequities through intergenerational transmission mechanisms (Bourguignon and Dessus, 2009). This situation reflects the persistent lack of opportunities associated with poverty traps, but it is affected by the entire distribution of outcomes, reflecting the unequal (economic, political and socio-cultural) interactions among groups.¹ Inequality traps thus capture horizontal inequality concerns, which have been noted to have considerable relevance since they affect individual well-being directly and other objectives instrumentally (Stewart, 2009).

Therefore, this research aims to search for suggestive evidence of inequality traps in educational attainment between ethnic groups, using Brazil and Chile as case studies.² The analysis will focus on traps in educational achievements for a number of reasons. First, Latin American countries exhibit substantial inequalities in educational outcomes (Gasparini *et al.*, 2011), and have the highest degree of educational persistence worldwide (Hertz *et al.*, 2007). Second, investment in education is considered one of the main pathways to development,

¹ In an inequality trap even when the available opportunities for the disadvantaged group (i.e. the poor in a poverty trap) increase over time, the patterns of unequal relative advantage persist in the long run due to the non-egalitarian nature of the society, which makes inequality traps a more general concept than poverty traps.

² The analysis is aware that studying attainment may not capture the entirety of the educational dimension since it does not account for quality and other factors. However, the inequities in attainment and quality seem to be relatively similar (Gasparini *et al.*, 2011).

mobility and poverty reduction, due to its strong correlation with future earnings (Breen and Jonsson, 2005; Peragine and Serlenga, 2008). Furthermore, education is a stock variable which is measured with lower degree of error (compared to income) and subject to less volatility, especially when observing adults who have already completed their educational process as will be the case here (Hertz *et al.*, 2007). Finally, education is a key area for policy interventions from governments and donors, since there is a broad range of potential demand and supply policy interventions in this area (Birdsall *et al.*, 1995; Behrman *et al.*, 2000).

The selection of ethnic groups as the primary partition reflects the stylized fact that ethnicity has been and remains a significant source of disparity in Latin American countries (Justino and Acharya, 2003; Busso *et al.*, 2005; Chong and Nopo, 2007). In particular, two of the nations where ethnic inequalities remain relevant are the case studies used in this research: Brazil (between Afro-Brazilians and White-Brazilians) and Chile (between Indigenous and non-Indigenous). In general, ethnic groups in these countries are characterized by worse overall conditions in access to land, housing, health, poverty, political representation and in particular, schooling (Gandelman *et al.*, 2007). For instance, illiteracy rates and the schooling gap are worse for the ethnic minority groups. Additionally, while enrollment is similar in primary school, the disparities in secondary and tertiary are striking. In fact, Busso *et al.* (2005) find evidence of increasing ethnic discrimination across the educational distribution throughout Latin America and the countries used here.

However, there remains no comprehensive methodological framework to empirically diagnose the presence of an inequality trap in a country or region at the individual level. Hence, following the suggestions in Bourguignon *et al.* (2007a), this study proposes an approach which evaluates certain conditions compatible with an educational inequality trap, mainly: (i) persistent inequality of opportunity in education between the selected groups; and (ii) that educational mobility patterns between both groups are different and not becoming similar over time (non-convergence). The measurement of these conditions will be based on heterogeneity indices proposed by Yalonetzky (2009, 2010). These indices capture horizontal inequality of opportunities and also allow comparing intergenerational mobility regimes between groups (represented by transition matrices) under an alternative specification. The empirical analysis will be performed on household survey microdata and conducted across birth-cohorts in order to capture historical trends and observe persistence.

This study constitutes a preliminary inquiry into the research agenda proposed by Bourguignon *et al.* (2007a) to diagnose inequality traps. The findings aim to generate an academic discussion on the methods used for assessing inequality traps and serve as a

backdrop to pursue further examination of its determinants. For policymakers, the evidence provides a starting point for designing equitable educational policy and as a way to identify disadvantaged groups for targeting purposes and promote short and long-term interventions which address both compensation for unequal initial conditions and policies to prevent the perpetuation of unequal low-level outcomes for trapped groups.

The main findings indicate that while average education and upward mobility have risen for the general population, ethnic disparities remain significant. On the one hand, there is statistical evidence of persistent disparities in educational opportunities between ethnic groups in both countries; i.e. ethnic differences in schooling show no signs of reduction. On the other hand, while upward mobility is higher in both countries (more individuals surpass their parent's level of education), the disadvantaged ethnic group seems to lag behind. This implies that higher mobility does not change the relative positions of the groups, and there is no additional evidence that they might be converging. However, the resulting empirical estimates lead to different final conclusions in both countries. For Brazil, the results do suggest that the disadvantaged ethnic group (Afro-Brazilians) seems to be caught in an educational inequality trap. In turn, the results for Chile are less clear since ethnic differences remain stable, but average education and mobility increase.

The rest of this study is organized as follows. The next section develops the general framework of inequality traps and accommodates this notion to the case of educational attainment and ethnic groups. Section 3 describes the data and methodology, while Section 4 describes the institutional educational context in Brazil and Chile and some descriptive statistics. Section 5 presents the main empirical results. Finally, the last section concludes by providing a discussion of the findings and their relevance for designing equitable and efficient policies.

2 Inequality Traps

2.1 Conceptual framework

An inequality trap may be broadly defined as a situation in which a disadvantaged group persistently faces an opportunity set (defined by the group's outcome distribution) that is worse than the set of another (advantaged) group (Bourguignon *et al.*, 2007).³ In other

³ The conceptualization of equality of opportunities used in this paper follows the initial contribution from Roemer (1998), which is in line to those proposed by political philosophers such as Dworkin (1981a and 1981b), Arneson (1989) and Cohen (1989). See Fleurbaey (2008) for an overview of the philosophical considerations of equality of opportunities.

words, it describes a situation of permanent inequality of opportunity between social groups transmitted across generations. In this context, inequality of opportunity refers to differences in the opportunity sets between social groups (or in Roemer's terms, circumstance types). Therefore, equality of opportunity is achieved when the opportunity sets become similar, meaning that this view focuses on inequality between groups and is neutral with respect to inequality within these types, i.e. horizontal inequality (Stewart, 2009).⁴

According to Bourguignon *et al.* (2007a), an inequality trap can be formally defined using a dynamic process drawn from a cross-sectional model. Let i represent individuals who belong to a specific group j and u_t^{ij} represent a given outcome at time t . This outcome is generated by the following process:

$$u_t^{ij} = u(c_t^j, e_t^{ij}, \phi_t) \quad (1)$$

Equation (1) assumes that outcomes depend on three components at time t . First, there is an effect of belonging to a certain social group (or type) denoted by c_t^j . Second, outcomes also depend on the level of individual effort exerted at time t , e_t^{ij} . Finally, ϕ_t represents policies which may affect the outcome directly or indirectly.

However, since an inequality trap aims to capture persistence, the above model needs to incorporate dependence on previous outcomes (own or of a previous generation). For instance, the circumstances enjoyed by group j in the present depend in part on the outcome levels faced by the preceding generation (e.g. their parents). Moreover, it allows incorporating the effect of characteristics of the overall distribution which reflect the historical inequalities in group relations.

To include these concerns, present circumstances may be rewritten to depend on previous outcome levels as $c_t^j = c_t^j(u_{t-1}^j, \zeta_t)$, where ζ_t represents an innovation at time t . In similar fashion, the level of individual effort today could also depend both on past outcomes and on their distribution ($F_{t-1}(u)$). Therefore, $e_t^{ij} = e_t^{ij}(u_{t-1}^{ij}, F_{t-1}(u), \xi_t)$, where ξ_t denotes another innovation.⁵ Similarly, the existing policy at time t may also depend on the prevailing

⁴ This view is known as the *ex ante* approach to the measurement of opportunity inequality (Aaberge *et al.*, 2011). The other common framework is the *tranches* approach, which focuses on differences within effort types. The *ex ante* concept used here is related to Sen's capability approach, with the main difference that individual responsibility (or effort) plays a different part in Sen's (1992) theory.

⁵ A personal election component that distinguishes effort from circumstances should be included in that innovation.

distribution of outcomes or power at $t-1$ and on innovations at time t . Thus, $\phi_t = \phi_t(F_{t-1}(u), \varepsilon_t)$.

Substituting these into (1), a general reduced form for the outcome of individual i who belongs to group j may be rewritten as:

$$u_t^{ij} = \Phi(u_{t-1}^{ij}, F_{t-1}(u), \omega_t) \quad (2)$$

where ω_t represents a vector of innovations at time t . Equation (2) captures a dynamic process which reflects the dependence of the current outcomes of individuals in group j with past outcomes and their distribution (and previous inequalities). Moreover, the time subscripts may be interpreted as representing generations, which makes (2) capture intergenerational transmission.

Therefore, this dynamic process defines an inequality trap as a specific low-level equilibrium where inequality in outcomes is driven by persistent differences in opportunities between social groups that are transmitted across generations, although there may be a feasible alternative equilibrium in which this situation is not present. The mechanisms which drive this inequality trap are related to the persistence of social, economic and political inequalities that link an individual's circumstances and outcomes to those of previous generations, and to policy choices which might reflect unequal distributions of power (Rao, 2006; Bourguignon *et al.*, 2007a; Bourguignon and Dessus, 2009).

2.2 Ethnic inequality traps in educational attainment

Setting u_t^{ij} to represent schooling for individuals belonging to a specific social group would describe the following dynamic process. Educational outcomes will depend on previous education (own or of a previous generation) and their distribution. For instance, an individual who has done well in school and has been presented with more available opportunities is expected to accumulate more schooling. Nevertheless, there is also an intergenerational effect, which may be comparatively stronger than the dependence on own outcomes. In fact, Hertz *et al.* (2007) have found that parental education has a striking influence on their children's schooling outcomes, and that this persistence is largest in Latin American countries. Furthermore, educational outcomes also respond to how parental outcomes were distributed, since any prevailing group inequalities may also be transmitted. Therefore, the persistence of low-level educational outcomes may have two different origins:

intergenerational educational transmission and inherited inequalities from the time an individual's parents made their educational choices.

Finally, educational attainment will also depend on the particular policies implemented to foster education in current and previous periods. For instance, schooling may be increased by providing generalized supply incentives (school construction), demand incentives (scholarships, conditional transfers) and merit-based schemes. In this point, while generalized policies of education may improve the situation for all children, it is possible that their main concern is access and not equity. For example, most interventions in the developing world focus on improving access to basic education, but do not address higher levels where inequities are more important between certain social groups (Keane and Roemer, 2009).

These mechanisms will interact to form an educational inequality trap if there is one group that performs persistently worse than another group in terms of education. To illustrate, consider the case of a group which (erroneously) believes that they are in some sense 'inferior' to another group, such as an ethnic minority (e.g. indigenous). As described, in a situation of equal opportunity, ethnic differences should not have an effect on educational outcomes. However, members of the stigmatized group may adopt certain behavior which contributes to a persistence of unequal opportunities in schooling, and leads them into an educational inequality trap. For instance, one rational mechanism is the internalization of future discrimination at the time of investing in human capital: individuals may choose a lower level of schooling since they anticipate lower earnings. On the other hand, less rational mechanisms may also be at work and individuals could adjust their educational ambitions downwards. This last case corresponds to the perpetuation of cultural and social stigmas which dictate historically unequal social relations between groups.

In fact, this ethnic example reflects observed patterns in Latin America, where racial inequities have been historically high and remain an important source of disparity (Justino and Acharya, 2003; Busso *et al.*, 2005; Chong and Ñopo, 2007). Ethnic disparities have been found in dimensions such as: income, access to land, housing, education, health, labor markets and political representation (Gandelman *et al.*, 2007). While ethnic differences are more evident in some countries, especially those with a historical dissociation and conflict between these groups, there is a consensus that ethnic inequalities account for a significant part of observed opportunity inequality in education. For instance, illiteracy and the schooling gap are higher for ethnic groups in most Latin American countries. Moreover, while enrollment is similar in primary education, the disparities in secondary and tertiary are

striking.⁶ In fact, Busso *et al.* (2005) find evidence of substantial discrimination higher along the educational distribution.

Therefore, studying ethnic educational traps surfaces as an interesting case study drawn from the general framework, and is additionally motivated by existing empirical evidence of large racial inequities. It is important to note that while other groupings might also represent plausible alternatives for the analysis, their case is less compelling. For instance, even though gender concerns have been important in the past, there is a body of evidence which suggests that male-female educational disparities have declined and seem to be disappearing (Zhang and Li, 2002; Harttgen *et al.*, 2010). Additionally, although regional differences may also be considered, migration is imperfectly captured in most data sources which could bias any analysis based on this information (McKenzie and Mistiaen, 2009). Moreover, the regional distribution of ethnic groups is historically linked to the past geography of slavery and European immigration, which leads to a marked correlation between regional and ethnic inequality (Okediji, 2004). Hence, studying ethnic groups may indirectly capture some variation due to the regional dimension.

