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More than a Sorting Machine: Educational Policy and Ethnic Boundary Making in Mexico

by

Enrique Eduardo Valencia López

A dissertation submitted in partial satisfaction of the

requirements for the degree of

Doctor of Philosophy

in

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in the

Graduate Division

of the

University of California, Berkeley

Committee in charge:

Professor Kris Gutiérrez, Chair

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Summer 2024

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Abstract

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This dissertation explores how education contributes to the making of ethnic boundaries and shapes attitudes towards ethnic groups in Mexico. This question is explored in three interlinked papers by looking at textbooks, educational reforms, and changes in social status, which include increased educational attainment.

The first paper examines historical depictions of Indigenous and Afrodescendientes in Mexican textbooks. It identifies a trend of shifting portrayals, moving from essentialist portrayals in early textbooks to more nuanced and inclusive portrayals in recent years. The language and imagery used in textbooks are shown to reflect broader socio-political changes and the state's efforts to construct a cohesive national identity. The analysis reveals that while Indigenous peoples are increasingly portrayed in terms of cultural and socio-economic differentiation, Afrodescendientes remain underrepresented and are often depicted with rigid, essentialist boundaries based on skin color.

The second paper investigates the effects of the 1993 educational reform, which made secondary schooling compulsory, on societal attitudes toward ethnic minorities. Using survey data and statistical analyses, the study finds that increased educational attainment is associated with more open and inclusive attitudes toward Indigenous peoples but has had a more limited impact on attitudes towards Afrodescendientes. The research suggests that education plays a critical role in shaping social attitudes, though its effects vary across different ethnic groups.

The final area of research explores the concept of ethnic mobility in Mexico, examining how individuals' ethnic identification can change over time and in response to social and economic pressures. The study finds that ethnic mobility is more fluid for Indigenous peoples, who may adopt a mestizo identity to gain social or economic advantages. In contrast, Afrodescendientes experience less mobility, with their identity more rigidly defined by skin color and less subject to change.

In conclusion, this dissertation provides evidence that Mexican educational policies and textbooks have played a significant role in both reflecting and shaping ethnic boundaries, with varying effects on different ethnic groups. While there has been progress towards more inclusive representations, particularly for Indigenous peoples, significant challenges remain in addressing the representation of Afrodescendientes in Mexican society.

Contents

Contents	i
List of Figures	ii
List of Tables	iii
1 Introduction	1
2 Historical Depictions of Indigenous and Afrodescendientes in Mexican Textbooks	3
2.1 Introduction	3
2.2 Context of Textbook Production and Policy in Mexico, 1959-2020	5
2.3 Literature Review: Representations in Textbooks	7
2.4 Computational Approaches to Examine Textbooks	9
2.5 Results	14
2.6 Appendix A: TF-IDF of Each Ethno-racial term	24
3 The Effect of the 1993 Educational Reform on Attitudes Towards Ethno-racial minorities	26
3.1 Introduction	26
3.2 Literature Review: Educational Attainment and Openness towards diversity.	28
3.3 The 1993 School Reforms: Compulsory Secondary School	33
3.4 Data	35
3.5 Identification Strategy	39
3.6 Results	41
4 Ethnic Mobility in Mexico	54
4.1 Introduction	54
4.2 Theoretical framework	56
4.3 Data Analysis	60
4.4 Appendix A: Transition Matrix	71
4.5 Appendix B: Transition Matrices by Age Groups	72
5 Conclusion	74
References	76

List of Figures

2.1	Proportion of specific terms in textbooks over time	14
2.2	Proportions of Faces with Specific PERLA Skin Tone Over Different Textbook Generations	19
2.3	PERLA Skin Color for Vicente Guerrero over time	20
2.4	Illustration of Vicente Guerrero in 1962	20
2.5	Illustration of Vicente Guerrero in 2019	20
2.6	PERLA Skin Color for Miguel Hidalgo over time	21
2.7	PERLA Skin Color for Benito Juárez over time	22
2.8	Top TF-IDF scores for Indigenous peoples	24
2.9	Top TF-IDF scores for Afrodescendientes	24
2.10	Top TF-IDF scores for Mestizos	25
2.11	Top TF-IDF scores for Mexicans	25
3.1	Years of schooling vs interval (k) bandwidth of 10	42
3.2	Density test for Manipulation of the Running Variable	46

List of Tables

1	Research Questions and Methods for Content Analysis and Facial Recognition	9
2.2	Combined Terms and Percentages	15
2.3	Percentage of terms across different years with row and column totals.	15
2.4	Log-odds ratio of words associated with particular groups	16
2.5	Unique keywords for each group across different topics.	18
3.1	ENADIS Survey Questions	35
3.2	Summary statistics for Attitudes Towards Indigenous Peoples	37
3.3	Summary statistics for outcome measures: Individual items and indigenous and afrodescendiente scales	38
3.4	2SLS Regression Results for the Indigenous Scale	43
3.5	2SLS Regression Results for the Afrodescendiente Scale	44
A.1	2SLS regression results, alternative bandwidths for the Indigenous scale.	48
A.1	2SLS regression results, alternative bandwidths for the Afrodescendientes scale.	48
A.2	Likelihood Ratio Comparing IRT Models	49
A.3.1	2SLS Regression Results for the Indigenous Scale with IRT Modelling	50
A.3.2	2SLS Regression Results for the Afrodescendiente Scale with IRT Modelling	51
A.4.1	2SLS Item Analysis for Items Related to Indigenous Peoples	52
A.4.2	2SLS Item Analysis for Items Related to Afrodescendientes	53
4.1	Transition Matrix for Self-Reported Ethnicity per Year	62
4.2	Description of variables	65
4.3	Odds ratio of self-reporting as indigenous given years of education and other socio-economic variables for young people aged 15-29	67
4.4	Odds ratio of self-reporting as indigenous given employment and other socio-economic variables for people aged 30-65	69

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Chapter 1

Introduction

This dissertation examines whether and how educational policies, and their cultural artefacts such as textbooks, contribute to the formation of ethno-racial boundaries and attitudes in Mexico. Theoretically, this work will link an emerging strand of research that examines the causal effect of educational policies on long-term attitudes and the theory of categorical inequality (Domina, Penner, & Penner, 2017). Empirically, this dissertation is composed of three studies where I assess 1) how history and civic education textbooks in 4th grade have depicted Indigenous and Afrodescendientes over time; 2) the relationship between ethnic fluidity in Mexico and changes in socioeconomic status; and 3) the causal effect of curricular policy on attitudes towards Afrodescendientes and Indigenous peoples.

In the first study, I look at eleven generations of official History and Civic Education textbooks (1960-2019) and analyse how these textbooks have depicted Indigenous and Afrodescendientes. Official textbooks, particularly in a centralised system like Mexico, are fundamental inputs to understand the social and political contexts of education (Apple, 1992): they provide official knowledge that the state expects its citizens to know (Williams & Bokhorst-Heng, 2016); they can frame narratives by describing how certain events occurred, and they represent a group's identity by creating a shared sense of history and values while describing who they are and who "the others" are. They can also transfer state-sanctioned racial schemas. A racial schema is a "a bundle of racial categories and the set of rules for what they mean, how they are ordered, and how to apply them to oneself and others." (Roth, 2012).

In Mexico, and Latin America more broadly, previous studies have examined how textbooks reflect a larger political discourse about ethno-racial identities (Luca, 2019). Their results have identified that many of the textbooks have shifted discourses whereby indigenous individuals are portrayed as a cultural "other" to class-based depictions, where indigenous identity is closely aligned with being a rural peasant (Vargas-Escobar, 2011). However, most of these studies focus on a particular time period, such as large reforms, or examine a few generations of textbooks, which limits our ability to study how textbook depictions adapt to policy discourse. To overcome this limitation, I use Natural Language Processing (NLP) and expand this line of work by looking at History textbooks over a period of 59 years to identify ethno-racial variations or continuities in school curricula. By looking at these changes over time, I build a more complete picture of the discourse around ethno-racial identities and the role of the History curriculum on nation-building and shaping racial schemas. Results from these analysis can show how aligned these depictions are with the predominant policy discourse in education about indigenous groups at the time.

In the second paper, I examine the causal effects of the 1993 Secondary Law Reform on perceptions towards Indigenous peoples and Afrodescendientes on a variety of measures: political participation, labour market, marriage, and affirmative action. Using data from the 2022 National

Survey on Discrimination (ENADIS), I also test whether increased educational attainment is associated with individualistic or structural views on inequality between ethnic groups. Results from this paper can contribute to the ongoing debate on whether and how education shapes attitudes towards diversity.

In the third study, I describe patterns of self-reported ethnic identity in Mexico and examine individual-level factors that contribute to these patterns using the Mexican Family Survey (MxFLS). By using longitudinal data, I provide additional evidence of the mutually constitutive relationship between ethnicity and socioeconomic inequality. To analyse my data, I will use fixed effects modelling, an approach that has been predominant in the sociological literature of racial fluidity in the United States (e.g. Saperstein, 2012). This estimation technique with longitudinal data allows me to address some of the limitations of current cross-sectional research where inferences are constrained by issues of endogeneity (Paredes, 2018) or over reliance in a main informant that required studies to assume that the main respondent knew how other members of the household, including children, would self-identify (Villarreal, 2012a). More importantly, longitudinal data allows me to test the assumption of the extent to which individuals report a stable ethnic identity over a certain period of time.

Chapter 2

Historical Depictions of Indigenous and Afrodescendientes in Mexican Textbooks

2.1 Introduction

This paper examines how 4th-grade history and social science textbooks in Mexico have depicted Indigenous peoples and Afrodescendientes since 1959, the year the government centralized textbook design and distribution. By taking control of educational materials, the government consolidated its power to shape elite-sanctioned ideologies, influencing racial perceptions and popular discourse about the Mexican nation.

Among the various ideologies embedded in these textbooks, *mestizaje* stands out as the most prominent. *Mestizaje*, the concept that Mexico is a nation formed from the amalgamation of Indigenous and European races, served two main purposes for the elites. First, it facilitated a discourse that positioned Mexico as a modern nation capable of negotiating more equitably with Western countries. Second, *mestizaje* acted as a tool for state consolidation, as elites sought to create a homogeneous nation, promoting stability.

By embracing *mestizaje*, the Mexican elite argued that the nation was moving beyond its colonial past and Indigenous roots to become a modern state (Stepan, 1991). This ideology also provided a more inclusive discourse of national identity, contrasting with the racial segregation and discrimination prevalent in other countries, particularly the United States. This inclusivity was presented as a modern and progressive approach to nationhood. For example, José Vasconcelos, the intellectual father of *mestizaje*, envisioned a "cosmic race," where all Mexicans, regardless of racial background, belonged to a unified mestizo identity, promoting social cohesion and reducing ethno-racial tensions (Knight, 1990).

Although the idea of racial mixing had emerged earlier during Latin America's independence movements—with figures like José Martí in Cuba and Simón Bolívar in Venezuela acknowledging the distinct cultural heritage of the Americas, integrating both Indigenous and European influences (cf. Martínez, 1998)—Vasconcelos provided a theoretical and cohesive framework that turned *mestizaje* from a mere concept into an ideological project.

Vasconcelos intertwined dominant political and aesthetic definitions of Mexican identity with racial discourse, creating a "mythical discourse" about the "racial superiority" of mestizos. This narrative allowed him to marginalize Mexico's social problems—such as poverty, violence, and instability—by promoting a utopian vision where social progress was tied to the adoption of European education and culture by mestizos. In this ideal society, racism and greed would be eradicated (Manrique & Bunkowski, 2016).

As a tool for state consolidation, the concept of *mestizaje* enabled post-revolutionary governments to redefine the Mexican nation. By equating the nation with mestizos, these governments

aimed to reduce the political mobilization of Indigenous peoples, particularly in regions involved in revolutionary struggles, such as those advocating for land reform. By encouraging Indigenous peoples to identify more as *mestizo*, and thus as 'Mexicans,' rather than as Indigenous, the government sought to achieve greater social cohesion and reduce conflict.

Education was one of the central tools governments used to transfer these ideas about national identity. José Vasconcelos himself saw schools as one of the channels that could help align individuals' ethnic identities with a national narrative (Vasconcelos, 1925). This paper examines one of those channels: the textbooks and how they portray *Afrodescendientes* and Indigenous peoples.