2.3 Assessing educational inequality traps for ethnic groups

As previously stated, there remains no comprehensive methodological framework to empirically diagnose the presence of an inequality trap in a country or region at the individual level. Surely, there are a number of ways in which the general framework may be adapted to available data and specific research objectives. (Bourguignon *et al.*, 2007a, for instance propose several potential research ideas). For the main objectives of this study, an approach which separately tests necessary conditions surfaces as a feasible strategy to obtain suggestive evidence of ethnic educational inequality traps.

Given the analytical framework, an ethnic educational inequality trap is characterized as a situation with persistent inequality of opportunity in educational attainment between those social groups transmitted across generations. Therefore, a first condition requires identifying the level and extent of inequality of opportunities and testing if there is evidence of significant and persistent disparities in those educational opportunities between ethnicities.

However, although the persistence of inequality of opportunity is required, this condition is necessary but insufficient to suggest the existence of an educational inequality trap. This is because analyzing inequality of opportunities at any given moment only reveals

⁶ See Figures 3.1, 3.2 and 3.4 in Busso *et al.* (2005).

a static picture. Since the definition of an inequality trap requires exploring the dynamic processes that perpetuate unequal outcomes over time, the analysis must somehow focus on intergenerational transmission of educational attainments for each ethnic group. Thus, a second component of the approach lies in analyzing intergenerational educational mobility and, in particular, testing convergence in the groups' mobility patterns (or regimes). In this case, the main finding of this step is whether educational mobility patterns between groups have become more similar (convergence) or not (non-convergence).

It is important to note that analyzing these conditions makes inequality and mobility, as well as their relationship, central to studying inequality traps. However, while these concepts by themselves have an ample theoretical base, their association is not straightforward to pinpoint; since their dependence and interaction with various other dimensions complicate isolating the effect of one over the other (Couch and Morand, 2005). In general, previous literature has suggested an inverse relationship between inequality and intergenerational mobility. On the one hand, lower inequality is expected to increase social mobility (Andrews and Leigh, 2009). On the other hand, higher mobility is also consistent with more equality (Rodriguez *et al.*, 2008).

This expected relationship may be considered particularly stronger when the discussion focuses on inequality of opportunity, which captures differences from 'unfair' sources over which individuals have no control (Roemer, 1998). However, not all situations of higher mobility indicate less inequality of opportunity (Jencks and Tack, 2006; Galiani, 2010). For instance, even while an increase in mobility might indicate better access to opportunities by definition –improving the ability of each generation of the disadvantaged group to overcome its historical disadvantages, it does not imply that this improvement will change the relative positions of the groups.

Consider a potential scenario where intergenerational educational mobility increases for both groups, but does not modify the racial gap, persistently leaving the disadvantaged ethnic group in a lower level of educational achievement despite generalized improvement. In this case, the disadvantaged may remain in a low-level outcome because the advantaged group improves more markedly. This better relative performance of the more advantaged group may be due to their use of superior resources to preserve their position and therefore the gap between groups (Morgan and Kim, 2006). In this case, higher mobility does not imply equal opportunity. Therefore, testing one condition does not imply the other, and therefore the analysis must jointly observe both concepts.

In this sense, while inequality of opportunity may be more straightforward to measure, analyzing intergenerational mobility requires additional decisions. For instance, which background variable may best capture intergenerational transmission? Although educational mobility is determined by several factors related to an individual's socioeconomic environment (Becker and Tomes, 1986; Behrman *et al.*, 1998), this study will focus on the intergenerational transmission of education from parents to children. The reason for this focus is the widespread evidence that parental education is one of the most important determinants of educational outcomes.⁷ In particular, Hertz *et al.* (2007) who analyze intergenerational educational mobility for 42 countries around the world find that Latin American countries present the highest degree of parental dependence in schooling; this is particularly evident in the cases of Brazil and Chile. One explanation behind this high dependence on parental education is its correlation with other potential circumstances that capture many aspects of an individual's family background. However, while the influence of education levels achieved by the previous generation is an important determinant of schooling, by no means should this relationship be interpreted as identifying a causal relationship.

Finally, Bourguignon *et al.* (2007a) require that a third condition be satisfied to guarantee the existence of an educational inequality trap across ethnic groups: the existence of a feasible alternative equilibrium in which there is no conclusive evidence of the second step. A plausible method for testing this condition may be performing counterfactual exercises. For instance, Bourguignon *et al.* (2007b) suggest using a dynamic structural model to simulate distributions of educational attainments for the selected groups under alternative scenarios. However, testing this step is far from straightforward, requires many (strong) assumptions and it remains unclear how a feasible test may be performed to obtain this result. While this condition fully establishes the existence of an inequality trap, testing the first condition (permanent inequality of opportunities between groups) and the second (non-convergence) is suggestive of an inequality trap. Therefore, the analysis will focus on assessing the first two conditions, under the limitation that this evidence does not undoubtedly confirm the existence of an inequality trap, but it does present an interesting lesson on the dynamics of group outcomes and may be used to inform and direct equitable policy.

⁷ See for instance, Bowles (1972), Knight and Sabot (1990), Lillard and Willis (1994), Thomas (1994), Couch and Dunn (1997), Hertz *et al.* (2007).

In summary, if the following two conditions are empirically verified: (i) persistent inequality of opportunity in education between ethnic groups, and (ii) that educational mobility patterns between both groups are different and not becoming similar (non-convergence) over time, then it would be suggestive –but not conclusive– that the disadvantaged ethnic group is trapped in an educational inequality trap. The measurement framework applied to test these conditions on the data for Brazil and Chile will be presented in Section 3. The remainder of this section presents a brief review of the available evidence on educational inequality of opportunities and intergenerational educational mobility, highlighting the most relevant literature consistent with the analytical framework.

2.4 A review of the available evidence

As mentioned in the Introduction, there are no available studies which directly test for inequality traps at the individual level.⁸ Hence, this survey focuses on the most relevant findings on educational inequality of opportunity and intergenerational educational mobility, the two conditions described above, highlighting important findings in Latin America and when available, for ethnic groups in the selected case studies.

The empirical literature on the first condition –inequality of educational opportunities– has been mostly applied to observe inequities in primary or basic education. For instance, Barros *et al.* (2009) estimate educational inequality of opportunity in the access to primary education for 20 countries in Latin America, and find equalization over time.⁹ These general findings are confirmed for the specific case of Brazil by Cogneau and Gignoux (2005), Bourguignon *et al.* (2007b) and Fontes *et al.* (2009). Furthermore, they attribute the observed improvement to changes in the educational composition of the Brazilian population, which has been steadily shifting towards higher attainment due to the expansion of the educational system. Torche (2005, 2010) arrives at the same conclusions when studying primary education in Brazil, and also presents results for Chile. For the latter, she finds that equality

⁸ While Daymon and Gimet (2010) study inequality traps, their focus lies on comparing income inequality dynamics in countries which depart from different initial conditions, which the authors define as opportunities. Their results show that inequality is closely correlated to these initial conditions, and that there seems to be evidence of persistence over time. Therefore, according to these authors, there is evidence of an inequality trap at the international level.

⁹ Inequality of opportunities has been a rapidly expanding empirical field since the initial theoretical contribution by Roemer (1998), with a number of applications for both developed and developing countries mostly studying the opportunity distribution of income. Some of these include: Londoño and Székely (2000), Morley (2001), Gasparini (2001), Roemer *et al.* (2003), World Bank (2004), Bourguignon *et al.* (2007b), Anand (2008), Le Franc *et al.* (2008, 2009), Barros *et al.* (2009), and Checchi and Peragine (2010). For Brazil see: Figueireido and Ziegelmann (2010); and for Chile: Contreras *et al.* (2009), Acuña and Zúñiga (2009) and Nuñez and Tartakowsky (2011).

of opportunity in primary education has improved, a finding also presented by Larrañaga and Telias (2009) and Contreras *et al.* (2009). In general, these studies arrive at the conclusion that younger generations' educational attainment seems to be less unequal (or conversely, less bound to circumstances) in basic education, mostly due to the (near) universalization of primary school. However, a limitation of the available literature is that evidence for higher educational levels is less abundant. In one of the available studies, Torche (2010) observes that inequality of opportunity increases at the secondary and university levels in Brazil and Chile, which suggests that opportunities are distributed quite differently further along the educational ladder.¹⁰

Studies for the second required condition of an inequality trap –intergenerational educational mobility, have been relatively scarce in developing countries due to the lack of longitudinal data and limited availability of family background information in cross-sectional surveys.¹¹ However, existing studies find evidence of increasing educational mobility during the last decades. For instance, Sapelli (2009), Celhay *et al.* (2010), Núñez and Miranda (2010) and Sanromán (2010) find higher mobility in Brazil and Chile across time. Behrman *et al.* (1998) rank the countries and conclude that Chile has higher mobility than Brazil, the latter considered among the least mobile. These results are corroborated by several other studies, as shown in the survey by Azevedo and Bouillon (2010).

One particular finding of the existing mobility research in Latin America is that parental education is a powerful determinant of schooling outcomes for children (see Dahan and Gaviria, 1999; Behrman *et al.*, 2000; Andersen, 2001; Behrman *et al.* 2001; Binder and Woodruff, 2002; Conconi *et al.* 2008).¹² Most notably, Hertz *et al.* (2007) report that out of 42 countries, the highest dependence between parental and child education is found in Latin America.

However, less evidence is available comparing mobility between social groups, as the analysis intends to do so here.¹³ Moreover, those studies with a group perspective have

¹⁰ These results are also confirmed by Gignoux and Crespo (2008), who use results from the standardized PISA test for secondary students and estimate the level of inequality of opportunity in secondary schooling. In this context, differences in opportunities represent a third of total educational disparities. Larrañaga and Telias (2009) present similar findings.

¹¹ See Solon (1999) for a wider discussion about the measurement of intergenerational mobility.

¹² See Fields *et al.* (2007), Fields (2009) and Cuesta *et al.* (2011) for studies of income mobility in Latin America. For Brazil, see Cogneau and Gignoux (2005), Guimarães and Veloso (2006), Dunn (2007) and Figueireido and Ziegelmann (2010).

¹³ Hertz (2005), Nguyen *et al.* (2005) and Kearney (2006) analyze the intergenerational income mobility between black and white families in the United States. Hertz finds that black children experience less upward mobility than white children, conditional on parental income. This ethnic gap is found to be significant at all

usually focused on gender and less so on ethnicity.¹⁴ Gang and Zimmermann (2000) is one of the earliest papers for developed countries which compares mobility patterns between second generation immigrants and natives in Germany. They find that educational persistence is only significant for the former but not the latter. Nimubona and Vencatachellum (2007) study ethnic groups in South Africa, where segregation was extreme due to the apartheid. Not surprisingly, they find that intergenerational educational mobility is higher for whites than blacks.¹⁵ Nevertheless, younger cohorts of black South Africans have improved their average level of education compared to their parents, mostly due to increased school supply policies since the mid 1980s. Louw *et al.* (2007) also analyze ethnic groups in South Africa, testing for evidence of convergence in educational attainments. Their results suggest that differences in educational mobility within blacks and whites improved over the 1970-2001 period, which they believe will soon lead to convergence in attainment between blacks and whites at the basic educational level. However, the gap between ethnic groups remains persistent at higher educational levels.

In Latin America, Guerreiro (2008) provides some of the scarce existing evidence on intergenerational mobility by ethnic groups, finding that the educational gap between afro-Brazilians and white Brazilians remains high in the present and shows persistence over time. In other work, Hermida (2008) presents the case of Guatemala and finds lower mobility for indigenous people. González and Sanromán (2010) study educational mobility for African descendants and non-African descendants in Uruguay, and find that mobility is lower for the former than the latter. Moreover, their estimates indicate that the ethnic gap remains mostly unchanged through time and that more than half of the differences may be explained by the racial inequality in education among parents, or conversely, historical patterns of inequality.

This brief literature review reveals some general patterns in terms of inequality of opportunities and social mobility in the region and selected case studies. On the one hand, educational inequality of opportunities has fallen somewhat but remains a significant concern beyond primary education. On the other hand, parental education remains a strong

percentiles, but primarily at the upper end of the distribution where racial disparities are larger. Kearney (2006) also finds a significant ethnic gap in mobility and suggests that black children are much more likely to remain in the lower percentiles of the income distribution and white children to remain in the upper quintiles.

¹⁴ Binder and Woodruff (2002) is one of the first attempts to measure intergenerational educational mobility in Latin America by social groups. In particular, they concentrate on gender disparities in Mexico. They find that mobility and attainment were higher for women over the analyzed period.

¹⁵ The authors also disaggregate their findings by gender and income level. These further refinements suggest that, among blacks, females show higher mobility and educational attainments than males. Also, the poor (in both ethnic groups) exhibit the lowest observed levels of intergenerational educational mobility.

determinant of children's outcomes in Latin America, even in the context of rising mobility. Additionally, the few studies which assess mobility patterns between groups indicate that mobility may differ markedly. Therefore, while these dimensions are considered as separately relevant, their interaction may shed some light into the workings of persistent inequality by determining the existence of educational inequality traps.