Textbooks are a central educational tool, they lie at the intersection of macro and micro level forces and have been considered fundamental to shape students' beliefs and attitudes (Apple, 1992). Macro-level forces refers to the sociopolitical context, elites' interests, and larger interests about nation-building. Micro-level refers to individuals' cognitive dispositions towards specific groups.

The results of this paper show textbooks have shaped ethno-racial boundaries for *Afrodescendientes* and Indigenous peoples differently. Through the use of different descriptors, topics, and terms, textbooks produce and reproduce racial schemas—specific ideas that affect how individuals perceive others' behaviors and appearances.

The concept of boundaries is central to theories that explain how the Mexican state, and Latin America more broadly, attempted to assimilate ethnic groups, particularly Indigenous peoples, with the explicit goal of nation-building¹. An ethnic boundary is a distinction that individuals make based on a belief, whether real or imaginary, of common descent, which shapes their behaviors and attitudes toward one another (Wimmer, 2013). These boundaries can be sharp or soft.

Sharp boundaries are characterized by high degrees of social closure: they imply that membership in a particular ethno-racial group is well-defined by distinct cultural, political, or perceived biological differences (Wimmer, 2013). Sharp boundaries create clearly identifiable groups, often considered outsiders, both in terms of social networks and mental representations. In contrast, soft boundaries have unclear demarcations of group membership, allowing individuals to switch identities situationally (Wimmer, 2013).

Ethnic boundaries for Indigenous peoples have shifted from soft to sharp in textbook representation over a period of 60 years. In earlier generations and until 1993, Indigenous peoples were framed as distinct groups, sometimes with clear statements reflecting their perceived cultural inferiority (e.g., the 1962 textbooks). However, the discourse of the Mexican nation remained inclusive—emphasizing that Indigenous peoples were also citizens of Mexico, particularly in textbooks from 1988. In later generations, as the discourse of *mestizaje* waned, Indigenous peoples were increasingly depicted as culturally and economically distinct from the rest of the population.

Afrodescendientes, on the other hand, have remained largely invisible across textbook generations, with discourses about them implying a sharp boundary. Across all the ethno-racial terms analyzed, *Afrodescendientes* are the least referenced. When they are mentioned, their skin colors are often portrayed as lighter than described by contemporaries. The terms used to describe this group have shifted from essentialist labels (e.g., "Black") to ancestry-based terms (e.g., "African"), suggesting that membership in the *Afrodescendientes* group is well-defined. This contrasts with the fluidity in how Indigenous peoples were defined, highlighting ongoing tensions in the nation's identity-building narrative.

¹Loveman (2014) also argues that Latin American states developed categorical practices based on external models of the modern, which were predominantly European

2.2 Context of Textbook Production and Policy in Mexico, 1959-2020

Since 1959, the Mexican federal government has provided free textbooks to all students enrolled in primary education (grades 1-6). The policy aimed to be both compensatory and managerial. As a compensatory policy, its purpose was to reduce household expenses for educational materials, which until then had been sold by private publishing companies. As a managerial policy, it allowed the government to consolidate control over the curriculum and monopolize important instruments for ideological dissemination, weakening the influence of other schooling providers in the country—the church and the private sector—in shaping students’ attitudes and beliefs (Escobar, 2011).

To ensure the implementation of the free textbook policy, the federal government created the National Commission on Free Textbooks (*Comisión Nacional de Libros de Texto Gratuitos*, CONALITEG). CONALITEG oversees the entire cycle of textbook production—design, publication, and distribution—but does not control curricular policy. Curricular policy is coordinated by the Secretariat of Public Education (SEP), which decides the objectives, content, and structure of the curriculum.

Research shows that changes in curricular policy often stem from major educational reforms (Unidad de Normatividad y Política Educativa, 2016). These reforms align with the National Development Plan (NPD) of each new presidential administration and are influenced by both external and internal factors. External factors usually include assessments of educational quality from international organizations (OECD, 2019), while internal factors frequently involve resolving tensions among stakeholders such as teacher unions and activists (OECD, 2019).

Although the process of designing educational policy is ostensibly democratic and involves teachers, intellectuals, and bureaucrats, the SEP has historically centralized the development of textbook policy, prioritizing governance and elite-sanctioned interests (OECD, 2019). These priorities are reflected in the content of textbooks, and research indicates an evolution from post-revolutionary concerns about social class and nationhood to more recent recognitions of Mexico’s multicultural identity (vom Hau, 2009; Vaughan, 1997).

CONALITEG was founded at a time when different ideological currents threatened the status of the Institutional Revolutionary Party (*Partido Revolucionario Institucional*, PRI) as the political party successor of the Mexican Revolution (1910-1917). The PRI achieved political consensus through a corporatism approach, where various associations—agricultural, labor, scientific, guilds—negotiated contracts or policy based on common interests. However, the rise of different parties (e.g., the National Action Party and the Socialist Party) jeopardized the ideological unity of the country’s political actors. Protests by nationalist workers and the increasing popularity of Marxist-Leninism also pressured the government to centralize the publishing industry, which was previously dominated by Spanish immigrants (Alejos, 2013).

Since the foundation of CONALITEG, the Mexican government has enacted several educational reforms that have changed the content and structure of textbooks. Historians have identified four waves of textbooks: the Nationalistic period (1960-1972), the Nativist approach (1972-1993), Modernization (1993-2008), and the Fourth wave (2009-2017) (Nehmad & Bravo, 2021). Each wave is characterized by specific ideological trends reflecting the federal government’s efforts to socialize students into ideas of citizenship and nationhood. While these waves primarily apply to language and reading textbooks, they also likely reflect the content structure of other subjects.

Reading and literature materials from the Nationalistic period reinforce the idea that Mexico is a mestizo nation. However, these books introduce class-based descriptions, depicting indigenous peoples as peasants and engineers as light-skinned individuals (Nehmad & Bravo, 2021). They

also emphasize the role of Spanish as central to the unity of Mexico, largely ignoring the country's indigenous languages.

Educational resources from the Nationalistic period (1960-1972) remain ideologically similar to those from the post-war period (1940-1959) (Vázquez, 2018). Both sets of materials continued reproducing cultural and ethno-racial hierarchies, where the idea of Mexico as a mestizo nation converged with social class. To become mestizo, the ideal citizen was expected to speak Spanish and adopt an urban lifestyle (vom Hau, 2009). Indigenous peoples, on the other hand, were depicted as rural peasants who were not fully granted citizens' rights. The country would achieve national unity only by assimilating indigenous peoples into the mestizo nation (Teja Zabre, 1951).

The dichotomy indigenous/rural and mestizo/urban was a major shift from the ideological perspective predominant during the post-revolutionary period (1920-1930), a period that deliberately targeted the countryside through socialist education. Socialist education was part of a larger program that aimed to control popular mobilization through schools (Vaughan, 1997). Such control was perceived as necessary by the elites to appease rebellions from peasants (Vaughan, 1997). At the same time, the left-wing of the newly founded PRI² aimed to build a national party based on worker, peasant, and middle-class support and exclude the landowning elites such as the church and private companies.

The second wave, or Nativist approach, still associated social classes with specific ethno-racial groups: Indigenous peoples were portrayed as poor and brown-skinned. However, recognition of Indigenous languages expanded, acknowledging the presence of other languages beyond Spanish. The process to develop these textbooks was inclusive, consulting broader groups about the design and affirming human rights (Latapí, 1998).

The modernization textbooks focused on reconciling Mexico's Indigenous identity with modernization. Research in Spanish-language and reading textbooks found that Indigenous peoples were barely mentioned and stereotyped.

The fourth generation of textbooks received mixed reviews from academics. While they included translated texts from Indigenous poets into Spanish, they did not address social inequalities between ethno-racial groups. Depictions of Indigenous peoples remained consistent with ideas of *mestizaje* or were based on stereotypes, portraying them as living in rural areas and as peasants (Corona & Le Múr, 2017).

Curricular changes for the 4th-grade textbooks have not been substantial since their inception. Over time, the curriculum for that grade level has focused on the History of Mexico from the Pre-Columbian times to the Mexican Revolution. However, the depth of the topics has increased with time (Lima, Bonilla, & Arista, 2010). For the latest generation of textbooks, topics related to the Reform and the Revolutionary period are excluded. Despite only including the historical up to the Independence period of Mexico, the textbooks still contain information about the colonial caste system, which has been a central reference in *mestizaje* (Carroll & Lamb, 1995).

Consistent with other studies examining the discourse of *mestizaje* in educational materials, these textbooks did not depict other ethno-racial minorities in the country, particularly *Afrodescendientes* (C. Sue, 2013). In part, such invisibility resulted from reductionist interpretations of what constituted an ethno-racial group: language and clothing were considered the primary markers of ethnic difference, which non-Indigenous groups could not claim to have for historical reasons. Those textbooks also used official terms with which the *Afrodescendientes* do not identify (Minority Rights Group International, 2024). For example, the census of 1895 and 1900 categorized people by Indigenous speakers, Spanish speakers, and foreign language (Cohen, 2020).

²At the time PRI was called the National Revolutionary Party, PNR, in Spanish

2.3 Literature Review: Representations in Textbooks

The previous section examined how textbook policy evolved in Mexico and how policy makers deliberately used textbooks to disseminate particular conceptions about nationhood, citizenship, and Mexican identity. During the post-revolutionary period, these ideas frequently intersected with portrayals of membership to the mestizo group and specific social classes (middle or peasant, depending on the political interests of the government). A new rhetoric on multiculturalism spread as the country liberalized its economy, democratized its political system, and responded to the political demands of different groups.

During these different periods, the underlying premise has been that textbooks can contribute to shape attitudes (Ullah et al., 2018), beliefs (Christianakis & Mora, 2012), and identity (Adukia, Eble, Harrison, Runesha, & Szasz, 2023) of students. This is possible because textbooks are one of the most widely used cultural artefacts in the world (Torney-Purta, Lehmann, Oswald, & Schulz, 2001)—and in a centralized system like Mexico's oftentimes they are the only pedagogical resource available (Anzures, 2011). Although teachers are important actors who can also contribute to the national socialization process, historical research has shown that they have largely embraced the changing conceptions of nationhood found in textbooks (vom Hau, 2009).

These ideas of nationhood have been aimed at creating a homogeneous idea of citizenship, which has resulted in unequal representation. This unequal representation often depicted citizens in specific ways, wearing specific clothes, speaking Spanish, and having a specific skin-color, which might have limited Afrodescendientes self-identification with their African ancestry. Extensive research from different disciplines has shown that whenever there is unequal representation, it often leads to social inequality in other outcomes (Adukia et al., 2023). For example, differences in how genders are represented in textbooks have been associated with persistent educational disparities and labour market outcomes (Bian, Leslie, & Cimpian, 2017).

Despite conceptual differences between how different theories approach how textbooks shape beliefs, attitudes, and identity, the literature identifies two key mechanisms: 1) inequality of representation (Adukia et al., 2023), and 2) biased discourses towards specific groups (Lucy, Demszky, Bromley, & Jurafsky, 2020; Escobar, 2011).

Inequality of representation refers to making nondominant groups invisible. Since textbooks can instill beliefs about who belongs in which societal domains (Rodríguez-Planas & Nollenberger, 2018), absence of identity-successful specific examples can distort students' expected returns to effort, which can lead to lower student achievement (Adukia et al., 2023) and potentially less successful labour market outcomes.

Textbooks can also influence children's attitudes by promoting social norms through specific imagery, socializing them into behaviors, attitudes, and beliefs deemed acceptable in society (Kneeskern & Reeder, 2022). This is particularly crucial with respect to gender and ethno-racial stereotypes. Evidence from children's books demonstrates that exposure to books depicting individuals in counter-stereotypical gender roles leads to more equitable gender role perceptions (Kneeskern & Reeder, 2022).

In countries where *mestizaje* was the predominant framework for nation-building, the lack of representation can also reflect broader policies that aim to assimilate ethno-racial groups, which can affect cultural transmission of preferences (Martinez de Lafuente, 2021; C. A. Sue, 2023). These preferences might contribute to educational outcomes and students' decisions to remain at school (Figlio, Giuliano, Özek, & Sapienza, 2019) or make them embrace identities that downplay their own. For example, in the case of Mexico, Sue (2013) finds that racial policies based on *mestizaje*

have led Afrodescendientes to embrace identities associated with indigeneity to downplay their African heritage (C. Sue, 2013).