3 Data, definitions and methodology

3.1 Data

The main source of information for the empirical application will be microdata from the 1996 *Pesquisa Nacional por Amostra de Domicílios* (PNAD) and pooled data from the 2006 and 2009 *Encuesta Nacional de Caracterización Socioeconómica* (CASEN) for Brazil and Chile, respectively. Both are nationally representative household surveys carried out periodically by the National Statistics Institutes in each country and include extensive demographic and socioeconomic information for individuals. Furthermore, each survey is based on large sample sizes and collects information on ethnicity and parental education, the latter which is essential to capture the dynamic aspect of inequality traps. Ethnicity is identified differently in both surveys: for Brazil, ethnic membership is self-reported, while Chile identifies indigenous individuals based on their native tongue.

Naturally, there are some limitations with this data. The Brazilian PNAD was conducted in 1996 which implies that despite its informational benefits, the findings may not depict the current state of Brazilian society. Additionally, a single Chilean CASEN survey might under-represent the indigenous population because it does not recollect information in some remote regions in which specific indigenous groups live (Agostini *et al.*, 2010), which is why the analysis pools two time periods to address this concern. However, even while these caveats must be taken into account when interpreting the results, these issues do not invalidate the analysis. Moreover, these surveys have been employed in several studies of inequality of opportunity and mobility despite these potential drawbacks.

The sample used throughout the analysis is comprised of adults aged 25 years or older since it is a likely assumption that these individuals have completed their educational process. In addition, the sample excludes survey respondents with incomplete information on their own educational attainment, that of their parents and ethnicity. Finally, all statistics and estimates obtained from the data are weighted unless otherwise noted.

3.2 Definitions

In what follows, the main outcome variable will be educational attainment defined in categories. This variable is defined homogeneously in both surveys to promote comparability, but respects the particularities of each country's educational system.¹⁶ In particular, three mutually exclusive categories are defined in each country. The *low* education category includes individuals with complete primary schooling or less (including those with no formal education). The *medium* education category is made up of individuals who have at least some secondary schooling (incomplete or complete). Finally, the *high* education category consists of individuals with at least some technical, tertiary, university or post-graduate degrees.

Parental education is defined using the same categorization, and the maximum education between mother and father is imputed to each individual.¹⁷ Ethnic membership is defined as a binary variable in a manner consistent with the afro or indigenous population in each country. Since the specific groups vary between countries, they will be referred to as the ethnic *minority* and *majority* groups to simplify the exposition. Strictly speaking, the ethnic majority in Brazil corresponds to individuals descendent from European immigrants (white Brazilians), while Afro-Brazilian individuals are included in the minority group.¹⁸ In Chile, the minority includes indigenous individuals and the majority will refer to the non-indigenous group (Contreras *et al.*, 2009; Agostini *et al.*, 2010).

Since one of the main objectives in analyzing inequality traps is to capture a dynamic process, the analysis exploits the potential to construct birth-cohorts since the available data is a single cross-section. Tracking cohorts allows analyzing long-term behavior of certain groups, in this case of adults who have completed their educational process, using a single point in time. Additionally, following cohorts has additional advantages such as the minimization of measurement error and the biases from attrition (Navarro, 2010). However, there are also some limitations to cohorts which are discussed in detail by Deaton (1997). In this study, the benefits from analyzing cohort trends outweigh the potential (and mostly unobservable) limitations. Hence, the sample is grouped into five successive birth-cohorts

¹⁶ In particular, the official educational definitions for primary, secondary and university (including tertiary education) are used to classify each individual into the selected categories.

¹⁷ Several tests were carried out to test sensitivity to this decision, but the results remain qualitatively unchanged.

¹⁸ Following Guerreiro (2008), the descendents of Asian people and indigenous are excluded in the analysis. This responds mainly to a small relative size of these ethnic groups in Brazil, evident from the survey data. Their omission does not significantly affect the estimates obtained in Section 4.

each separated by a ten-year span. Tables 1 and 2 summarize the definition of each cohort, their aging patterns and composition for the Brazilian and Chilean data, respectively.

3.3 Methodology

As mentioned, two conditions must be evaluated to determine if there is suggestive evidence of an educational inequality trap between ethnic groups: (i) persistent differences in educational opportunities between ethnic groups; (ii) assessing whether or not the group trajectories in mobility patterns are converging over time. In this case, since the available data is not longitudinal, persistence is assessed by tracking cohorts.

To empirically test the above conditions this study uses two indices proposed by Yalonetzky (2009, 2010), which are drawn from a family of heterogeneity indices based on the statistics from homogeneity tests for multinomial distributions (Hogg and Tanis, 1997). (Slightly) different specifications of this family may be used both for analyzing inequality of opportunities and comparing mobility regimes (represented by discrete-time transition matrices) between social groups. Moreover, the indices perform well with ordinal discrete variables, unlike other potential indices available in the literature for continuous outcomes.

*Heterogeneity indices to assess inequality of opportunities and differences between transition matrices*¹⁹

Following Yalonetzky (2010), assume that the population can be partitioned into a number of *social groups*, $g = (1, 2, \dots, G)$. Each group or type is defined by a vector of circumstances. This means that all individuals with the same set of circumstances belong to the same group, for example, every Afro-Brazilian belongs to the same type in a case where ethnicity is the only circumstance. In similar fashion, define a vector of outcomes (or advantages), $\alpha = (1, 2, \dots, O)$. An example of a possible element of α would be to have a low, medium or high level of education, in the case in which the only outcome considered is educational level as defined above.

The heterogeneity index applied to assess inequality of opportunities measures between-group inequality as the degree of association between groups and outcomes, by comparing the distribution of outcomes conditional on belonging to a specific group.²⁰ Formally, this index can be expressed as:

¹⁹ For more details on the derivation of these indices and their properties, see Yalonetzky (2009, 2010).

²⁰ Note that we are considering conditional distributions of discrete variables.

$$H^{IO} = \frac{1}{\min(G-1, O-1)T} \sum_{g=1}^G \sum_{\alpha=1}^O \frac{(p_{\alpha}^g - \tilde{p}_{\alpha})^2}{\tilde{p}_{\alpha}} \quad (3)$$

where p_{α}^g is the probability of attaining a particular level of advantage α , conditional on belonging to group g ;²¹ \tilde{p}_{α} is the arithmetic average of the group-specific probabilities for the advantage level α ; that is,

$$\tilde{p}_{\alpha} = \frac{1}{G} \sum_{g=1}^G p_{\alpha}^g \quad (4)$$

The denominator of the first term in (3), $\min(G-1, A-1)T$, normalizes the index so it ranges between zero and one. For the analysis here, it would be equal to zero if and only if the conditional distribution of educational attainments across ethnic groups is identical. This is consistent with a situation of literal equality of opportunity in a Roemerian sense that opportunity sets be equal between groups. Conversely, it would be equal to one if and only if there is complete association between ethnic groups and educational attainments, which would reflect a situation of ‘perfect’ inequality of opportunities. Thereby, H^{IO} measures the degree to which the conditional distribution of the outcome differs across selected groups, that is, it captures horizontal inequality of opportunities.²²

This study uses this index to measure the evolution of ethnic differences in educational opportunities across cohorts and as a means to evaluate whether the ethnic gap has improved or persists for the youngest generations. Confidence intervals for the point estimate of H^{IO} are constructed using bootstrap methods in order to infer if the trends present statistically significant variations across cohorts. In addition, differences in the index between the cohorts (and their respective confidence intervals) are also estimated to determine if observed differences are located between the oldest and youngest cohorts, or in contiguous generations.

As mentioned, a slightly different specification of this index may be applied to compare intergenerational mobility processes represented by transition matrices. In this case, transition matrices present the probability of an individual attaining a particular level of socioeconomic

²¹ This probability is defined as: $p_{\alpha}^g = \frac{N_{\alpha}^g}{N^g}$, where N_{α}^g is the frequency of people that belong to group g and have a level of outcome α and N^g is the absolute frequency of people belonging to group g .

²² Even though this might be a shortcoming in a general study on inequality of opportunities that aims to consider a complete notion of inequity (both within and between), the inequality trap seeks to capture only between-group differences, which makes this particular methodology useful for the present research.

status conditional on their parents having achieved a particular level in that variable.^{23,24} In this context, a conditional probability vector is one of the matrix's columns (or rows, depending on the assortment) which contains the probabilities of an individual reaching each possible level of the outcome controlling for the particular level reached by the individual's parents. Formally, define this vector as $V_j = (P_{1|j}, P_{2|j}, \dots, P_{A|j})$.

The heterogeneity index for transition matrices is a summary measure which quantifies the differences between these matrices for different groups by comparing them element-by-element. That is, the heterogeneity index computes the differences between the conditional probability vectors (V_j) of transition matrices across groups individually and then aggregates the respective statistics into a global indicator which has an asymptotic chi-square distribution with $(G-1)O(O-1)$ degrees of freedom. Formally, an index of heterogeneity for transition matrices based on the multinomial distribution test and fulfilling certain basic axioms is given by:

$$H^M = \frac{1}{O} \sum_{j=1}^O H_{V_j} \quad (5)$$

where

$$H_{V_j} = \frac{\sum_{g=1}^G \sum_{\alpha=1}^O N_j^g \frac{(p_{i|j}^g - p_{i|j}^*)^2}{p_{i|j}^*}}{\min(G-1, O-1) \sum_{g=1}^G N_j^g} \quad (6)$$

and $p_{i|j}^*$ is defined as in (4) for G groups of conditional probability vectors conditioned on a parental level of advantage j , and N_j^g is the absolute frequency of the conditional probability vector of group g conditioned on a parental level of advantage j .

This index also ranges between zero and one. In this case, it would be equal to zero if and only if the conditional distributions of educational achievements across the compared matrices are identical (i.e. $H_{V_j} = 0, \forall j$, which indicates perfect homogeneity among

²³ Formally, $P_{i|j} = \Pr(\alpha_t = i | \alpha_{t-1} = j)$, where α represents the outcome variable and the subscripts t and $t-1$ refer to the level of outcome showed by the individual and his parents, respectively. In this way, $P_{i|j}$ is the conditional probability of an individual to have a level i of the outcome conditioned on his parents having attained a level j in that same advantage.

²⁴ Transition matrices might also show two moments in time for the same person, when the objective is to study mobility along the life cycle.

matrices). This suggests that the mobility regimes represented by the transition matrices of different ethnic groups would be equal. In turn, it would be equal to one if and only if there is maximum heterogeneity (dissimilarity) among matrices (i.e. $H_{V_j} = 1, \forall j$).

An interesting property of H^M , is its decomposability (the index can be split into additive sub-elements). In the empirical application, this property is helpful to track the contributions of each conditional probability vector (i.e. each parental level of education) to the estimated heterogeneity between transition matrices. These contributions may be computed as:

$$W_{V_j} = \frac{H_{V_j}}{OH^M}; \text{ with } \sum_{j=1}^o W_{V_j} = 1 \quad (7)$$

In summary, H^M is used to compare transition matrices linking parents and children's educational outcomes between ethnic groups. This group comparison provides information on whether educational mobility regimes are different between ethnicities for each cohort in the sample. The input matrices will also be presented in an Appendix as descriptive evidence of mobility trends and their differences between ethnicities. In addition, the evolution of this index across cohorts provides information whether these mobility regimes are becoming similar (H^M closer to zero) or not. The observed behavior will provide suggestive evidence on the potential convergence between those regimes, although it does not constitute a formal test. However, to pinpoint the significance of the observed changes, confidence intervals for the point estimate of H^M and their differences across cohorts are also calculated.

Finally, it is worth noticing that both H^{IO} and H^M are only one possible methodological approach of many that could be used to measure inequality of opportunities and compare mobility regimes. Different methodologies have been proposed to separately address these two topics. For instance, Barros *et al.* (2009) present the *Human Opportunity Index* (HOI) to measure inequality of opportunities applied to dichotomous outcomes.²⁵ However, although this index seems to be useful in some cases, a large debate has risen regarding its potential biases and its inability to fulfill certain desirable properties (Peragine, 2011).

In similar fashion, the H^M index used in this paper is one of several potential approaches to compare mobility regimes between groups. For instance, some studies directly compare summary indices derived from transition matrices (Formby *et al.*, 2004), while other

²⁵ As was mentioned in Section 2.4, Barros *et al.* (2009) applied this index to estimate inequities in the access to basic education and other outcomes in several countries of Latin America.

research compares mobility patterns of different groups based on parametric models of educational intergenerational mobility (Gang and Zimmerman, 2000; Nimubona and Vencatachellum, 2007).²⁶ In this study, the suggested approach has the additional advantage that both indices are (slightly) different specifications from the same family of heterogeneity measures, which provides a common methodological framework to analyze the joint conditions suggestive of a trap.

4 Educational context in Brazil and Chile

4.1 Evolution of the educational systems

Before proceeding to the estimates, this section provides a context of the main policies and reforms in the Brazil and Chile's educational systems; illustrating the changing educational context by means of descriptive statistics. This analysis provides a picture of the situation in each of the countries and also serves as a validity control to ensure that the data properly capture the changing educational context in each of the selected case studies.