The second mechanism that can explain how textbooks affect students holds that discourses in the classroom, including textbooks, can nurture bias and stereotypes towards specific groups (Islam & Asadullah, 2018; Shah, 2023). Textbooks also carry a 'hidden curriculum', where they reproduce dominant meanings that normalize certain ways of knowing, being, and doing (Macgilchrist, 2018). Studies that examine the causal effect of textbooks find that these hypotheses about educational materials can shape how students perceive themselves (Cantoni, Chen, Yang, Yuchtman, & Zhang, 2017).

In general, linguistics research has framed textbooks as "text" or as a resource. As a text, textbook discourse reflects institutional agendas aimed at preserving power, ideologies, and oppression by comparing or deconstructing specific narratives (Shah, 2023). As a resource, textbooks are used to facilitate learning—they contribute to define classroom activities, and in centralized school systems, they might even determine them (Vaughan, 1997).

2.4 Computational Approaches to Examine Textbooks

Methods

To identify any changes in the descriptors associated with two specific groups, Indigenous and Afrodescendientes, I perform word-to-word analyses. Then, I examine topic prevalence and relationships using topic-to-topic analysis. Following Li et al. (2020), I break down my research questions into subproblems associated with specific algorithms (Table 1). For example, my first research question, which explores how textbooks have described Indigenous groups over time, requires identifying specific descriptors linked to particular ethnic groups, their connotations, and the strength of their association with our main target groups. I employ two primary methods: text-based analysis using Natural Language Processing and facial recognition using the Open-Source Computer Vision library (OpenCV).

While previous research has identified a rhetorical shift in how Indigenous individuals are depicted in textbooks—a shift where Indigenous were defined primarily as a cultural "other" to one where they are part of a social class (Pacheco Ladrón de Guevara, Navarro Hernández, & Cayeros López, 2011)—my study contributes in novel ways. First, NLP algorithms can provide broader depictions of the scope and scale of how the state defined and reproduced ideas about Indigenous and mestizo groups because these algorithms can process and analyze large amounts of digital data. Second, I can identify networks of terms associated with certain words, which will give me a richer description of what characteristics were associated with indigeneity and whether these characteristics shifted as policy changed. Finally, I will also analyze the indirect contributions of laws, by looking at instruments derived from them such as policies, in shaping ethnic boundaries.

Table 1: Research Questions and Methods for Content Analysis and Facial Recognition

Research Questions	Subquestions	Methods
1. How much space is allocated to each ethno-racial group over time?	1. Identify the distribution of key terms	1. Text tokenization
2. How are different groups described?	1. Identify descriptor words 2. Compare descriptor words for each group 4. Measure connotations of descriptors	1. Stanza for Spanish 2. Logistic Regression 3. Hunspell
3. What are predominant topics and how are they related to these two groups of people (Indigenous and Afrodescendientes)	1. Identifying topics 2. Comparing topics across books	1. Topic Modelling using LDA
4. How are Indigenous and Afrodescendientes characterised in images, figures, and photographs across the textbooks over time?	1. Identify skin tones using the PERLA Palette 2. Identify distribution of skin color 3. Measure skin tone of historical figures	1. Support Vector Machines 2. PERLA Color Palette 3. Haar Cascades

Note: Structure of the table based on Li et al. (2020).

Natural Language Processing (NLP)

NLP has increasingly become a popular method to study social science questions, but limited work remains to answer sociological questions in education (Lucy et al., 2020). Some studies, particularly in the United States and English-speaking countries, have used NLP methods to study ethno-racial reflections in textbooks in several states (Lucy et al., 2020); depictions of war (Lachmann & Mitchell, 2014); cultural representations in English language teaching (Bose & Gao, 2022); climate change (D'Apice & Bromley, 2023); and educational reforms (Bromley, Nachtigal, & Kijima, 2024).

NLP combines different machine learning approaches, but particularly deep learning. While research has found that deep learning produces results similar to human coders (Lucy et al., 2020), it still does not provide adequate transparency or explainability. To address that concern, my analysis will focus on methods where the estimation is clear and interpretable at each stage of analysis.

Another limitation of NLP is that most models are trained in non-educational material that is predominantly in English. To address this concern, I use resources that have been developed using Spanish language material. A limitation of such libraries is that they were mostly developed using Spanish from Spain and might be imprecise for ethno-racial terms that are used predominantly in Mexico.

Facial Recognition

The analysis of images in education research using computational approaches remains limited (Adukia et al., 2023). In traditional textbook research, few studies have examined the skin colour of the individuals portrayed in primary school books in Mexico and the implications for particular depictions of race (Leon, 2019). However, the results of these studies are hard to replicate as coding and decisions about skin color remain highly subjective.

To address the issue of replicability, I use OpenCV, a Python library that can manipulate images and track objects for face recognition (Bradski, 2000). Combined with the skin-tone-classifier library, I can detect the face or skin area of a specified image and obtain its RGB value. The RGB value is a numerical representation of specific colors, which can then be categorized and converted into the values of the PERLA color palette. The PERLA color palette has been used in several studies on ethno-racial identity and discrimination, both in the United States and Latin America (Solís, Güémez, & Campos-Vázquez, 2024). It is a standardized set of skin tone colors that are used to categorize and analyze skin color. It includes a range of shades, each numerically labeled from PERLA 1 to PERLA 11, representing different skin tones from light to dark. Although there is concern about how sensitive the PERLA color palette is to display the full range of skin color in countries with a high proportion of individuals of Indigenous and mixed-race individuals, the results of PERLA are consistent with other ways of identifying skin color (such as colorimeters) (Solís et al., 2024).

OpenCV and the skin-tone classifier proceed to identify the color of each image in a four-stage process. First, OpenCV detects faces using a pre-trained model such as Haar cascades. Haar cascades are a machine learning-based approach in which a cascade function is trained from a lot of positive and negative images and then calculates the probability that a pixel is part of a larger object (Sharma, Pathak, Prakash, & Singh, 2021). The second step is skin segmentation, which uses a Gaussian blur function to filter out color space and non-skin areas (e.g. eyes, hair, and teeth). The third step is skin tone distillation, where through k-means clustering, the dominant colors are distilled in the remaining skin area that was not filtered out. Finally, the algorithm classifies the skin tone in the PERLA palette with the closest color detected from the portrait based on the minimum weighted Delta E distance (Rejón Piña & Ma, 2023).

While computational approaches for facial recognition are imprecise and prone to bias—a limitation largely dependent on the input training data for these models—they have a key advantage over human-based classification: the classification rules are applied consistently across different types of data. One limitation of the skin-tone classifier is that the main model is trained on photographs, which means that it will be less precise for illustrated faces, a central input of

textbooks. Due to this limitation, the analysis here will be limited to skin tone analysis and not to the gender or age characteristics of the illustrations.

Data and Analysis

I analyzed the data of eleven generations of textbooks for 4th grade (primary school) in Mexico. Data were collected from the History Digital Repository³ hosted in the Secretariat of Public Education (SEP) and converted to images that were then converted to PDF format. Then, I used both a Python command (pytesseract) and an Optical Character Recognition (OCR) software (ABBYY) to convert the PDF files into text. Of the two, ABBYY software showed better performance, performance that has been previously documented (Lucy et al., 2020).

Research Question 1: How much space is allocated to each ethno-racial group over time?

Quantifying how much space ethno-racial minorities are allocated in textbooks provides information on whether their roles in history are portrayed as central or contributory. This allocation is also one way to measure diversity in history textbooks (Lucy et al., 2020).

To address this research question, I have identified terms that are associated with a particular ethno-racial group. Since it is likely that terms to describe a specific ethno-racial group have changed over time, I reviewed the academic literature and popular newspapers on the online center of the National Newspaper Archive of Mexico, a digital repository containing newspaper articles since 1722. The academic literature provided me with an initial list of terms that referred to a specific category while the media allowed me to cross-check additional uses of the term in popular discourse and trace back its origin, at least until the 18th century.

The following list includes terms that are used for the different ethno-racial categories⁴

- **Indigenous:** Indio(s) (Indian(s)), Indígena(s) (Bonfil Batalla, 2020)
- **Afrodescendientes:** Negro (black), Afromexicana (Afromexican), Afrodescendiente, Africano (african), Mulato (mulatto).
- **Mestizo:** Mestizo.
- **Indigenous Groups:** Amuzgo, Chatino, Chichimeca Jonaz, Chinanteco, Chocholteco, Chontal de Oaxaca, Chontal de Tabasco, Chol, Cora, Cuicateco, Guarijío, Huasteco, Huave, Huichol, Ixcateco, Jacalteco, Kanjobal, Kakchiquel, K'iche', Kumiai, Lacandón, Mame, Matlatzinca, Maya, Mayo, Mazahua, Mazateco, Mixe, Mixteco, Nahuatl, Pame, Pápago, Pima, Popoluca, Popoloca, Purépecha, Q'anjob'al, Q'eqchi, Seri, Tarahumara, Tecuate, Teko, Tepihua, Tepehuano del Norte, Tepehuano del Sur, Tlahuica, Tlapaneco, Tojolabal, Totonaca, Triqui, Tzeltal, Tzotzil, Yaqui, Zapoteco, Zoque, Cakchiquel, Chalchiteco, Huichol, Mam, Pápago, Pima Bajo, Triqui de Copala, Olmeca, Teotihuacan, Tolteca, Tlaxcalteca, Xochimilca, Cholulteca, Otomí.
- **Aztecs:** Azteca, Azteca, Mexica, Mexicas
- **Mexican:** Mexicano

³Information is available at: <https://historico.conaliteg.gob.mx>

⁴Terms include plurals

Once I obtained the frequency of each list, I calculated the percentage of mentions as a proportion of the total count of the ethno-racial lists in a given textbook. Case-sensitivity analysis was also included to account for different ways of writing specific ethno-racial groups (e.g., earlier generations wrote *indígenas* while for newer generations it was *Indígenas*).

Research Question 2: How are different groups described?

To extract verbs and adjectives, I used a dependency parser in Spanish, which is a tool that annotates dependency relations between words, in this case the six ethno-racial terms defined previously. The library that I used to parse the data was Stanza. Stanza is a dependency parsing tool that supports texts in Spanish and identifies the most common verbs and adjectives associated with a specific term (Qi, Zhang, Zhang, Bolton, & Manning, 2020). It does that by building a tree structure (dependency tree) that shows how a word in a sentence relates to each other. In this tree, I can identify the adjectives and verbs that are directly connected to the specific ethno-racial descriptors.

A dependency tree is a synthetic representation of a sentence that shows the grammatical relationships between words (Qi et al., 2020). In NLP, dependency parsing is used to create a structure where each word is connected to another word with a direct edge, indicating a specific type of grammatical relationship.

To examine the relationship between ethno-racial terms, I estimate the log-odds ratio with informative Dirichlet prior of the words associated with them, following Monroe et al. (2008). This method estimates the probability that an adjective will follow a specific ethno-racial group based on frequency counts and an estimate of prior word probability. This method has been preferred for quantifying associations between words and groups because it uses the prior probability of a word in a large corpus (e.g., all textbooks), which helps to obtain a more accurate estimate for words that have extreme frequencies (high or low) (Lucy et al., 2020).

The log-odds ratio compared the two recognized ethno-racial groups in Mexico in 2023: Afrodescendientes and Indigenous peoples. Other indigenous groups and Mestizos were excluded due to low counts between generations. Aztecs were excluded since they are no longer an existing indigenous group and do not represent an adequate comparison group.

As a robustness check, I also use the term frequency-inverse document frequency (tf-idf). TF-IDF is a measure that quantifies the relevance of string representations (words, phrases, etc) adjusted for frequency, since some words are more likely to appear more often than others. Higher values of the TF-IDF represent terms that describe the particular corpus of textbooks while lower values are associated with words that are common to all corpus (e.g. all textbooks) and do not describe a particular document.

Research Question 3: What are the prominent topics of particular ethnoracial groups?

This question moves from word-to-word analysis to sentence structure to obtain potential topics that describe a particular corpus of text through topic modelling using Latent Dirichlet Allocation (LDA).