Since 1950, the Brazilian educational system has been in continual expansion. One of the main challenges at this time was reducing children's late start to school and grade repetition, addressed by encouraging enrollment and incorporating children into school at the mandated age. This led to an increase in primary and secondary enrollment between 1920 and 1970 which was surpassed the observed population growth. Therefore, during this period, many children were incorporated into the formal schooling system and repetition and delayed start dropped significantly. Jointly with this expansion, the Brazilian Ministry of Education developed initiatives to increase the duration of compulsory education, incorporated early childhood education (pre-primary education) and built more schools, especially in rural and marginal areas.

The current organization of the educational system was set by the Constitution of 1988, with the approval of the National Education Guidelines and Framework Law (*Lei de Diretrizes e Bases da Educação* 1996). This reform changed the organization of the school system, by extending compulsory education,²⁷ encouraging the professionalization of teachers (especially at secondary) and introducing other forms of schooling, such as special and ethnic education, which became an important part of the educational system.

²⁶ For instance, by compare slope coefficients of estimated models for different groups.

²⁷ For instance, day care (for children 0 to 3) and pre-school (from 4 to 6) became the National Childhood Education. The first 4 years of pre-school and low high school became primary, while the last three years became secondary.

Since this latest reform, illiteracy has dropped substantially, enrollment continued to increase at all levels and the population's average education has steadily risen. The changing educational structure is denoted by the drop in the proportion of population with only basic education (which in 1970 accounted for almost 90% of total enrollment), and the continuous expansion at higher educational levels.

However, while there were encouraging efforts in basic education, the overall level of public income restrained the system from guaranteeing public access at the secondary and university levels. This made the system highly selective at these stages: for example, only 5.6 percent of those who began primary were able to attend secondary school in Brazil (UNESCO, 2006). Therefore, while secondary enrollment did increase, this selectiveness increased inequities at this level, mainly affecting disadvantaged groups. The situation at university levels was even more unequal.

Unlike Brazil, education in Chile had a much more pronounced advancement in the past decades. Between 1960 and 1990, the average level of schooling doubled and illiteracy dropped to less than 5%. In general, the educational situation continually improved since then, with primary education becoming almost universal. Additionally, secondary enrollment is one of the highest in Latin America, due in part to its gratuity and the compulsory requirement which is set at 12 years. Moreover, quality has also improved, since over 98% of teachers have some sort of formal qualification.

However, UNESCO (2006) recognizes that there are still some fundamental problems in Chile's education system. Mainly, they argue its *'poor and uneven quality'*, which makes the system inequitable and inefficient, especially for groups such as the poor. Furthermore, the system is based on the Spanish language, which is not spoken in certain regions and by some ethnic groups. The most important groups in these categories are the Mapuche, the Aymara and the Rapa Nui.²⁸ According to UNESCO (2006), educational attainment for these groups is significantly lower compared to the general population. On the one hand, they live in secluded areas where supply of schooling is fairly limited (even though there are policies aimed at expanding access to education in marginal areas). On the other hand, indigenous groups also employ traditional education outside the formal system which emphasizes their cultural roots. However, in recent years the Ministry of Education has tried to attract children from indigenous groups by offering a multicultural education, which contemplates their own

²⁸ The Mapuches are grouped in the rural south of the country and account for around half a million people. The Aymaras inhabit mainly the area of the Andean highlands and the Rapa Nuis live in Easter Island.

language and traditions (UNESCO, 2010). Currently, most of these ethnic groups are now bilingual and adhere to the national education system.

4.2 Main educational trends

Some of these aspects are reflected when observing the educational distribution of individuals across cohorts and that of their parents. Figure 1 summarizes this distribution for each birth-cohort and Figure 2 plots the observed distribution for their parents in Brazil and Chile (panels A and B in each graph, respectively). These two graphs help paint a picture of the evolution in educational attainment and support certain trends consistent with the educational reforms and policies described above.

In Brazil, the educational structure shows an upward trend for the individuals in the sample, especially when compared to their parents, and compatible with the expansion of the system. Particularly, the growth in medium and high levels of schooling is 15 and 6 percent between cohort 1 (eldest) and cohort 5 (youngest), respectively. However, the majority of Brazilians in the youngest cohort (approximately 70 percent) remain with low educational attainment. In contrast, educational improvement is more evident in Chile. The proportion of individuals with low education fell from over 60 percent from the eldest cohort to less than 20 percent in the youngest. The figure shows that for the youngest cohort, more than 60 percent of individuals attain at least medium schooling (equivalent to some secondary) and almost 30 percent have obtained high education (at least tertiary schooling), also in accordance with the previous description of the educational system.

Comparing the educational distribution in both countries reflects the difference pointed out previously, mainly that Chile is better-off in terms of education than Brazil. Therefore, the interpretation of the main results must keep in mind that both countries begin from different initial situations, with Brazil characterized by low overall educational attainment and Chile by more optimistic educational growth. However, even though both countries have improved average education across cohorts, a question arises: are there still significant differences in attainment between ethnic groups?

Figure 3 plots the educational distribution by ethnic groups to answer this question. The graphs depict several marked trends. On the one hand, and congruent with Figure 1, average educational achievements have improved for both ethnic groups. On the other hand, the ethnic gap shows no signs of reduction in both countries. For instance, in Brazil (panel A of Figure 3), while the proportion of individuals with low education has fallen for both ethnic groups, this reduction has been proportionally higher for the ethnic majority group (white

Brazilians). Consequently, the ethnic gap in low educational attainment becomes larger for the youngest cohort when compared to the eldest. The same situation is observed at high achievement levels, where the majority seems to be improving at a faster rate than the minority. These findings are qualitatively similar for Chile (panel B of Figure 3), where even though average schooling rises for both groups, ethnic differences do not seem to be fading. As found for Brazil, disparities are more salient at the low and high educational levels, due to a higher relative improvement of the majority (non-indigenous) when compared to the minority (indigenous).

In general, this descriptive evidence shows that the process of educational restructuring and reforms have generated a higher average level of schooling in Brazil and Chile. However, there seem to be persistent ethnic differences within this distribution, primarily when observing educational outcomes at medium and high education levels. These findings suggest that there remain important disparities in education between these social groups, as has also been suggested by UNESCO (2006, 2010). However, to find suggestive evidence of a trap, these inequities must be both persistent and non-converging.

5 Results

To test for inequality traps, the analysis begins by presenting estimates for the heterogeneity index for inequality of opportunities, H^{IO} , as the first of two conditions suggestive of this trap. The patterns of this index will help determine if one ethnic group has persistently lower opportunities than the other. As a point of comparison, the analysis also includes a broader estimation of this index considering a wider set of groups which results from combining three categorical variables: ethnicity (2), gender (2) and parental education (3), for a total of 12 groupings. These estimates are then used to compare the trend using only ethnicity to observe whether this grouping captures the general patterns of inequality of educational opportunity.

Table 3 presents the values of the heterogeneity index for inequality of educational opportunities and their corresponding confidence intervals (obtained by bootstrap with 300 replications). In both cases, the differences in educational opportunities between ethnic groups are statistically different from zero, implying that ethnicity is a determining factor for educational achievement and, more interestingly, that it is a source of disparity. In addition, while the trends show slight statistical differences between countries, they both indicate that from the eldest to the youngest cohort, there is no sign of equalization in opportunities between ethnic groups; that is, H^{IO} is statistically different from zero for every birth-cohort.

Specifically, the findings for Brazil reflect that inequality of educational opportunities from ethnicity mildly increases from 0.18 to 0.21, although the change is relatively small. Nevertheless, this signals that the ethnic gap in opportunities is not closing across generations (Panel A of Figure 4), suggesting that ethnic disparities in schooling remain relevant even for younger cohorts. Chile shows a statistically insignificant change in educational inequity between ethnicities when comparing the first and last cohorts (Panel B of Figure 4). These trends are maintained when considering the broad case with more groups (Table 3), suggesting that ethnic group differences reflect the general pattern of educational opportunities.²⁹

This analysis may be complemented by looking at the results in Table 4, which shows the difference in the H^{10} index between two given cohorts and their bootstrapped confidence intervals (e.g. the cell in which cohort 2 crosses cohort 1 refers to the difference in the estimated index between these two cohorts). From the table, most differences in Brazil appear to be statistically different from zero, with the exception of some between contiguous cohorts. In particular, the changes are significant when comparing the eldest and youngest generations. In turn, the differences between cohorts in Chile cannot be considered significantly different from zero, which suggests that the distribution of opportunities remains unequal and unchanged across cohorts.

These results are related to the observed differences in Figure 3 (in Section 4), which showed that there seems to be a persistent ethnic gap in educational attainment. In particular, this effect appears to be driven by a higher relative improvement of the majority group in comparison to the minority in both countries. This effect ensures the persistence of the ethnic gap in schooling even in the context of rising average education, and is consistent with documented educational trends by ethnic groups in Brazil by Guerreiro (2008) and in Chile by Agostini *et al.* (2010). In this application, while the analysis finds evident benefits from educational expansion (higher average achievement), ethnicity still influences these outcomes, leading the minority groups into persistently lower educational opportunities.

Nevertheless, while this finding provides an important notion that persistent ethnic inequality exists in educational attainment, the analysis is static and does not capture the dynamic aspects which perpetuate these inequities to form an inequality trap. For this

²⁹ While the results may seem to contradict existing estimates (for instance Barros *et al.*, 2009; Contreras *et al.*, 2009), the analysis here evaluates educational inequities across *the entire educational distribution*, whilst the former studies focus on access to primary education or higher. Other work which has concentrated on higher levels of schooling finds that opportunities remain unequal or might be worsening, which is in line with the results obtained here (see Gignoux and Crespo, 2008; Larrañaga and Telias, 2009; Torche, 2010).

purpose, the next step is to compare intergenerational mobility patterns between ethnic groups to gauge whether the persistent ethnic gap has an intergenerational component.

Table and Figure 5 present the estimates of the heterogeneity index for transition matrices, H^M . In both countries the index is statistically different from zero for every cohort, implying that mobility processes between minority and majority ethnic groups are different. As when testing inequality of opportunity, the results show a statistically significant increase of this index between the eldest and youngest cohorts in Brazil, suggesting that mobility regimes by ethnic group have become more dissimilar. In comparison, the value of the index is lower in Chile but the main finding of an unchanging gap between ethnicities remains. These trends are further confirmed in Table 6, which presents the differences in H^M index between cohorts (and their confidence intervals).³⁰

Overall, these findings suggest that educational mobility regimes between ethnic groups have not become more similar in either Brazil or Chile. However, this analysis does not provide insight as to where in the educational distribution the differences lie. For this purpose, the analysis now turns to some summary statistics and also observes the main input used to compute this mobility index: transition matrices. These tools will help interpret the findings obtained from the indices and further understand their changes.

The first panel of Table 7 presents summary statistics on directional movements computed from the transition matrices. In general, mobility has increased for younger generations in comparison to older cohorts in both Brazil and Chile. This is denoted by the reduction of educational immobility (i.e. the percentage of people who have the same level of education as their parents) and by the evidence of rising upward mobility. From the estimates, almost 22 percent of individuals in the youngest cohort have attained higher schooling than their parents in Brazil, while this proportion amounts to almost 50 percent in Chile. Although the estimates also show some degree of downward mobility in both countries, this percentage is quite low (between 4 and 7 percent). Therefore, these summary measures denote that mobility has improved across generations, but, is this also the case when observing these results by ethnicity? An initial answer is found in the remainder of Table 7, which separates the same statistics for each ethnic group.

In Brazil, increasing mobility is still observed for younger cohorts between ethnic groups, but the patterns differ. The proportion of individuals who present the same level of

³⁰ Some of the differences presented in Table 6 are not statistically different from zero, but they refer to comparisons between contiguous cohorts. When evaluating the difference between extreme generations, the results are greater than zero (statistically significant), implying an increase in the H^M index across generations.

education than their parents is around 10 percentage points higher for the ethnic minority, for every cohort, showing a higher level of immobility for this group. Differences are also present in downward and upward mobility. Ethnic groups show higher downward mobility and lower upward mobility. For the latter concept, while 27 percent of majority individuals surpassed their parent's education, this proportion was only 15.4 for the minority group. Moreover, this gap has widened from the oldest to youngest cohort (from 6 to almost 12 percentage points). This increasing gap is depicted in the third panel in Figure 6, and may be attributed once again to a more than average educational improvement for the advantaged ethnic majority (White Brazilians) relative to the minority group (Afro-Brazilians). In other words, the disadvantaged group benefits less and is not able to '*catch up*' to the other group – at least in terms of upward mobility.

However, not only is upward mobility more limited for the ethnic minority in Brazil but educational attainments are also below the levels of the ethnic majority, as was shown in Figure 3 and can also be derived from the transition matrices in Appendix A. That is, the minority group shows a higher proportion of individuals with low or basic education than the majority for every cohort, while the opposite is true for medium and high educational levels. In addition, although both groups have experienced a decrease in the proportion of individuals with low education, this reduction has been even greater for the majority; deepening the ethnic gap. This is partly due to the fact that the minority's initial conditions (i.e. parental education) are worse than for those belonging to the ethnic majority.³¹ Thus, being born into a household where parents have a low level of education results in a high probability for individuals of the ethnic minority to also attain low education. On the other hand, the majority group is characterized by being raised in households with better educated parents and higher mobility which leaves them with better educational outcomes. Together, these two opposing effects enlarge the gap between ethnic groups.

In the case of Chile, the findings also reveal that the ethnic minority has lower mobility than the majority group. Educational immobility is also higher among the minority group, although this gap has fallen for the youngest generations, and actually seems to be converging (Figure 7). However, this does not mean that educational achievements are becoming identical between ethnicities, but instead that the groups are likewise mobile and dependent in a similar degree on parental education. In fact, as already shown in Section 4,

³¹ Figure 3 shows that the proportion of parents with low education is higher for the ethnic minority, for every cohort. In the case of medium and high education, the ethnic majority is the one showing greater percentages.

the minority group in Chile has significantly lower schooling than the majority for every cohort (even the youngest). Thus, while mobility patterns seem to have become similar between ethnicities, educational achievements are still lower for the ethnic minority. Once again, the results from the transition matrices aid in interpreting these results. The group probabilities show that while differences at lower levels of education have been falling for younger cohorts, they increase at the high educational level.³² These movements also correspond to opposing effects which cause the heterogeneity index to remain unchanged (in a statistical sense), and leads mobility index to show no evident change.

As mentioned in the methodological section, the heterogeneity index for mobility allows for decomposability. Therefore, it is possible to explore whether the observed behavior is due to greater inequity at some level of parental education. The contributions of each parental education category to overall heterogeneity are presented in Figure 8. For both countries, disparities in mobility patterns between ethnic groups are greater for individuals whose parents have either low or high educational attainment. For instance, in Brazil, low parental education is the one which explains most of the heterogeneity between ethnicities (over 50 percent for every cohort). This is so because as previously mentioned, most individuals in the minority have parents with low education, while parents for individuals in the majority group are less likely to attain only basic education. Similar results are found for Chile, though the contribution of the probability vector conditioned on the lowest parental educational level is even higher (never below 60 percent), which reflects the inequities in the parental distribution of outcomes or historic educational inequalities.

In summary, the main findings from the proposed methodology indicate that while average education and upward mobility have risen for the general population, ethnic disparities remain significant. On the one hand, there is statistical evidence of persistent disparities in educational opportunities between ethnic groups in both countries; i.e. ethnic differences in education show no signs of reduction. On the other hand, while upward mobility is higher in both countries, the disadvantaged ethnic group seems to lag behind. However, the overall conclusion for the two countries is different. For Brazil, the results indicate that the disadvantaged ethnic group (Afro-Brazilians) seems to be caught in an

³² For instance, in the case of the ethnic majority, 61 percent of the eldest cohort shows a low level of education, while this proportion is 85 percent for the minority (a difference of 24 percentage points); these shares are 16 and 32 percent, respectively, for the youngest cohort, with a reduced ethnic gap of 16 percentage points in detriment of the minority (the group more concentrated in low educational levels). On the other hand, when considering individuals with a high level of education, the gaps are 7 and 15 percentage points, in favor of the majority which has higher average attainment.

educational inequality trap. In turn, the results for Chile are less suggestive that indigenous individuals are in this situation.

6 Discussion and Conclusions

This paper searched for suggestive evidence of an ethnic inequality trap in educational attainment in Brazil and Chile. The findings present a contribution since the available literature has not studied this matter for a region or country at the individual level. Moreover, since there is no comprehensive methodological framework to diagnose inequality traps, the study proposed assessing certain conditions compatible with an educational inequality trap, mainly: (i) persistent inequality of opportunity in education between ethnic groups, and (ii) dissimilar mobility patterns between both groups that do not become similar over time (non-convergence).

In general, the main findings indicate that while average education and upward mobility have risen for the population in both countries due to more predominant access to schooling at all levels, ethnic group dynamics show less encouraging results.

For Brazil, there is statistical evidence of persistent disparities in educational opportunities between Afro-Brazilians and White-Brazilians that shows no signs of reduction. In addition, the educational mobility regimes between the groups have become more dissimilar (a sign of non-convergence) across cohorts. This pattern seems to be explained by the greater relative improvement in upward mobility for white Brazilians, while Afro-Brazilians lag behind. Together, these results are suggestive that Afro-descendants seem to be caught in an educational inequality trap in Brazil.

For Chile, while there also seems to be persistence in the differences in opportunity sets of indigenous and non-indigenous individuals, there is no growth in dissimilarity between their mobility regimes. This denotes that mobility patterns between ethnic groups have not improved nor grown similar, although mobility in general has risen substantially. Therefore, in this context, the evidence is not entirely conclusive on whether there is non-convergence. However, ethnic disparities remain a significant concern in this country, especially at the medium and high levels. Nevertheless, the estimates do not suggest that a trap is driving the low-level equilibrium of indigenous individuals.

These results shed light on two main aspects in which policies may be aimed to enhance equity among ethnic groups in educational attainment. On the one hand, there is need to compensate previous generations which faced a more restricted opportunity set due to their ethnic background, since their educational decisions reflected an internalization of inequality

of opportunity. This objective may be achieved by affirmative action employment and wage policies, which should aim to eliminate inequalities due to initial endowments (Blumkin *et al.*, 2009). On the other hand, there is also concern for future generations, since educational opportunities remain lower for ethnic groups. Therefore, particular attention must be placed on improving opportunities for younger generations through policies which seek to eliminate ethnic disparities in education, especially at the middle and high levels of schooling. For instance, existing large scale poverty programs may include an ethnic component (possibly conditional cash transfers) to mitigate the gap and ensure that future generations of ethnic groups ‘catch-up’ to the more advantaged group, which would directly address the persistent nature of educational inequalities (Fizbein and Schady, 2009).

However, there are some important notions to consider when designing policies from the presented results. First, both countries begin from different initial situations, which suggest that educational policies should focus on the particularities of the country’s education systems. Second, it is also relevant to consider the relative size of the ethnic groups in each country. Afro-Brazilians represent 40 percent of the total population, which implies that policies would have to be comparatively larger than any interventions in Chile (where the indigenous represent only 6 percent). Therefore, these differential concerns should also be relevant when determining the extent and scale of proposed interventions. These policies should lead to a more equitable society and increase efficiency in the development process (Bourguignon *et al.*, 2007).

Finally, further research is also required to consider inequality traps between other groups and outcomes, as well as additional methodological refinements to create a more established measurement framework to study long-term inequality of opportunity and the mechanisms which perpetuate situations of unequal power among groups to create a fairer society, at least in terms of opportunities.

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Tables

Table 1
Cohort definitions, sample sizes and composition

Brazil

Cohort label	Age in 2006	Years of birth	Number of Observations	Ethnicity		Parental Education			Children's Education		
				Ethnic Majority	Ethnic Minority	Low	Medium	High	Low	Medium	High
1	65 or +	1931 or -	12636	63.8	36.2	92.5	5.3	2.2	91.4	4.6	4.0
2	55 - 64	1932 - 41	15357	61.0	39.0	92.2	6.1	1.7	88.0	6.6	5.3
3	45 - 54	1942 - 51	24011	60.2	39.8	90.0	8.0	2.0	79.3	11.2	9.5
4	35 - 44	1952 - 61	34128	60.2	39.8	86.3	11.0	2.7	71.6	16.8	11.7
5	25 - 34	1962 - 71	32782	58.8	41.2	82.7	13.8	3.5	69.0	21.1	9.9

Source: Authors' calculations.

Note: Data is from survey year 1996 of the *Pesquisa Nacional por Amostra de Domicílios* (PNAD). Ethnic Majority corresponds to descendants of European immigrants while Ethnic Minority includes afro-descendent individuals following Guerreiro (2008). The low education category includes individuals with complete primary level or less. The medium education category includes individuals with incomplete or complete high-school and the high category includes individuals with incomplete or complete college or technical education and some post-high school degree.

Table 2
Cohort definitions, sample sizes and composition

Chile

Cohort label	Age in 2006	Years of birth	Number of Observations	Ethnicity		Parental Education			Children's Education		
				Ethnic Majority	Ethnic Minority	Low	Medium	High	Low	Medium	High
1	65 or +	1941 or -	31223	94.8	5.2	76.8	15.6	7.6	61.8	28.8	9.4
2	55 - 64	1942 - 51	29950	94.4	5.6	71.6	20.3	8.0	47.8	35.5	16.7
3	45 - 54	1952 - 61	42583	94.3	5.7	66.9	23.9	9.2	33.7	44.8	21.5
4	35 - 44	1962 - 71	49057	93.7	6.3	60.9	29.0	10.1	25.9	50.9	23.2
5	25 - 34	1972 - 81	37311	92.7	7.3	49.1	35.9	15.0	16.9	52.6	30.6

Source: Authors' calculations.

Note: Data are from survey years 2006 and 2009 of the *Encuesta de Caracterización Socioeconómica Nacional* (CASEN). Ethnic Majority corresponds to indigenous individuals while Ethnic Minority includes non-indigenous individuals following the classification in Agostini *et al.* (2010). The low education category includes individuals with complete primary level or less. The medium education category includes individuals with incomplete or complete high-school and the high category includes individuals with incomplete or complete college or technical education and some post-high school degree.

Table 3
Inequality of educational opportunities between ethnic groups
Heterogeneity index H^{IO}

Groups	Cohort label									
	1		2		3		4		5	
Brazil										
Ethnicity	0.185		0.178		0.201		0.233		0.217	
	(0.170	0.198)	(0.162	0.189)	(0.190	0.214)	(0.223	0.244)	(0.206	0.229)
Ethnicity, Gender and parental education	0.452		0.414		0.467		0.460		0.460	
	(0.410	0.478)	(0.385	0.429)	(0.439	0.488)	(0.439	0.474)	(0.441	0.472)
Chile										
Ethnicity	0.273		0.267		0.236		0.238		0.227	
	(0.232	0.315)	(0.219	0.302)	(0.197	0.271)	(0.210	0.267)	(0.195	0.261)
Ethnicity, Gender and parental education	0.501		0.441		0.387		0.445		0.419	
	(0.464	0.529)	(0.406	0.467)	(0.362	0.400)	(0.414	0.475)	(0.388	0.443)

Source: Authors' calculations from PNAD and CASEN data.

Note: 95% confidence intervals obtained by bootstrap methods with 300 replications.

Table 4
Differences in the H^{IO} index between cohorts

Brazil									
Cohort label	Cohort 1	Cohort 2	Cohort 3	Cohort 4	Cohort 5				
1		0.001	0.025	0.057	0.044				
		(-0.014	0.019)	(0.008	0.040)	(0.042	0.072)	(0.028	0.060)
2			0.024	0.056	0.043				
			(0.008	0.042)	(0.041	0.073)	(0.027	0.059)	
3				0.032	0.019				
				(0.016	0.045)	(0.004	0.034)		
4					-0.013				
					(-0.029	-0.001)			
5									

Chile									
Cohort label	Cohort 1	Cohort 2	Cohort 3	Cohort 4	Cohort 5				
1		0.007	-0.002	0.006	0.013				
		(-0.015	0.030)	(-0.024	0.017)	(-0.014	0.026)	(-0.007	0.036)
2			-0.009	-0.002	0.006				
			(-0.033	0.013)	(-0.023	0.022)	(-0.016	0.031)	
3				0.007	0.015				
				(-0.015	0.029)	(-0.007	0.040)		
4					0.007				
					(-0.013	0.031)			
5									

Source: Authors' calculations from PNAD and CASEN data.

Note: Each cell presents the estimate difference between the estimation of H^{IO} for cohort t+1 and cohort t (see Table 3). 95% confidence intervals obtained by bootstrap methods with 300 replications.

Table 5
Intergenerational educational mobility
Heterogeneity index H^M between transition matrices

Cohort label	Brazil		Chile	
1	0.313		0.409	
	(0.262	0.367)	(0.358	0.455)
2	0.301		0.389	
	(0.264	0.336)	(0.356	0.407)
3	0.429		0.333	
	(0.392	0.462)	(0.305	0.365)
4	0.426		0.362	
	(0.392	0.451)	(0.340	0.409)
5	0.417		0.378	
	(0.395	0.448)	(0.345	0.429)

Source: Authors' calculations from PNAD and CASEN data.

Note: 95% confidence intervals obtained by bootstrap methods with 300 replications.

Table 6
Differences in the H^M index between cohorts

Brazil

Cohort label	Cohort 1	Cohort 2	Cohort 3	Cohort 4	Cohort 5				
1		-0.012	0.115	0.112	0.104				
		(-0.114	0.070)	(0.011	0.202)	(0.043	0.182)	(0.031	0.176)
2			0.127	0.125	0.116				
			(0.072	0.180)	(0.085	0.200)	(0.076	0.185)	
3				-0.002	-0.011				
				(-0.060	0.053)	(-0.063	0.038)		
4					-0.009				
					(-0.050	0.031)			
5									

Chile

Cohort label	Cohort 1	Cohort 2	Cohort 3	Cohort 4	Cohort 5				
1		-0.019	-0.075	-0.046	-0.031				
		(-0.151	0.102)	(-0.169	0.018)	(-0.138	0.053)	(-0.105	0.071)
2			-0.056	-0.027	-0.011				
			(-0.113	0.048)	(-0.093	0.057)	(-0.060	0.078)	
3				0.029	0.044				
				(-0.021	0.084)	(-0.007	0.109)		
4					0.015				
					(-0.040	0.077)			
5									

Source: Authors' calculations from PNAD and CASEN data.