Briefly, LDA is a probabilistic model used to uncover the hidden thematic structure in a collection of documents. It assumes that each document is composed of a mixture of topics, and each topic is characterized by a distribution over words. The process begins by assigning each document a unique distribution over a fixed number of topics. For each word in a document, LDA randomly selects a topic based on the document's topic distribution and then selects a word from the chosen topic's word distribution. Through inference methods like Gibbs Sampling or Variational Inference,

LDA estimates these hidden distributions, allowing me to identify the main topics across the corpus and understand the contribution of each topic to individual documents. This enables the automatic discovery of topics that best represent the corpus without needing prior labels. Previous studies that use LDA in educational content and textbook analysis include Li et al. (2020), Taisuke et al. (2021), and Park (2021).

Research Question 4: How are Indigenous and Afrodescendientes characterised in images, figures, and photographs across the textbooks over time?

Using OpenCV and Haar cascades, I analyzed how the skin color of the faces in the textbooks changed over time. By looking at trends and changes, it is possible to identify the representation of specific skin tones and alignment of textbook discourse with visual representation. To verify the reliability of the face detection model, a coder calculated the proportion of faces in a textbook and compared it with the results of the computational approach. By faces, we focus on any illustration or photography that represents a human being. We exclude sculptures as much as possible, but drawings of humans are included (for example, the image of a child's drawing of a person). In group pictures, each face is analyzed separately, and the closest skin color of each individual is linked to a color in the PERLA palette.

In textbooks from earlier generations, I excluded illustrations where the face was too small to analyze. By "small," I refer to faces that did not have either a mouth, eyes, nose, or eyebrows. I also excluded full-body humans because the facial characteristics were not identifiable. This restriction was necessary to ensure that other attributes did not influence the classification of skin colors, such as clothing or the background of the image. Black-and-white images were also excluded to reduce the measurement error (less than 5

Using OpenCV and the PERLA Color Palette, I will analyze the changes in skin color of three prominent historical figures: Vicente Guerrero (Mexico's first Afrodescendiente president), Miguel Hidalgo (the criollo priest who led the early stages of Mexico's independence movement), and Benito Juárez (the country's first Indigenous president). This analysis will help assess the extent to which skin color was emphasized in depicting these "great heroes." Historical figures are often portrayed to embody romanticized ideals of citizenship and simplified, one-dimensional images that promote patriotism (Alridge, 2006). I have chosen these three leaders because they: 1) frequently appear in textbooks, 2) represent different ethno-racial groups—Indigenous, Afrodescendiente, and Criollo, and 3) serve as significant symbols of Indigenous and Afrodescendiente representation, particularly in the cases of Juárez and Guerrero.

2.5 Results

Text Analysis

Research Question 1: How much space is allocated to each ethno-racial group over time?

References to mestizos and Afrodescendientes have decreased over time. In earlier generations of textbooks, both groups represented 20 percent of the total mentions of ethno-racial groups; however, by 2019, both terms accounted for less than 10 percent. Despite this decrease, the continuous reference to mestizos reflects the ongoing narrative of *mestizaje* in Mexican identity.

The Aztecs remain the most mentioned group throughout the different generations, reflecting their significant role in Mexico's history. This finding is consistent with previous research that has found that the Indigenous component of Mexican identity is usually ascribed to the Aztecs at the expense of other Indigenous groups. The percentage of names of different Indigenous groups has remained inconsistent over time: while the first generations of textbooks did not reference them substantially, by 1972, the 4th-grade history book increased their frequency. By 1993, the proportion decreased again, and since 2010, the names of different Indigenous groups have remained stable.

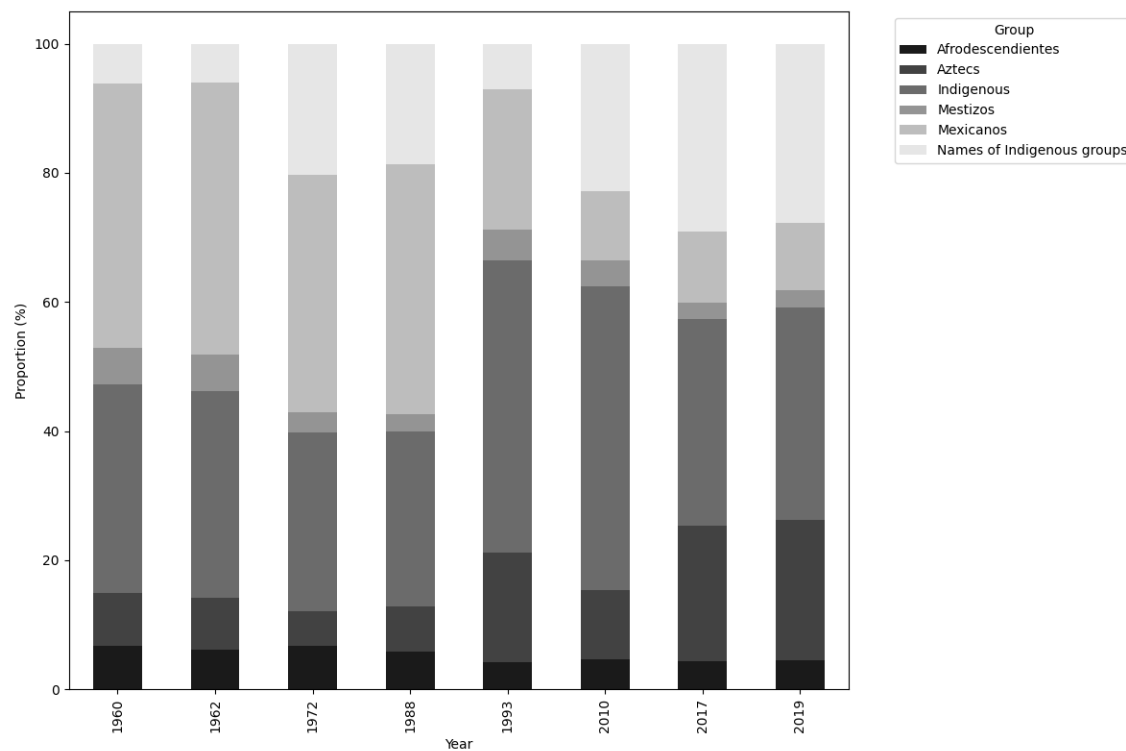


Figure 2.1: Proportion of specific terms in textbooks over time

In the first generations of textbooks (1960-1962), the Tlaxcaltecas (Nahuas) were the most frequently mentioned Indigenous group (Table 2.2), appearing in 40-50% of references, followed by the Tarascos at 17%. However, from 1972 onward, the Maya became the most frequently mentioned group. Over time, textbooks have tended to reference historical Indigenous groups more than

contemporary ones: of the 62 nationally recognized Indigenous groups, only 7 are mentioned across different generations of textbooks (11%).

Table 2.2: Combined Terms and Percentages

Group	1960	1962	1972	1988	1993	2010	2017	2019
Maya	8.33%	8.33%	81.48%	79.31%	26.67%	35.29%	36.84%	40.85%
Tolteca	8.33%	8.33%	0.00%	0.00%	6.67%	20.59%	13.16%	14.08%
Olmecca	8.33%	8.33%	3.70%	3.45%	20.00%	11.76%	23.68%	21.13%
Teotihuacano	8.33%	8.33%	3.70%	3.45%	20.00%	14.71%	15.79%	15.49%
Tlaxcalteca	41.67%	50.00%	3.70%	3.45%	20.00%	8.82%	5.26%	8.45%
Mayo	0.00%	0.00%	0.00%	3.45%	6.67%	2.94%	0.00%	0.00%
Zapoteca	0.00%	0.00%	0.00%	0.00%	0.00%	5.88%	3.95%	0.00%
Tarasco	16.67%	16.67%	3.70%	3.45%	0.00%	0.00%	0.00%	0.00%
Tarahumara	0.00%	0.00%	3.70%	3.45%	0.00%	0.00%	0.00%	0.00%
Otomí	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	1.32%	0.00%
Yaqui	8.33%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Total	12	12	27	29	15	34	76	71

The terms used to describe both Indigenous and Afrodescendientes have changed over time. Earlier generations of textbooks prioritized the term "Black" while current textbooks have introduced the term "Africans". Mulato, the name of a caste during colonial times, has also been consistently used to refer to Afrodescendientes. Notably, none of the official terms used by the 2015 Inter-census Survey has been used by the Secretariat of Public Education (SEP) such as Afromexicano, Afrodescendiente or Mexican of African Descent.

Term	1960	1962	1972	1988	1993	2010	2017	2019	Total
African	0%	0%	0%	0%	0%	0%	33.33%	33.33%	8
Black	84.62%	91.67%	88.89%	88.89%	88.89%	85.71%	41.67%	41.67%	62
Mulato	15.38%	8.33%	11.11%	11.11%	11.11%	14.29%	25.00%	25.00%	13
Total	13	12	9	9	9	7	12	12	83

Table 2.3: Percentage of terms across different years with row and column totals.

The predominant use of Black and African suggests that textbooks are using two different strategies to mark a sharp ethno-racial boundary and potentially retain a foreign perspective in Mexico (C. Sue, 2013). The first strategy adopts an essentialist approach by defining an ethno-racial group primarily in terms of their skin color. The second adopts an ancestry-based approach, where the boundary is defined by geographical origin (e.g., Africa).

Research Question 2: How are different groups described?

To examine how the groups are described, I focus only on Indigenous, Afrodescendientes, Mestizos, and Mexicans. Due to the low frequency of the terms, I exclude the names of each

Indigenous group (e.g., Mayans, Tzotziles, Tzeltals, Mayo, etc.). Then, I identify the most common adjectives using the Stanza library and the TF-IDF.

Table 2.4 shows that across all different textbook generations, Indigenous peoples are usually described with a varying range of adjectives, but three stand out: poverty, barbarians, and Mexicans. The use of these terms suggests that we can classify how textbooks describe Indigenous peoples into three groups: in class-based terms (e.g., poverty), in nation-building terms (e.g., Mexicans), and in eugenicist terms (e.g., barbarians).

Class-based terms are more common in recent editions of textbooks. For example, in 2019, on page 72, it says: "Throughout our history, Indigenous groups have faced difficulties: poverty, segregation, racism, lack of educational access, health, among others. Despite these challenges, and supported in community life, the Indigenous have retained their traditional government, ways of life, religion, and language. This occurs even if they travel to cities to improve their living conditions"⁵

Nation-building terms are frequent in textbooks of the Nativist period (1972-1993). In those textbooks, Indigenous are defined in terms of sharp boundaries with a strong emphasis on ancestry, which, combined with a decrease in references to *mestizaje* (see Figure 2.1), only reinforces a clear boundary. This boundary—that the Indigenous groups are those that existed before the Conquest of the Americas—does not exclude them from citizenship as previous discourses of *mestizaje* would have implied. Instead, the discourse is more similar to the multicultural shift: "But despite our differences, we are all Mexicans: north and south, those in the countryside and the cities; those that speak an Indigenous language and those that speak Spanish"⁶.

Eugenics-related terms for Indigenous peoples are used in the 1960 and 1962 textbooks. For example, on page 141, it says: "In 1877, Mexico faced difficulties with the American government because their troops would cross the border to prosecute the barbaric Indians and cattle thieves"⁷. References to Indigenous peoples as "Indians" are also frequent, which is a term derived from colonial times and is historically inaccurate.

Descriptor	Value	Descriptor	Value	Descriptor	Value	Descriptor	Value
Top 5 log-odds-ratio words (Indigenous vs Mexicans)		Top 5 log-odds-ratio words (Afrodescendientes vs Mexicans)		Top 5 log-odds-ratio words (Mexicans vs Indigenous)		Top 5 log-odds-ratio words (Mexicans vs Afrodescendientes)	
Past	3.3640	First	5.1551	Good	5.3231	Good	3.2032
Current	3.2627	African	5.1551	Traditional	5.2103	Traditional	3.0884
Barbarian	3.2192	Riding	4.8715	Divided	5.2103	Divided	3.0884
Defeated	3.0332			Patriot	4.9313	Ancient	2.8074
Poor	3.0332			Born	4.9313	Patriot	2.8074

Table 2.4: Log-odds ratio of words associated with particular groups

The TF-IDF analysis for the entire corpus suggest similar terms. In Appendix A, I have plotted the values of the top 10 terms associated with a particular term across the different corpus, or whole group of textbooks. the higher a value, the more the term is relevant in the entire corpus of textbooks.