Note: Each cell presents the estimate difference between the estimation of H^M for cohort t+1 and cohort t (see Table 5). 95% confidence intervals obtained by bootstrap methods with 300 replications.

Table 7
% of Individuals high lower, same and higher educational level than their parents

Cohort label	Brazil				Chile			
	Average years of education	% Lower education than parents	% Same education than parents	% Higher education than parents	Average years of education	% Lower education than parents	% Same education than parents	% Higher education than parents
Total								
1	2.7	4.0	90.2	5.8	6.7	7.7	69.2	23.2
2	3.6	3.7	87.2	9.1	8.4	6.2	59.1	34.7
3	4.9	3.4	80.0	16.6	10.0	5.9	49.0	45.1
4	6.2	4.0	73.5	22.5	10.9	5.6	46.5	47.9
5	6.8	5.9	72.1	22.0	12.0	5.5	47.0	47.6
Ethnic Majority								
1	3.4	5.0	87.0	8.0	6.8	7.9	68.3	23.8
2	4.4	4.3	83.6	12.1	8.5	6.3	58.3	35.4
3	5.9	3.7	75.5	20.8	10.2	5.9	48.5	45.6
4	7.2	4.3	67.6	28.1	11.0	5.7	46.0	48.2
5	7.7	6.2	66.8	27.0	12.1	5.5	46.9	47.6
Ethnic Minority								
1	1.4	2.0	96.1	2.0	4.3	3.4	84.7	11.9
2	2.3	2.5	93.0	4.4	6.2	4.8	72.0	23.2
3	3.4	2.4	87.8	9.8	8.1	5.3	57.4	37.4
4	4.7	3.6	82.6	13.8	9.2	4.2	53.2	42.7
5	5.6	5.4	79.3	15.4	10.4	5.1	47.5	47.4

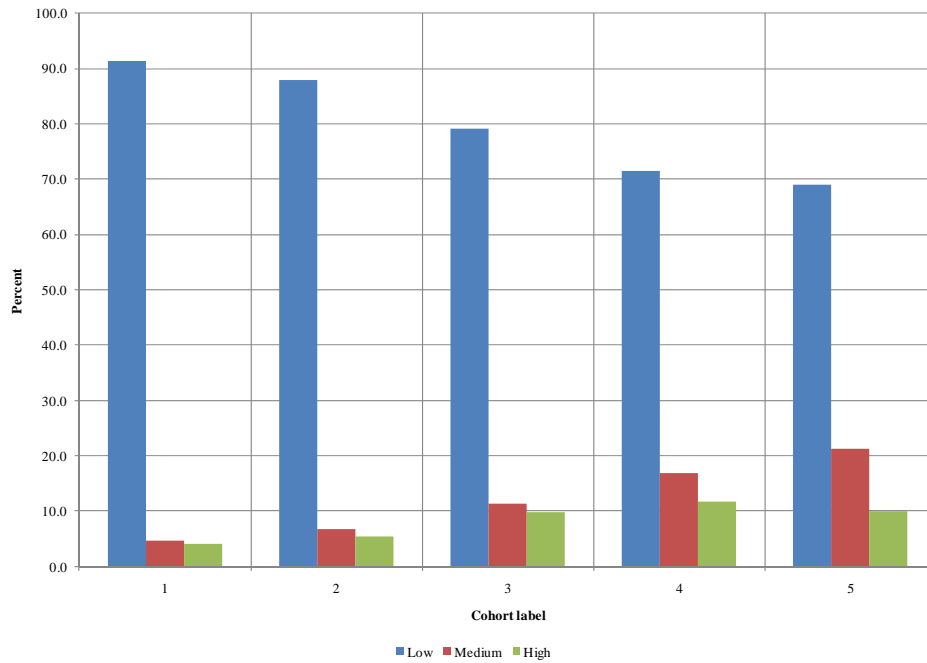
Source: Authors' calculations from PNAD and CASEN data.

Note: In Brazil, Ethnic Majority corresponds to descendents of European immigrants while Ethnic Minority includes afro-descendent individuals. In Chile, Ethnic Majority corresponds to indigenous individuals while Ethnic Minority includes non-indigenous individuals.

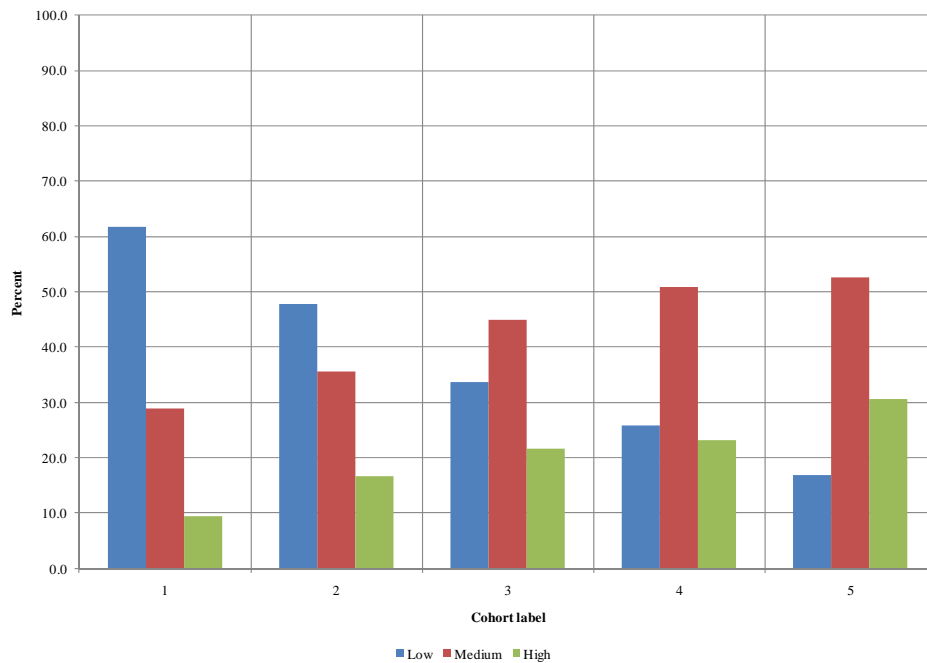
Figures

Figure 1
Individual educational distributions by cohort

Brazil



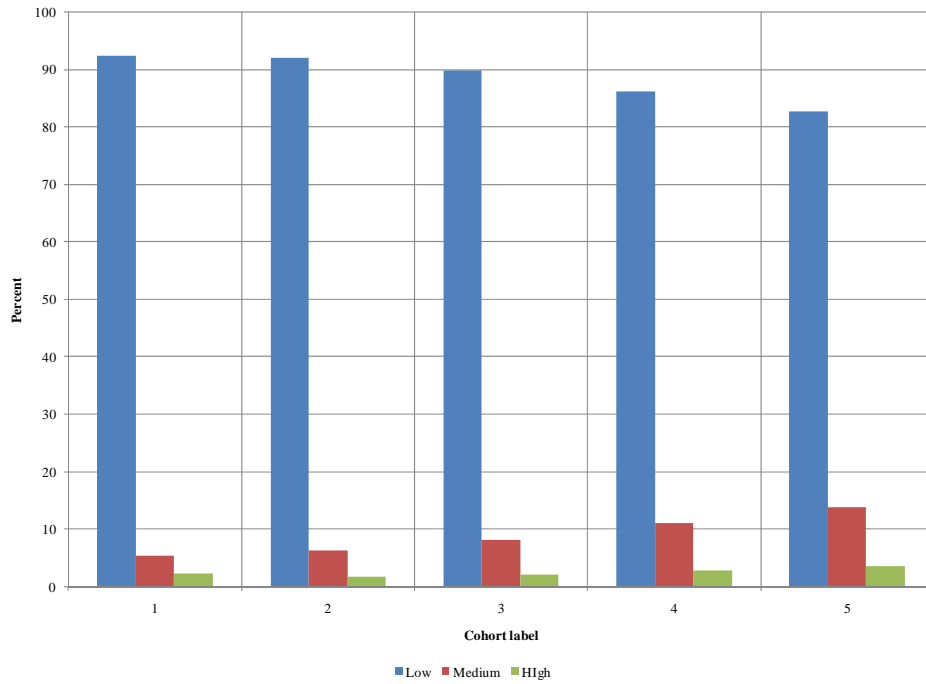
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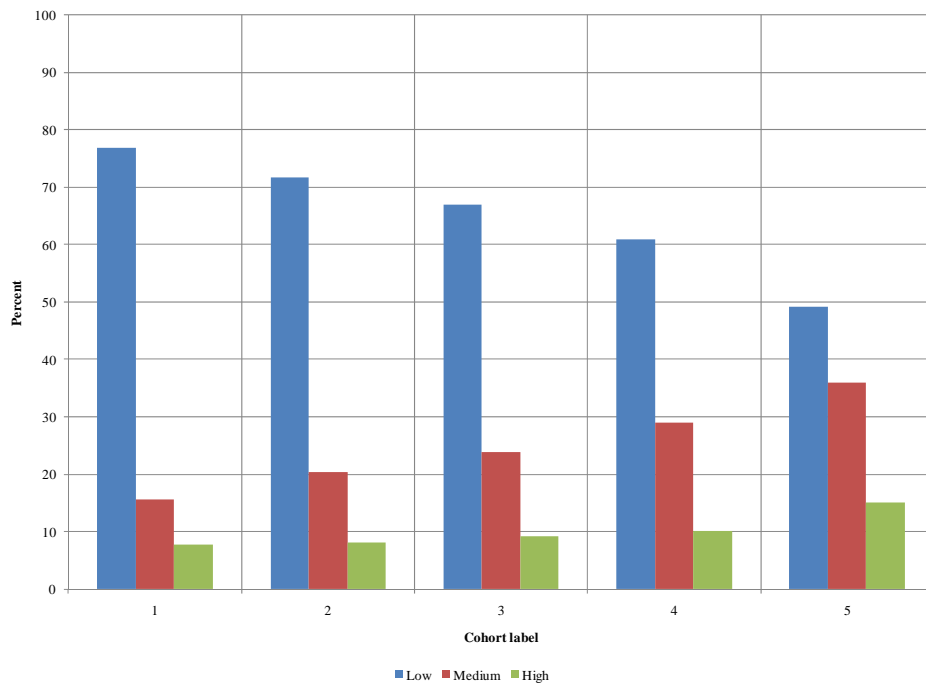
Source: Authors' calculations from PNAD and CASEN data.

Note: The low education category includes individuals with complete primary level or less. The medium education category includes individuals with incomplete or complete high-school and the high category includes individuals with incomplete or complete college or technical education and some post-high school degree.