Among the most common terms associated with indigenous peoples are the tlaxcaltecas, barbarian, current, the Acaxeas, known, enemies, forced, island inhabitants, Mexicans and poverty. These

⁵A lo largo de nuestra historia, los grupos indígenas han tenido diversas dificultades: la pobreza, la segregación, el racismo, la falta de acceso a la educación y a la salud, entre otras. No obstante, apoyados en su vida comunitaria, los indígenas han conservado sus sistemas de gobierno tradicionales, sus formas de vida, su religión y su lengua; esto sucede incluso entre aquellos que se trasladan a las ciudades buscando mejorar sus condiciones de vida.

⁶Pero, a pesar de tantas diferencias, México es uno. Todos somos mexicanos: los del norte y los del sur, los del campo y los de la ciudad; los que hablan lenguas indígenas y los que hablan la lengua española.

⁷En 1877 hubo dificultades con el gobierno de los Estados Unidos porque éstos pretendían que sus tropas cruzaran la frontera en persecución de los indios bárbaros y los abigeos.

terms represent the class-based, nation-building and eugenicist approach identified in previous analyses. However, they also include information about an important group that led an insurrection against Spanish rule (Acaxees) and an Indigenous group that supported the Spanish conquest (Tlaxcaltecas).

Terms associated with the Indigenous peoples suggest a significant discussion in subjects related to Mexico's colonial period (1520-1820). Specific names of Indigenous civilizations or groups that are of relevance to the corpus of textbooks also come when discussing that time period. These results reinforce previous evidence that Mexico's link with Indigenous peoples rely mostly on narratives that Indigenous peoples treat them as part of the past. Socioeconomic dimensions to describe Indigenous peoples (poverty) become predominant in more recent textbooks.

Afrodescendientes, who occupy a limited space in the textbooks, are usually described in terms of the process of slavery in the Spanish colonies that brought them. This finding is also confirmed in the TF-IDF values. Textbooks in earlier generations emphasise both an economic and a social argument for slavery. Economically, additional labour was necessary for the cultivation of sugarcane—a physically demanding task. Socially, Afrodescendiente labour was meant as labour substitution for the Indigenous since they were considered subjects of the Spanish crown.

While Afrodescendientes are not mentioned directly in earlier textbooks, the process used to define them, slavery, is. The 1960 and 1962s generations mention slavery or slaves 15 times across three sections—the conquest of Mexico, the colonial period, and the Independence. By discussing slavery, textbooks tacitly address the ethno-racial relations of Afrodescendientes with both the Spanish (who enslaved them) and the Mestizos (who liberated them). The relationship between Afrodescendientes and the other ethno-racial groups is hierarchical. Comparisons between how the United States and Mexico approached slavery implicitly indicate that Mexico's ethno-racial relations are more harmonic, where the salience of race, for Afrodescendientes, is of less consequence.

Newer generations of textbooks, however, address the issue of slavery in a less simplistic manner. They also devote more sections and space to explain this process (26 words related to slavery/slaves). The process of slavery is framed as unequal and unjust, but also as one that allowed for cultural mixing: words, music, food, and dressing codes.

Across the corpus, Mexicans was one of the terms that was more relevant to "Mestizo". The strong association between these two terms reflects the ongoing narrative that Mexico is a race mixed nation.

Research Question 3: What are prominent topics of particular ethno-racial groups?

To obtain the predominant topics associated with a particular group, I first obtained keywords associated with those groups. The interpretation of these keywords allows me to discern common patterns that can be classified as topics. However, careful interpretation is necessary to accurately determine the label for each grouping of words.

I analyzed how topics are distributed across different keywords, including Indigenous, Afrodescendientes, Mestizos, and Mexicanos. Across all textbooks, we identified two topics for Indigenous peoples: terms related to *mestizaje*, which include mentions of other ethno-racial groups and the reference to Mexico; and characteristics of Indigenous peoples, including culture, language, life, land, and government.

Group	Unique Keywords
Indigenous	Mexico, some, European, López, people, Black, first, land, pay, Creole, culture, life, work, have, language, government
Afrodescendientes	mulatto, pray, army, son, India, have, new, African, caste, life, Creole, first, mine, arrive, Asian, slave, Yanga
Mestizos	son, San, important, city, Juan, caste, Spain, art, mix, activity, Hidalgo, peon, start, people, Mexican, form
Mexicans	country, revolution, first, give, some, people, national, city, do, territory, power, duty, current, language

Table 2.5: Unique keywords for each group across different topics.

For Afrodescendientes, words can be grouped into two topics. The first topic relates to slavery, such as the mines, slave, Yanga (a slave who led a revolt in Veracruz during the colony), and arrive; the second topic refers to the caste system and the ethno-racial relations predominant during the colonial times: caste, Creole, and Mulatto.

For Mestizos, words clearly relate to *mestizaje*, such as mix, Mexican, people, and caste. Mexicans, on the other hand, are referred to with keywords related to people, national, and country, which reinforce their association with nationhood.

Research Question 4: How are Indigenous and Afrodescendientes characterised in images, figures, and photographs across the textbooks over time?

In total, the algorithm extracted 1,477 human images for analysis. This number only includes faces that are in color (consistently, they represent 95% of the illustrations that include humans). The results show that the skin tone of faces in textbooks has become more diverse over time. In 1960, the first generation of textbooks showed illustrations of individuals with predominantly light brown skin. By 2019, the tails of the PERLA color palette were represented (white and black skin tones). The proportion of light brown skin individuals also decreased, from 50 percent in 1960 to 20 percent in 2019. A major shift occurred in 1993, when a higher proportion of white individuals were depicted in those textbooks compared to those with dark brown skin. This change was reversed in subsequent textbooks. In more recent years, the chart shows a more balanced distribution of several colors.

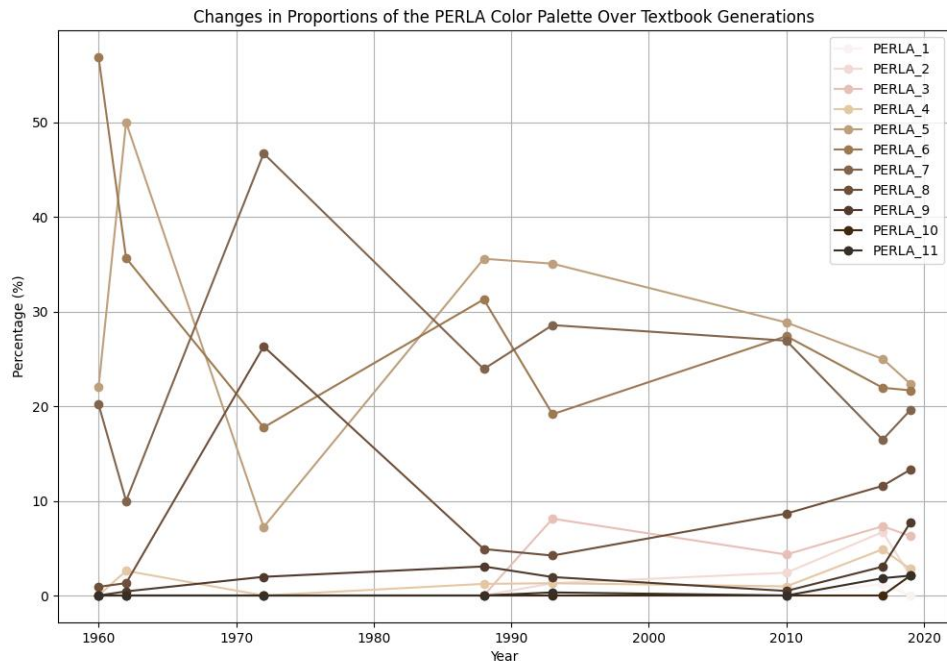


Figure 2.2: Proportions of Faces with Specific PERLA Skin Tone Over Different Textbook Generations

Analysis of historical figures shows that the skin tone of Vicente Guerrero, the Afrodescendiente president of Mexico, has changed little over time in textbooks. Earlier generations tended to adopt a fairer skin tone to his illustrations (Perla 6 and Perla 5). But more recent textbooks have prioritized paintings or illustrations that show him dark-skinned (Perla 6). Despite this darkening of skin, historical texts have described Guerrero's skin tone as black (Ballesteros Páez, 2011).

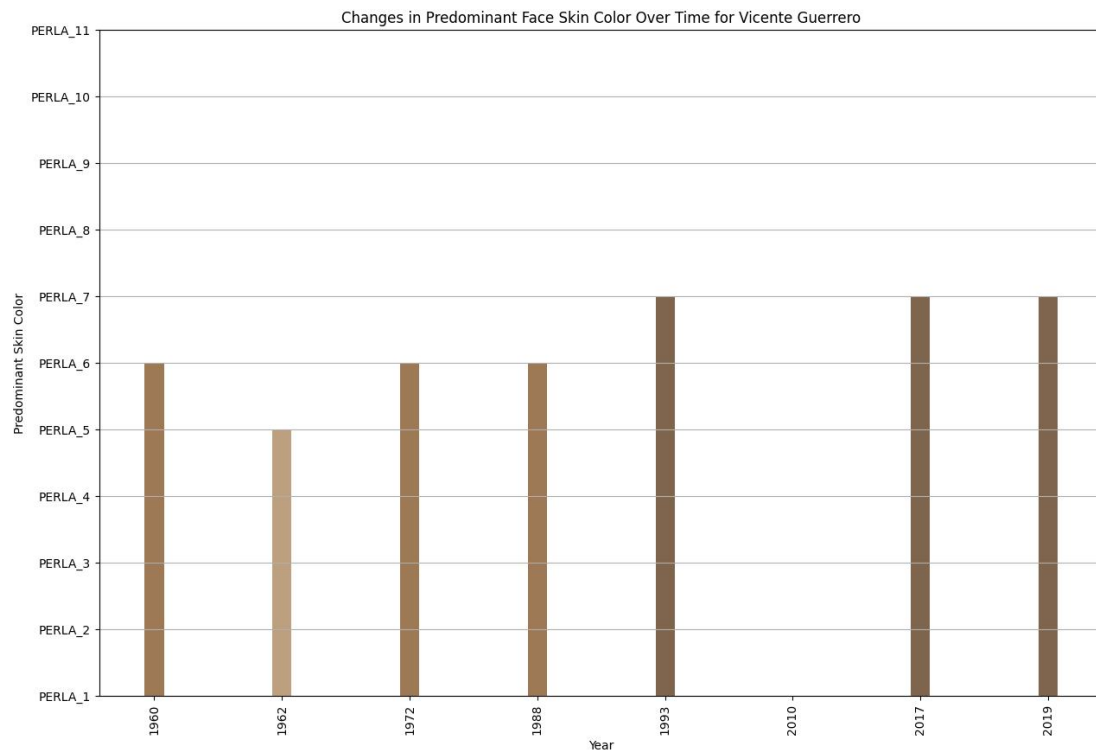


Figure 2.3: PERLA Skin Color for Vicente Guerrero over time

Figures 1.4 and 1.5 show the variation in the skin tone of Vicente Guerrero, the first Afrodescendiente president. Partially, Vicente Guerrero's skin tone may have depended on the idiosyncrasy of the illustrators of the early generations. Between 1960 and 1962, textbook designers relied on illustrators who were close to the *Muralistas* (de Educación Pública, 2024), an artistic movement that was concerned with defining the Mexican identity and was heavily influenced by ideas of *mestizaje* (Feria & Lince Campillo, 2010).



Figure 2.4: Illustration of Vicente Guerrero in 1962



Figure 2.5: Illustration of Vicente Guerrero in 2019

The skin tone for Hidalgo (Spanish descendant) and Juárez (Indigenous) also shows a preference for light-brown skin and dark-brown skin. In particular, in 1962 (and consistent with figure 2.2), the skin tones are fairer compared to other years.

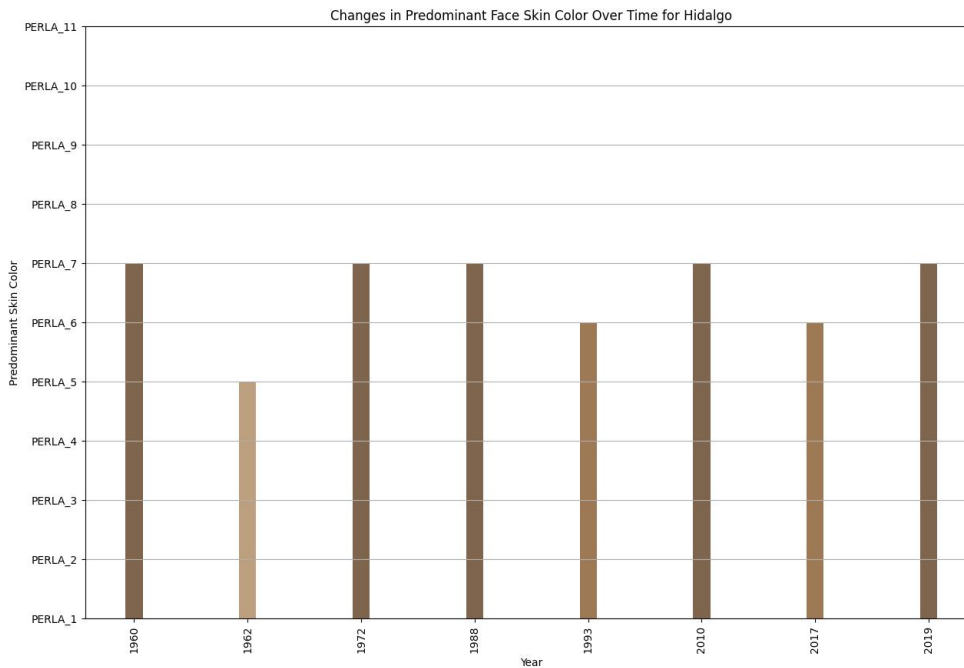


Figure 2.6: PERLA Skin Color for Miguel Hidalgo over time

Benito Juárez, a historically important Indigenous figure in Mexico, was represented in the 1993 and 2010 editions in Black and White. And in 2017 and 2019, he was excluded due to new curricular changes that eliminated the time period when he lived (1806-1872).

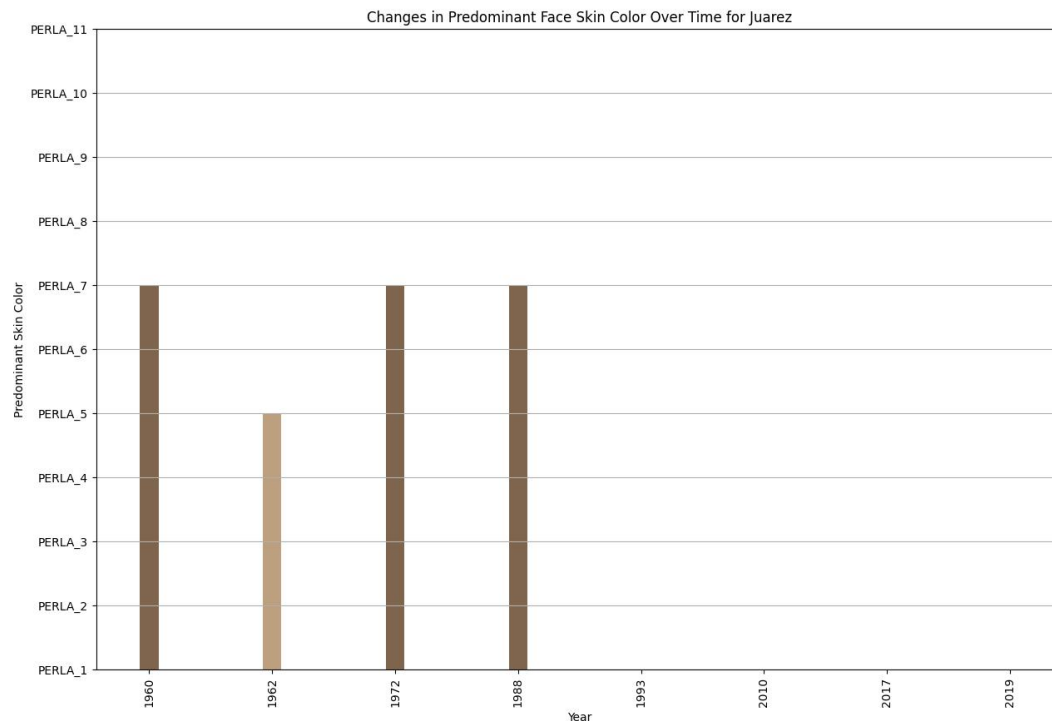


Figure 2.7: PERLA Skin Color for Benito Juárez over time

Robustness checks

I conducted two robustness checks to examine whether the algorithms classified the topics and words correctly and whether skin tone color was also categorized accurately. In Inductive coding, students derived five codes from the data on particular excerpts. These codes then were grouped to assess if they formed specific topics and were compared against the results in topic modelling for Indigenous peoples. Results show that words to describe topics are similar: nation building, *mestizaje*, but specific codes differ. Coders also identified poverty as a central theme, which topic modelling did not find. For Afrodescendientes, the topics were also similar, but the coders also identified rebellion and political tension, which the topic modelling did not identify, potentially because of the limited space dedicated to address such events.

We compared the color palette classification of 20 randomly selected photographs and illustrations using computational approaches and human coding. Results show a high level of accuracy with photographs (close to 80%, but more limited in illustrations, close to 60%). The results indicate that the pre-trained model is less effective in drawings, and is an area of further research.

Conclusions

Textbook research using non-English inputs in computational approaches is a growing area of research. They can manipulate significant amounts of data in faster and measurable ways that can provide for additional insights that might not be possible in traditional content analysis.

In this paper, using textbooks from History in 4th grade, NLP methods have revealed the limited acknowledging of the Afrodescendientes while skin tone analysis reveal a growing diverse use of skin tones in textbooks. This contrast between limited textual representation vs more balance visual imagery might suggest that a process of ethnic closure, where Afrodescendientes are defined by a sharp bundary is happening. In other words, while references to African have increased over time, racial schemas about Afrodescendientes are mostly based on physical appearance, or essentialist notions. This physical appearance might indicate that Afrodescendientes are a well-defined group whose marker of difference is skin color.

Indigenous peoples, on the other hand, have been defined frequently in socio-economic, nation-alistic, or eugenicist terminology in particular textbooks. And topics associated with the Indigenous people relate to *mestizaje* and markers of differentiation. Over time, textbooks from the multicultural era suggest that other Indigenous groups are now acknowledged even if topics related to the Aztecs have also increased. The link between the Aztec Empire as part of Mexico's past remains central to textbooks. In terms of *Mestizaje*, I find that despite a slight decrease, newer textbooks still mention it, which suggests it continues to be a part of the educational policy discourse.

Despite some promising results, further research should focus on developing newer algorithms for social science in Spanish texts that can incorporate the diversity of different terms across time and regions within a country. In addition, these results should be cross-validated and suggest that NLP approaches achieve standard accuracy, but skin tone segmentation for illustrations is limited.

The contribution of this paper centers on describing how Indigenous and Afrodescendientes are depicted, both visually and textually over time and as part of the larger corpus of textbooks. But further research is also needed to understand more clearly the mechanisms behind specific changes. For example, to explain the inclusion of African in more recent textbooks and how this affects how Afrodescendientes are perceived. Current hypothesis might indicate that by associating the Afrodescendiente peoples with specific origins, textbooks might contribute to create sharp boundaries for that group.