Figure 2
Parental educational distributions by cohort
Brazil



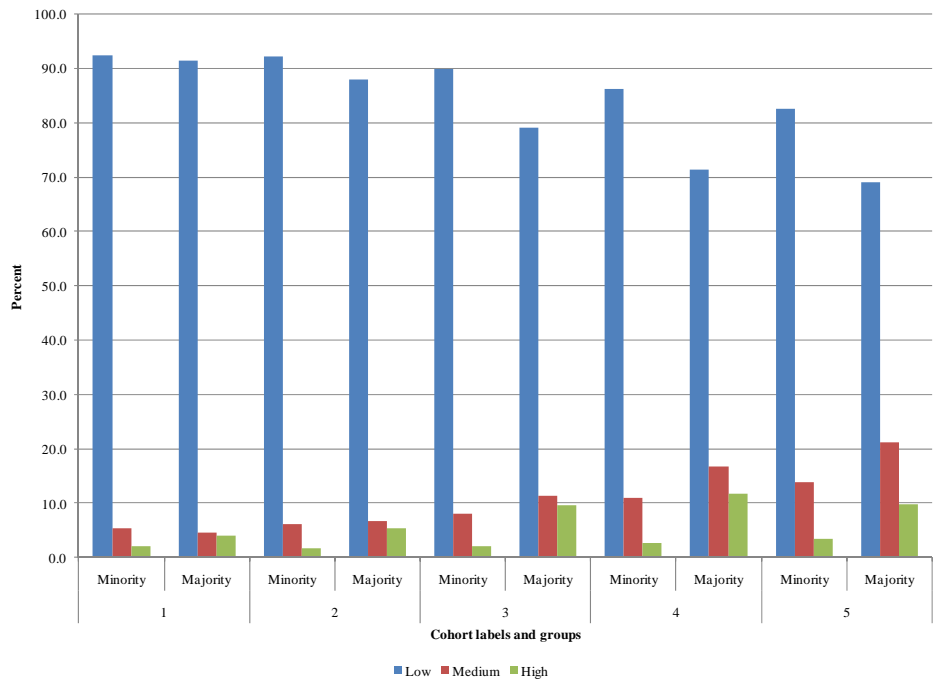
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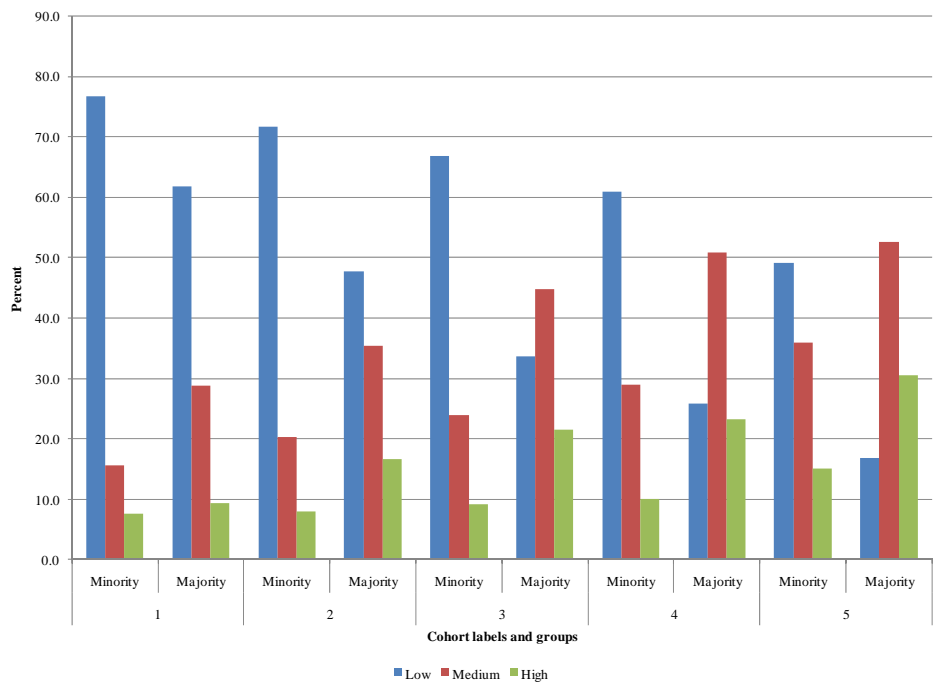
Source: Authors' calculations from PNAD and CASEN data.

Note: The low education category includes individuals with complete primary level or less. The medium education category includes individuals with incomplete or complete high-school and the high category includes individuals with incomplete or complete college or technical education and some post-high school degree.

Figure 3
Educational distributions by ethnic groups across cohorts
Brazil



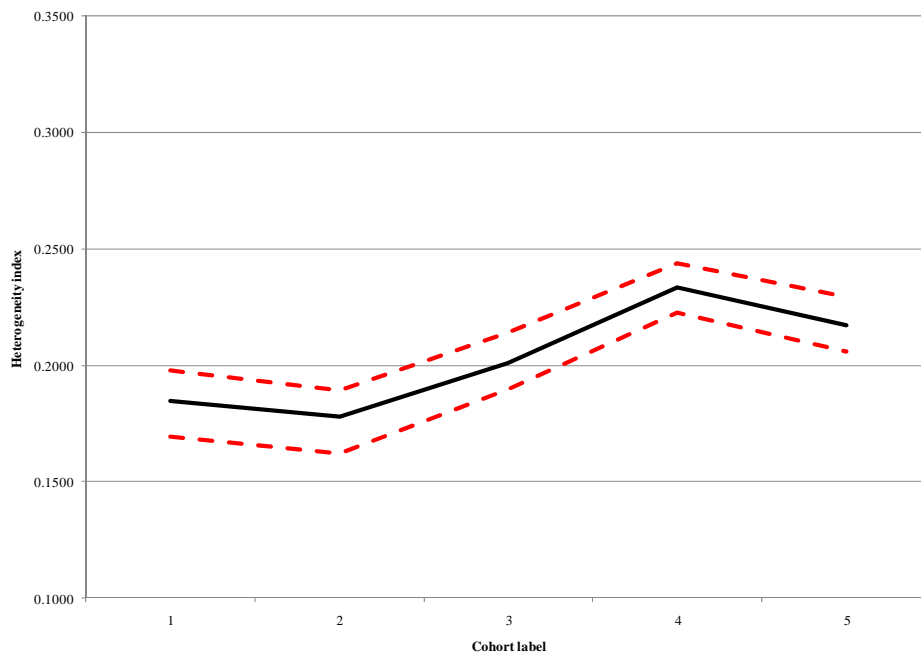
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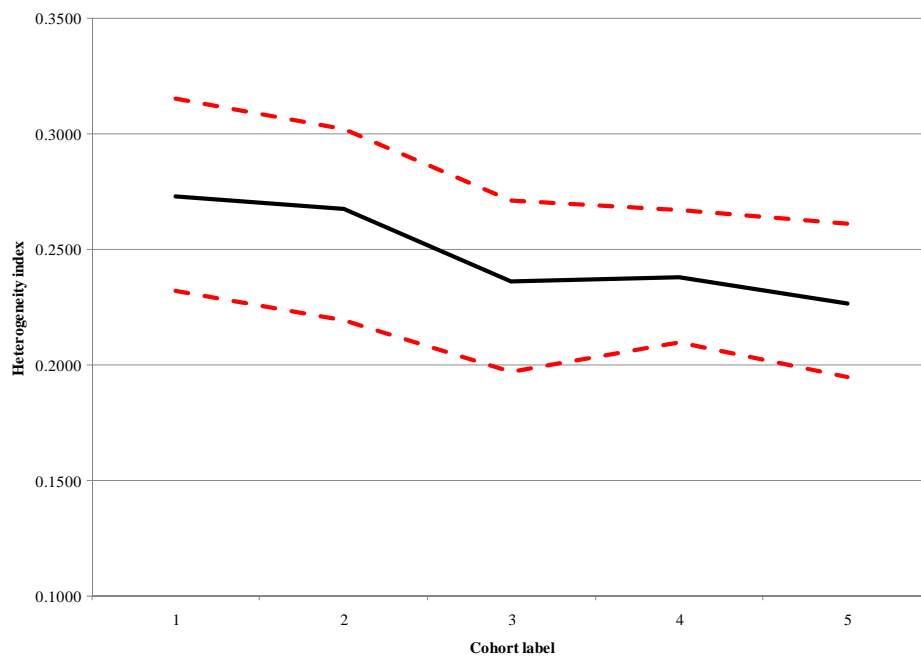
Source: Authors' calculations from PNAD and CASEN data.

Note: In Brazil, Ethnic Majority corresponds to descendants of European immigrants while Ethnic Minority includes afro-descendent individuals. In Chile, Ethnic Majority corresponds to indigenous individuals while Ethnic Minority includes non-indigenous individuals. The low education category includes individuals with complete primary level or less. The medium education category includes individuals with incomplete or complete high-school and the high category includes individuals with incomplete or complete college or technical education and some post-high school degree.

Figure 4
Inequality in educational opportunities between ethnic groups and cohorts
Brazil



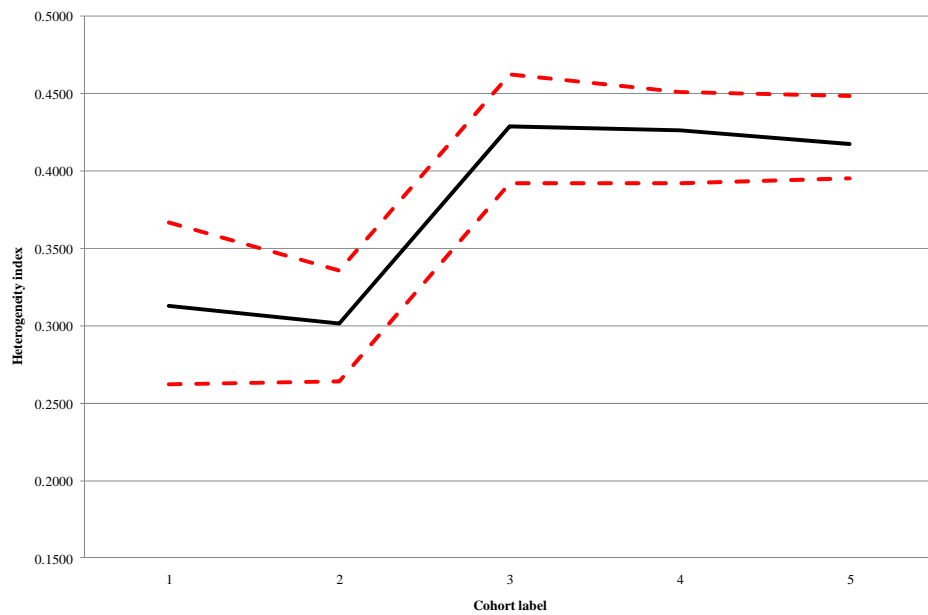
Chile



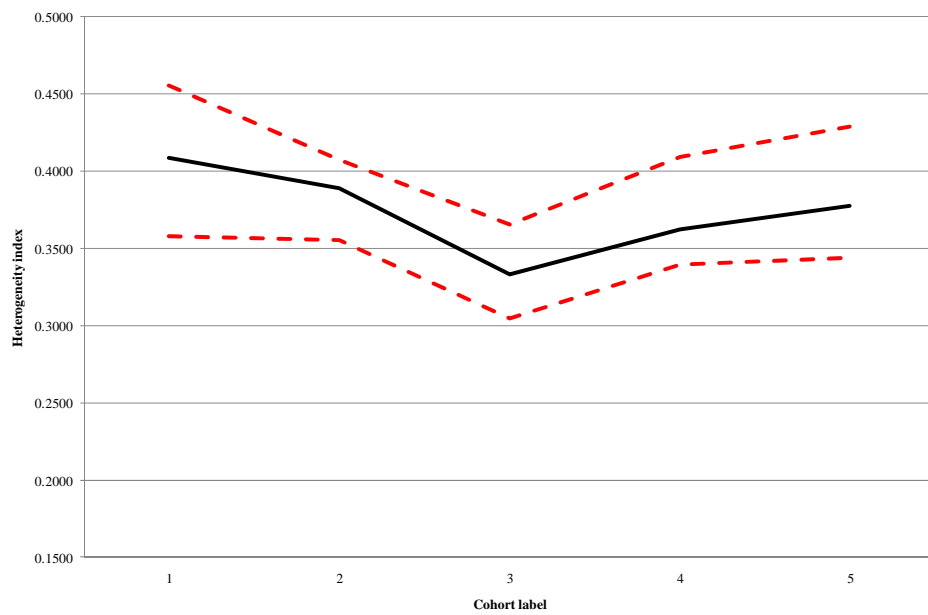
Source: Authors' calculations from PNAD and CASEN data.

Note: 95% confidence intervals depicted by dotted lines (obtained by bootstrap methods with 300 replications).

Figure 5
Differences in intergenerational educational mobility between ethnic groups and cohorts
Brazil



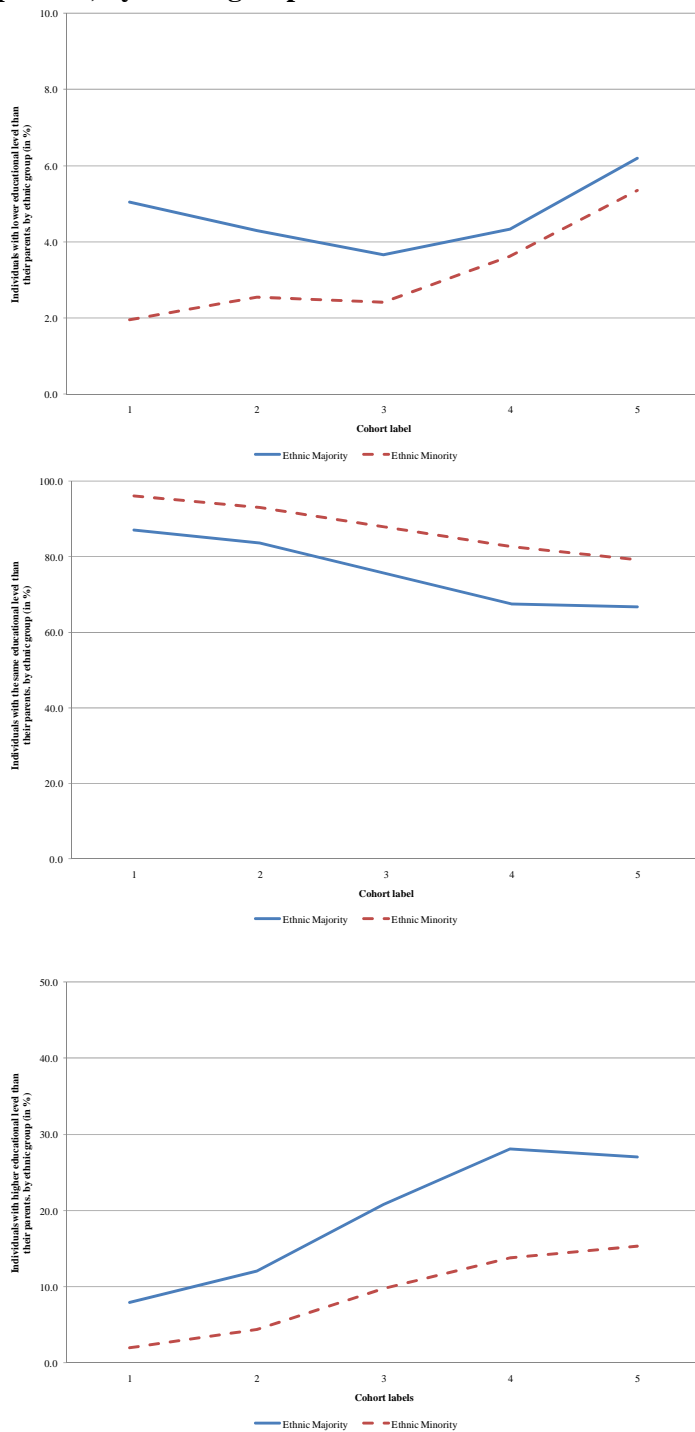
Chile



Source: Authors' calculations from PNAD and CASEN data.

Note: 95% confidence intervals depicted by dotted lines (obtained by bootstrap methods with 300 replications).

Figure 6
Brazil: Percentage of individuals whose education is lower, the same or higher than their parents, by ethnic group and cohorts

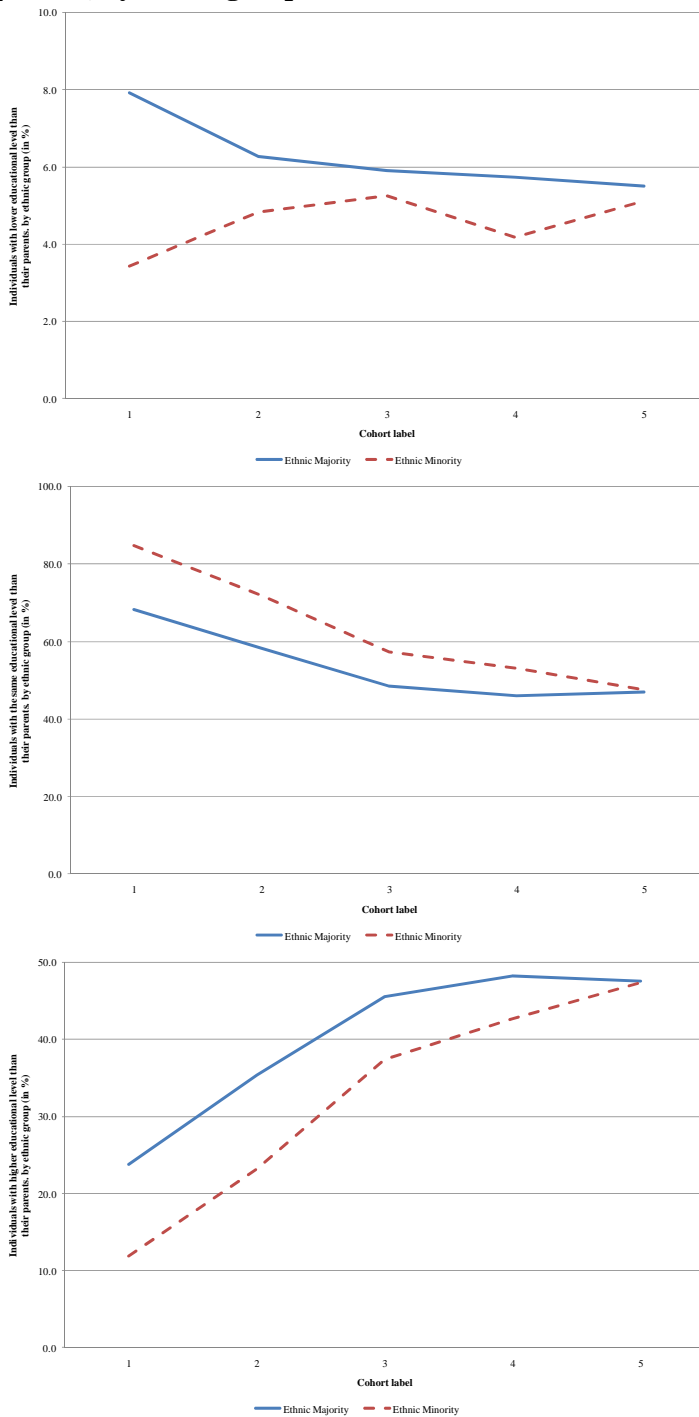


Source: Authors' calculations from PNAD data.

Note: In Brazil, Ethnic Majority corresponds to descendants of European immigrants while Ethnic Minority includes afro-descendent individuals. In Chile, Ethnic Majority corresponds to indigenous individuals while Ethnic Minority includes non-indigenous individuals.

Figure 7

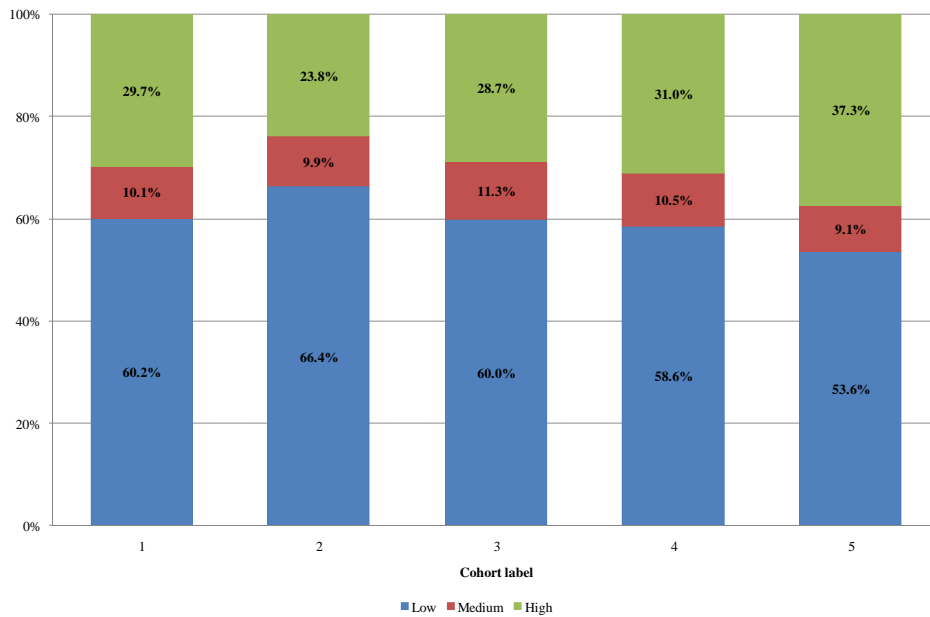
Chile: Percentage of individuals whose education is lower, the same or higher than their parents, by ethnic group and cohorts



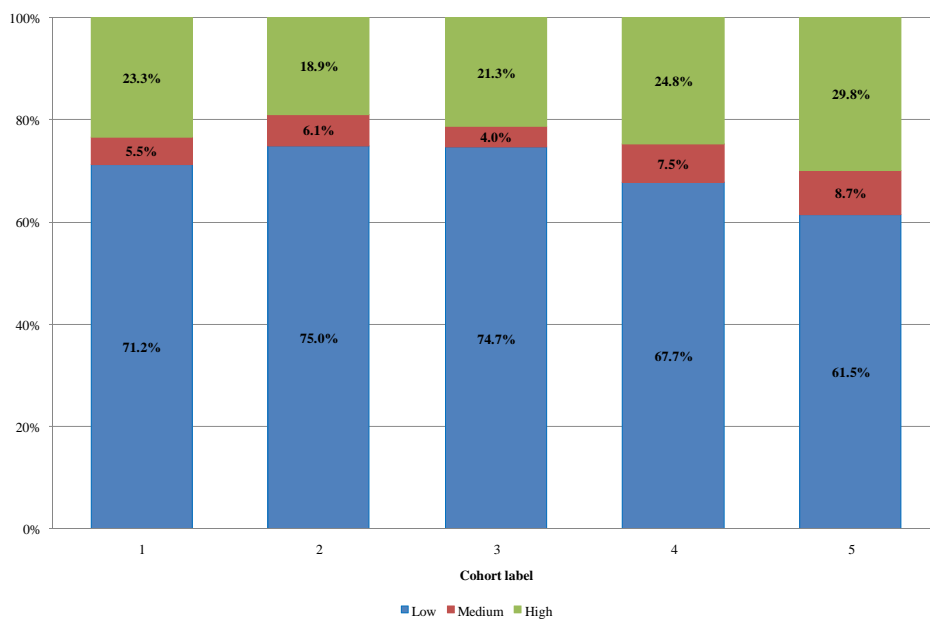
Source: Authors' calculations from CASEN data.

Note: In Brazil, Ethnic Majority corresponds to descendants of European immigrants while Ethnic Minority includes afro-descendent individuals. In Chile, Ethnic Majority corresponds to indigenous individuals while Ethnic Minority includes non-indigenous individuals.

Figure 8
Contribution of each parental education level to overall heterogeneity in educational mobility
Brazil



Chile



Source: Authors' calculations from PNAD and CASEN data.

Note: 95% confidence intervals depicted by dotted lines (obtained by bootstrap methods with 300 replications).

Appendix

Table A.1
Transition matrices - Brazil

Parental Educational Level	Individual's Educational Level								
	Total			Ethnic Majority			Ethnic Minority		
	Low	Medium	High	Low	Medium	High	Low	Medium	High
Cohort 1									
Low	0.88	0.03	0.02	0.84	0.04	0.02	0.96	0.01	0.01
Medium	0.03	0.01	0.01	0.03	0.02	0.02	0.02	0.00	0.00
High	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00
Cohort 2									
Low	0.85	0.05	0.03	0.80	0.06	0.04	0.92	0.03	0.01
Medium	0.03	0.02	0.02	0.03	0.02	0.03	0.02	0.01	0.00
High	0.00	0.00	0.01	0.01	0.01	0.01	0.00	0.00	0.00
Cohort 3									
Low	0.76	0.08	0.05	0.70	0.09	0.07	0.86	0.06	0.02
Medium	0.02	0.03	0.03	0.03	0.03	0.04	0.02	0.02	0.01
High	0.00	0.00	0.01	0.00	0.01	0.02	0.00	0.00	0.00
Cohort 4									
Low	0.68	0.13	0.06	0.60	0.15	0.08	0.80	0.10	0.03
Medium	0.03	0.04	0.04	0.03	0.04	0.06	0.03	0.03	0.02
High	0.00	0.00	0.02	0.00	0.01	0.03	0.00	0.00	0.00
Cohort 5									
Low	0.64	0.15	0.04	0.57	0.17	0.05	0.75	0.12	0.02
Medium	0.05	0.06	0.04	0.05	0.07	0.05	0.05	0.04	0.02
High	0.00	0.01	0.02	0.00	0.01	0.04	0.00	0.00	0.01

Source: Authors' calculations from PNAD data.

Note: In Brazil, Ethnic Majority corresponds to descendants of European immigrants while Ethnic Minority includes afro-descendent individuals.

Table A.2
Transition matrices - Chile

Parental Educational Level	Individual's Educational Level								
	Total			Ethnic Majority			Ethnic Minority		
	Low	Medium	High	Low	Medium	High	Low	Medium	High
Cohort 1									
Low	0.57	0.17	0.02	0.56	0.18	0.02	0.82	0.09	0.02
Medium	0.03	0.09	0.04	0.03	0.09	0.04	0.02	0.03	0.01
High	0.01	0.03	0.03	0.01	0.03	0.04	0.01	0.00	0.00
Cohort 2									
Low	0.44	0.23	0.05	0.43	0.23	0.05	0.68	0.18	0.03
Medium	0.03	0.10	0.07	0.03	0.11	0.07	0.03	0.03	0.02
High	0.01	0.02	0.05	0.01	0.02	0.05	0.01	0.01	0.01
Cohort 3									
Low	0.30	0.30	0.07	0.29	0.30	0.07	0.51	0.30	0.04
Medium	0.03	0.13	0.09	0.03	0.13	0.09	0.03	0.05	0.04
High	0.01	0.03	0.06	0.01	0.03	0.06	0.01	0.02	0.02
Cohort 4									
Low	0.23	0.32	0.06	0.22	0.32	0.06	0.41	0.34	0.04
Medium	0.03	0.16	0.10	0.03	0.17	0.10	0.03	0.10	0.05
High	0.00	0.03	0.07	0.00	0.03	0.08	0.00	0.01	0.01
Cohort 5									
Low	0.14	0.29	0.06	0.13	0.28	0.06	0.29	0.35	0.06
Medium	0.02	0.21	0.13	0.02	0.21	0.14	0.02	0.14	0.06
High	0.00	0.03	0.12	0.00	0.03	0.12	0.00	0.03	0.04

Source: Authors' calculations from CASEN data.

Note: In Chile, Ethnic Majority corresponds to indigenous individuals while Ethnic Minority includes non-indigenous individuals.