2.6 Appendix A: TF-IDF of Each Ethno-racial term

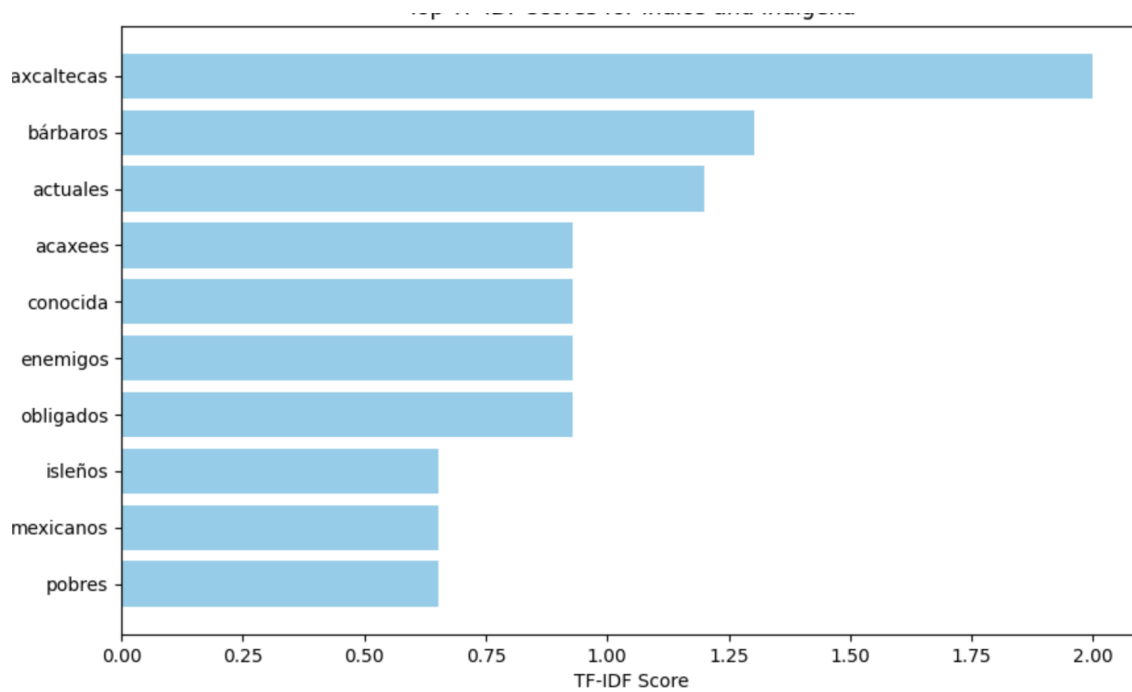


Figure 2.8: Top TF-IDF scores for Indigenous peoples

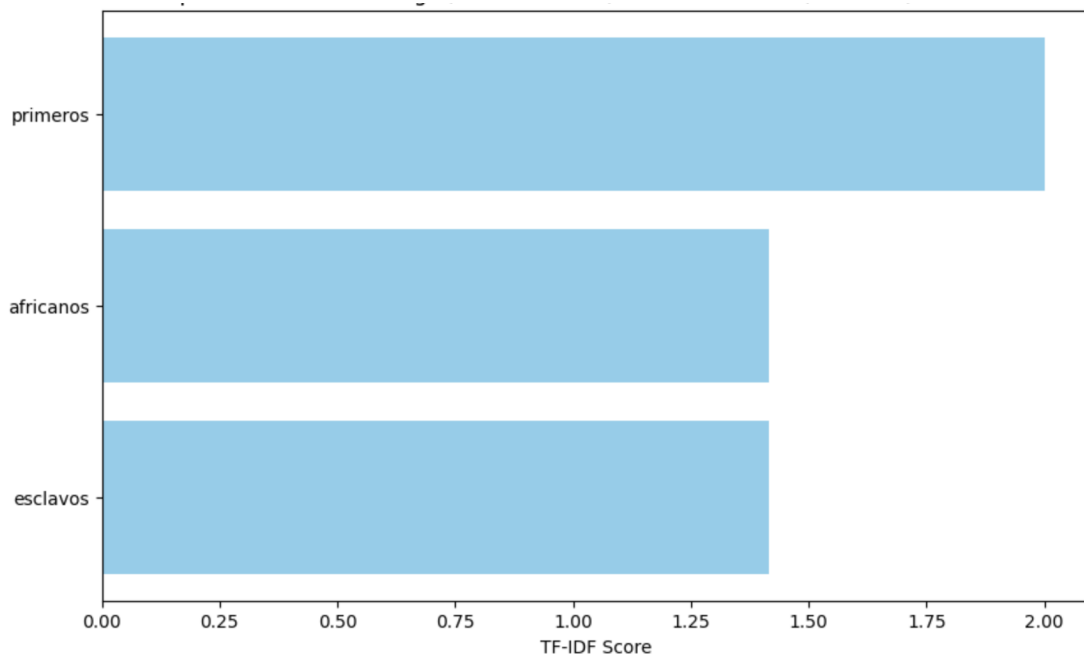


Figure 2.9: Top TF-IDF scores for Afrodescendientes

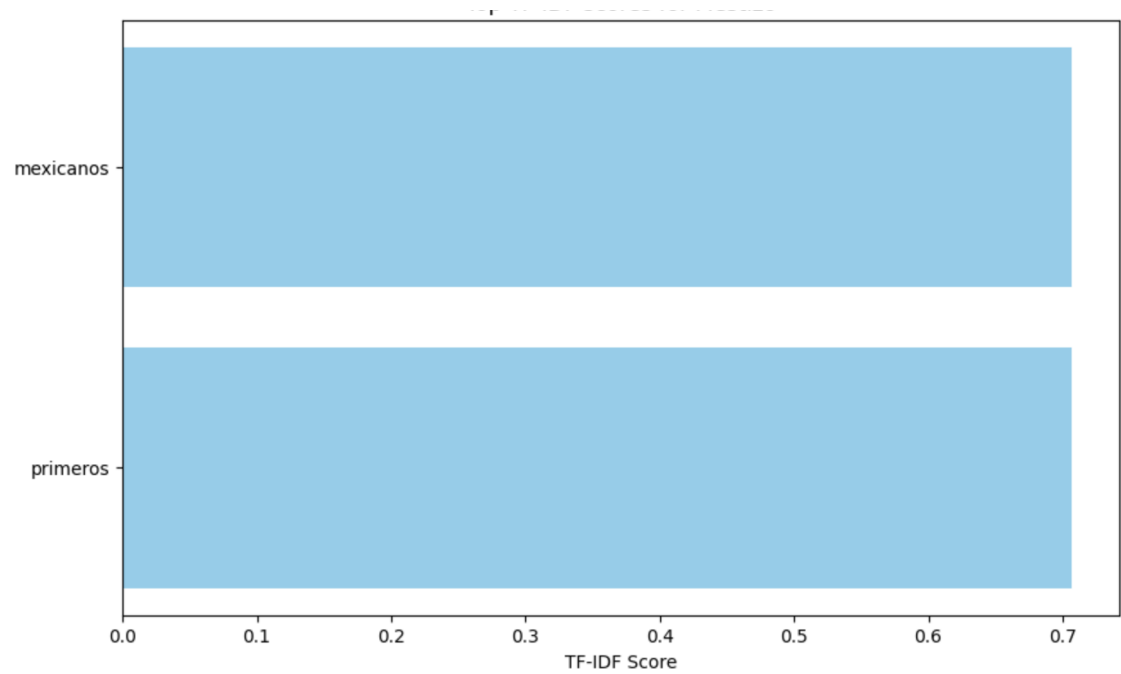


Figure 2.10: Top TF-IDF scores for Mestizos

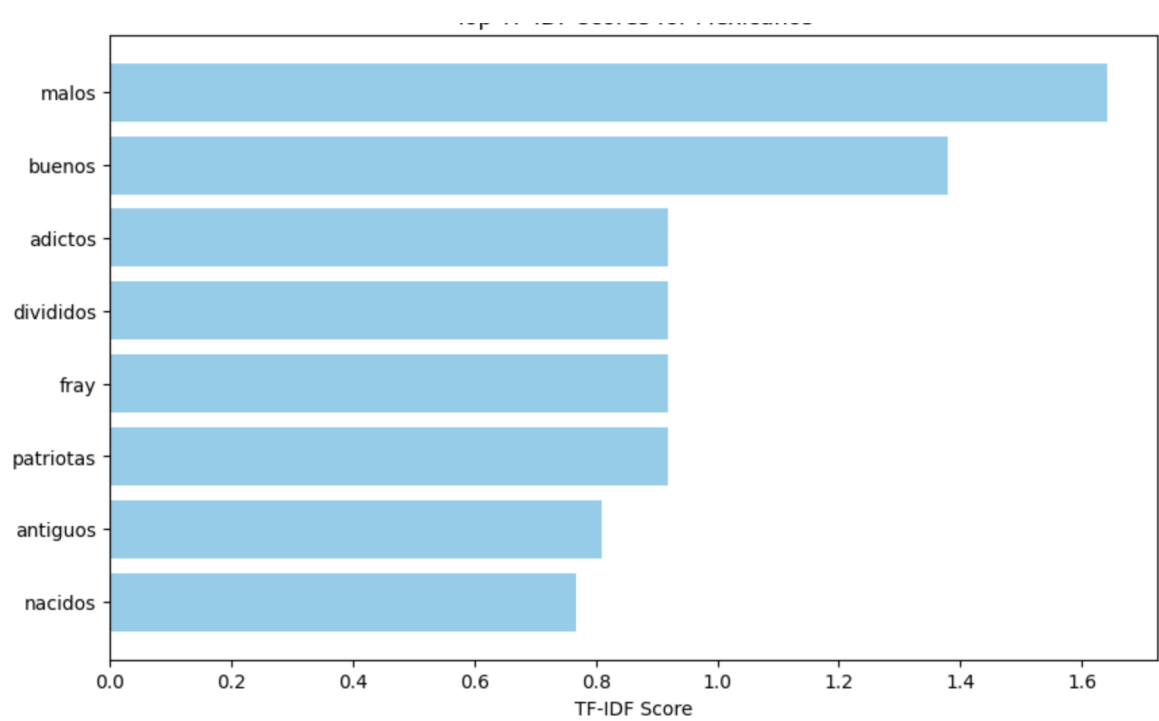


Figure 2.11: Top TF-IDF scores for Mexicans

Chapter 3

The Effect of the 1993 Educational Reform on Attitudes Towards Ethno-racial minorities

3.1 Introduction

In Europe and North America, research examining the causal effect of education suggests that educational reforms, by increasing educational attainment, have mitigated the rise of anti-discriminatory movements and fostered more open attitudes towards underrepresented minorities. The consensus on this positive relationship between education and attitudes is so strong in the European and North American literature that researchers constantly advocate increasing educational attainment as an effective policy to promote social cohesion in highly diverse societies.

Examining how educational attainment relates to attitudes towards minorities also has implications for theories of *mestizaje* or racial mixing. Researchers and theorists of ethno-racial nation-building in Latin America have identified education as a key factor in shaping racial schemas—mental frameworks that individuals use to process, organize, and interpret information about race and racial groups, including their attitudes towards them.

According to theorists of *mestizaje*, schools play a central role in socializing individuals into the idea that Mexico is a *mestizo* nation, or an amalgamation of Indigenous and European cultures, that has resulted in decades of racial color blindness. However, there is limited systematic evidence in Latin America, and outside high-income countries in general, that education contributes to shaping individuals' attitudes towards ethno-racial minorities or their racial schemas. This paper aims to fill that gap by analyzing the causal effect of the 1993 Secondary¹ School Reform in Mexico on openness towards Indigenous peoples and Afrodescendientes².

Using data from the 2022 National Survey on Discrimination, and a fuzzy regression discontinuity design (Fuzzy RDD), this paper contributes to the literature in three ways. First, it extends research on the causal effect of educational attainment on attitudes toward ethno-racial diversity outside of high-income countries³, particularly in a country marked by ideas of *mestizaje*. Second, the paper examines the long-term effect of education toward the two ethnic groups legally recognized in the country—Indigenous and Afrodescendientes; when most studies have focused on either group separately. And finally, I test whether the self-interest hypothesis can explain individuals' attitudes towards ethnic minorities in the case of Mexico.

¹Secondary schooling in Mexico comprises grades 7th, 8th, and 9th. Throughout the paper, I will use secondary school to refer to these grades, which are internationally considered lower secondary

²Throughout the text, I will use Afrodescendientes and Mexicans of African Descent interchangeably

³Due to the conceptual problems surrounding the distinction between "race" and "ethnicity," I use the term ethno-racial to recognize the overlapping and complex relationship between these two concepts (C. A. Sue & Riosmena, 2021; Loveman, 2014)

Consistent with previous studies in high-income countries, I find that the 1993 lower secondary school reform increased educational attainment. I also find a positive effect on perceptions toward Indigenous peoples and Afrodescendientes, which is the opposite of what would be expected under the self-interest hypothesis. These results are robust to different bandwidths and ways to estimate the outcome measure. However, the effects are smaller compared to studies found in Europe and North America, which suggests that researchers might have overestimated how effective the school system can be in transferring racial schemas and in shaping attitudes towards underrepresented minorities in the long-term.

Question-level analysis of perceptions towards Indigenous and Afrodescendientes also suggests that increasing educational attainment leads to some support for structuralist views that explain ethno-racial inequality (i.e., discrimination or lack of respect for a specific group's rights) as opposed to individualistic explanations (i.e., Indigenous peoples do not value continuing their studies). These results are relevant as Indigenous and Afrodescendientes movements extend their work from political recognition to political participation.

3.2 Literature Review: Educational Attainment and Openness towards diversity.

In Mexico, recent political, cultural, and economic changes have resulted in greater recognition of ethno-racial diversity. In 1990, the Mexican constitution acknowledged the cultural rights of Indigenous peoples, and in 2019, Mexicans of African descent, or *Afrodescendientes*, obtained legal recognition at the federal level as a distinct ethnic group (de la Unión, 2019). Despite these institutional advances, significant challenges remain in addressing ethno-racial discrimination.

Several studies have identified that ethnic minorities in Mexico face limited access to the formal labor market (Canedo, 2019), healthcare services (Armenta-Paulino, Wehrmeister, Arroyave, Barros, & Victora, 2022), and political representation (Natal, 2023). Beyond these systemic and structural challenges, discrimination also occurs at the interpersonal level, where individuals may harbor negative attitudes towards their own or different ethnic groups. This can result in opposition to minorities' demands for increased political participation (Lashta, Berdahl, & Walker, 2016). Such demands are often perceived as undeserving or threatening to the way of life of other group members, leading to resistance against diversity policies and broader political inclusion.

Given the political consequences of how ethno-racial groups are perceived, it is important to understand the attitudes of the non-Indigenous and non-Afrodescendiente majority towards these minorities. The non-Indigenous, non-Afrodescendiente population comprises the demographic majority in Mexico, accounting for approximately 80

Studies that assess the general attitude towards Indigenous peoples in Mexico can be categorized into two strands: 1) Studies that examine how different ethno-racial groups are stereotyped and perceived, and 2) Studies that compare the institutional narratives (for example in textbooks or media depictions) of Indigenous identity against local discourses.

Studies that compare perceptions of different groups show three substantial findings. First, *mestizos*, or non-Indigenous individuals, hold positive attitudes towards Indigenous peoples (Vázquez-Flores, Navas, López-Rodríguez, & Vázquez, 2024; Sotelo, 2014; Castillo, 2020). Those results hold even when *mestizos* are asked to rate Indigenous peoples against other underrepresented groups. For example, in a study comparing perceptions about the Indigenous peoples and Honduran and American immigrants, the Indigenous were considered the least threatening to the status quo (Vázquez-Flores et al., 2024). Second, despite an overall positive sentiment, the non-Indigenous are less likely to support affirmative action policies or any significant systemic measures that address discrimination or enhance Indigenous peoples' political participation (CDI, 2006). Third, respondents showed limited knowledge about some of the Indigenous peoples, often associating them with the Aztecs, a perspective consistent with the historical analysis of political discourse that has framed Mexicans as primarily descendants of the Aztec empire (Alonso, 2005).

Despite their positive findings, these studies have several limitations. First, they are not representative of the larger population, as they interview college-educated individuals (Vázquez-Flores et al., 2024; Sotelo, 2014). Second, research on perceptions about Indigenous peoples also relies on a definition that reduces their identity to a linguistic difference. By using this definition, urban college-educated respondents could infer that the Indigenous peoples live in remote areas, which might reduce their perception of threat and the validity of their responses. Third, some of these studies do not control for potential confounders. Highly educated individuals are a selective group with regard to certain factors that might influence their attitudes towards ethno-racial minorities, but obtaining a college degree might not be the cause of greater levels of tolerance. Finally, questions about perceptions oftentimes focus on identifying whether individuals have stereotypical views

about the Indigenous peoples and largely focus on individualist explanations to explain ethno-racial inequalities between groups (Telles & Bailey, 2013).

Individual explanations of ethno-racial inequality locate the roots of discrimination in individuals themselves, either as a cultural trait, lack of motivation, or behavioral pattern. These explanations are opposite to structural views that posit that ethno-racial inequalities are embedded in the social structure. Discrimination, lack of government support for minorities, and poor schooling are examples of structural factors (Telles & Bailey, 2013).

The second strand of studies that examine attitudes towards the Indigenous peoples compare the institutional discourse with local narratives. The institutional discourse is usually examined through textbooks (de Guevara, del Refugio Navarro Hernández, & López, 2011), the media (Muniz, Saldierna, Marañón, & Rodríguez, 2013), and policy documents (C. A. Sue & Riosmena, 2021). This research provides an alternative explanation for the positive perceptions towards Indigenous peoples and frames it as an example that racist color blindness is still pervasive in the political and local discourse. Sue (2021), for example, interviews individuals in Costa Chica, a predominantly Afrodescendiente area in Mexico, and found that black-indigenous prioritized a Mexican, or a national, identification over a racial one. This is consistent with the idea that Mexico is a single, unified nation derived from racial mixture.

Afrodescendientes might face similar challenges. Studies that examine discrimination in the labor market by skin color suggest that Afrodescendientes might be more likely to face persistent prejudice in the region (C. A. Sue & Riosmena, 2021; Campos-Vazquez & Medina-Cortina, 2019). But Afrodescendientes' recent recognition implies that there is limited data on their experiences with discrimination and how other groups perceive them. Such limited data, however, also reflects how invisible Afrodescendientes have remained in official statistics in Latin America, as statistical data in the region has generally been collected for the purpose of measuring discrimination (Loveman, 2014). Their absence in such official statistics also indicates that they have been excluded from official narratives of nation building and political participation (Velázquez Gutiérrez, 2016; Wade, 2017).

One reason why Afrodescendientes could have remained invisible both at the institutional level and in public opinion might be due to a predominantly assimilationist perspective towards Afrodescendientes. A historical review has shown that research from the first half of the 20th century consistently framed Afrodescendientes as a group that successfully blended into the broader population for two reasons. First, the abolition of both the caste system and slavery during the independence period cemented the high levels of miscegenation already happening during the colonial period (1520-1820). This interracial marriage, along with the eagerness of Afrodescendientes to integrate into Mexican society, erased any cultural distinction between them and the mestizos. By the time of Independence, Afrodescendientes had successfully assimilated into the main dominant cultural group (Beltrán, 1946). And second, social class emerged as the dominant framework in explaining how social relations are shaped in Mexico (Vinson III, 2005). As class took over, any cultural differences became secondary or irrelevant in explaining how Mexican society was stratified.

In contrast to the limited literature in Mexico and Latin America on attitudes towards Indigenous and Afrodescendientes, research in high-income countries has extensively explored the determinants of public opinion toward minorities, particularly immigrants or different ethno-racial groups. Many of these studies have pointed to individual-level theories that examine the causes of prejudice and stereotypes⁴.

⁴For a review of theories that explain the causes of prejudice, cf. Fibbi, 2021

Among the determinants of attitudes towards underrepresented groups, education remains one of the strongest predictors. Studies have found that higher educational attainment is associated with more positive beliefs towards ethnic and racial minorities (Wodtke, 2012), Indigenous (Castillo, 2020; Sima Lozano & Perales Escudero, 2015), immigrants (Cavaille & Marshall, 2019), homosexuality (Yang, 2022), gender roles (Simon, 2022), and general liberal ideological and political views (A. G. Meyer, 2017; Kunst, Kuhn, & van de Werfhorst, 2020a). While these results suggest that education can shape beliefs and attitudes in the short and long term, many of these studies have not addressed the endogeneity of education (A. G. Meyer, 2017).

The endogeneity of education means that attaining certain levels of education might depend on factors that are unmeasured or unobserved. For example, motivation, income levels, and mother's education are potential predictors of an individual's educational attainment, and these factors can also be associated with specific ideological and political beliefs (Cavaille & Marshall, 2019; A. G. Meyer, 2017; Yang, 2022). Unless these factors are controlled for, estimates about the relationship of education with attitudes toward diverse groups and political attitudes will be biased.

One way to mitigate such bias is through quasi-experiments. Quasi-experiments provide a source of variation that allows us to estimate causal effects by exploiting exogenous variation, where the assignment to education is not affected by any individual or household's decision. When an educational level is made compulsory by law, households are required to send their children to school. Evidence about compulsory laws in lower and upper-middle-income countries, which include many Latin American countries, has shown that compulsory laws are effective at raising the educational attainment of the population despite persistent high dropout rates in the region (Diaz-Serrano, 2020).

Research that has examined education as a source of exogenous variation to conduct quasi-experiments has, however, found inconsistent results on attitudes towards diverse groups. For example, some studies have concluded that educational attainment leads to more socially liberal attitudes (Yang, 2022), while others do not identify any effect at all in some countries (Cavaille & Marshall, 2019), or the opposite effect, where education leads to more conservative attitudes (A. G. Meyer, 2017). Given these mixed results, it is crucial to examine this relationship in the context of Mexico. My analysis overcomes the endogeneity of education problem by leveraging the 1993 educational reform that made secondary schooling compulsory. Using a nationally representative dataset on discrimination, I also include how individuals perceive both Indigenous and Afrodescendientes peoples across a broader set of questions, including the labor market, marriage, and political representation.

Theories that explain the relationship between Education and Openness towards Immigrants

Sociologists and political scientists have theorized how education can contribute to shaping individuals' beliefs. The most predominant are the self-interest, the developmental, and socialization theses. Each one of them also identifies particular mechanisms through which educational *levels* contribute to shifts towards diversity.

The self-interest thesis states that the relationship between education and political beliefs is mediated by income. As highly educated individuals are likely to have higher incomes, their beliefs tend to be shaped by self-interest and utility maximization (Malchow-Møller, Munch, Schroll, & Skaksen, 2008). Studies in Europe suggest that this relationship exists in high-income countries (Dunn, 2011; A. G. Meyer, 2017), where individuals with university degrees tend to support less redistributive policies (A. G. Meyer, 2017).

Intergroup theory provides an alternative mechanism through which education mediates income's attitudes towards ethnic minorities and immigrants. Intergroup theory argues that the formation of preferences and attitudes towards diverse groups depends on their perceived impact on the local labor market. Depending on the size and composition of ethno-racial minorities and immigrants, native individuals might feel their status quo threatened. But if such a threat is low, individuals are more likely to support immigration and social integration and have more open attitudes toward those ethno-racial minorities (Hainmueller & Hiscox, 2007). This theory predicts that when low-skilled immigrants arrive in a new location, low-skilled natives will perceive that competition for their types of jobs will increase. High-skilled immigrants, on the other hand, will not feel threatened since they perceive their job opportunities remain unaffected by the new influx of people. Evidence of this effect is found in the United States, where low-skilled native workers are more likely to prefer limiting immigrant inflow into the country (Scheve & Slaughter, 2001).

Perceived competitive threats for valued resources are also a framework that helps explain attitudes toward national ethnic minorities. Group conflict theories present a similar argument to the self-interest thesis because they posit that material interests structure racial attitudes (Telles & Bailey, 2013). In the United States, researchers have used group conflict theories to explain Whites' opposition to affirmative policy intervention for Blacks (Bobo & Kluegel, 1993).

The developmental thesis also predicts that education, through changes in cognitive and emotional development, leads to more tolerant values and openness towards diversity. More specifically, as individuals spend more time in school, they develop cognitive skills and personality traits that are more flexible, rational, and reflect awareness of the diversity of human experience (Crocetti, Albarello, Prati, & Rubini, 2021). Education also makes people more aware of the social, historical, and economic forces behind social inequality and ethno-racial disparities (Wodtke, 2012).

The third thesis, the socialization model, argues that education exposes individuals to specific values that are internalized and transferred through direct or indirect mechanisms. Directly, interactions with members of educational institutions, such as teachers and textbooks, contribute to disseminating and exposing students to official ideologies that they then adopt (Apfeld, Coman, Gerring, & Jessee, 2023). Indirectly, social networks, for example, the type of peers a student has, can also influence individuals' values and perceptions (Phelan, Link, Stueve, & Moore, 1995; Stubager, 2008). A central assumption of this thesis is that, once internalized, values remain stable throughout the life of the individual (Inglehart, 1997).

The socialization thesis can explain certain discrepancies that the developmental thesis cannot. For example, research in the United States shows that college-educated individuals are highly supportive and accepting of homeless people, yet they are significantly less likely to support giving them economic aid (Phelan et al., 1995). According to the developmental thesis, highly educated individuals are expected to support high levels of redistribution. However, the socialization thesis offers a different perspective by emphasizing the importance of the content of education. Phelan et al. (1995) explain this inconsistency by arguing that U.S. institutions promote values of tolerance and opportunity, but not equality of outcomes. Consequently, highly educated individuals may tolerate homeless people but may not necessarily support redistributive policies.

In Mexico, studies that have examined perceptions towards Indigenous peoples and Afrodescendientes have done so from the perspective of nation-building. These studies have historically addressed how Mexico's, and more broadly, Latin America's national identities have been defined through *mestizaje* or racial mixing. A central assumption of this research is that education can shape views towards Indigenous peoples.

Both the theorists of *mestizaje* and the researchers that have examined it have assumed that

education is a successful factor through which individuals perceive Indigenous peoples (and potentially Afrodescendientes). For example, in their work, Telles & Garcia (2013) state that Mexico's developed narratives of *mestizaje* were promoted through "the educational system, the arts, and communications infrastructure" (pp. 134).

Ideas of *mestizaje* have also affected individuals' racial attitudes in ways that could differ from research in high-income countries. For example, Telles & Garcia (2013) and De la Cadena (2000) have found that in Latin America, individuals tend to adopt structural explanations for ethno-racial inequality, which stands in opposition to the more individualistic perspective predominant in the United States, and to some extent in Europe.

In a pooled sample of several Latin American countries, Telles & Garcia (2013) find that more educated people are more likely to support ideas of *mestizaje* and intermarriage. Their hypothesis aligns with the socialization model since they argue that more educated people are also more likely to be aware of Latin America's history of social exclusion. However, their study does not address the endogeneity of education or include perceptions about Afrodescendientes.

In education, studies have examined how teachers and the curriculum can affect Indigenous students' view of themselves, which aligns with the socio-developmental thesis. For example, Jimenez-Naranjo & Mendoza-Zuany (2016) find that bilingual educators in Mexico had negative perceptions about their Indigenous students, which affected how students saw themselves (Jimenez-Naranjo & Mendoza-Zuany, 2016). Similar to the sociological literature, education research has favored the socialization thesis to explain how education can shape people's perceptions towards Indigenous and Afrodescendientes.

3.3 The 1993 School Reforms: Compulsory Secondary School

Previous studies that examine the relationship between education and political beliefs and attitudes suffer from potential bias because individuals' decisions to enroll in a particular level are usually dependent on unobserved (e.g., income) or unmeasured (e.g., motivation) factors. Compulsory schooling laws, however, provide a good source of quasi-experimental variation that eliminates the endogeneity of education because they force individuals to take on more years of education rather than allowing them to self-select into more schooling (A. G. Meyer, 2017).

Recent studies in high-income countries have also successfully used compulsory reform laws in selected European countries as a source of exogenous variation to examine the effect of education on left-right political ideology (A. G. Meyer, 2017), pro-environmental attitudes (A. Meyer, 2015), and immigration (Cavaille & Marshall, 2019). In the United States, educational reforms have also been used as an adequate instrument to identify causal effects of attitudes and beliefs towards diversity (C. K. Jackson, Johnson, & Persico, 2015).

The 1993 secondary school reform in Mexico provides an opportunity to examine whether educational attainment contributes to shaping individuals' beliefs towards Indigenous peoples and Afrodescendientes. The 1993 reform, which made secondary education compulsory (grades 7th through 9th⁵), was part of a larger effort to modernize the Mexican economy and reverse the economic stagnation of the previous decade (Creighton & Park, 2010; Navarro Leal & Navarrete, 2014). President Carlos Salinas (1988-1994) also framed the reform as a necessary change to make the Mexican labor force more competitive as the economy liberalized, and the North American Free Trade Agreement (NAFTA) came into effect (Lopez-Rodriguez, Lopez, Garay, & Gonzalez, 2020).

The educational reform also took place at the end of an extensive institutional reform that had begun in the 1980s. Many researchers explained such changes from the perspective of modernization theory, where Mexico's gradual economic growth and improved financial conditions would lead to cultural shifts in values. Those values would be related to self-expression and tolerance and would replace the predominantly traditional attitudes toward family, authority, and religion (Casar, 2010). As the country became more educated, there was a more pressing demand to democratize the government—a need that President Salinas noted in a speech where he also addressed how reforms could preserve the legitimacy of the ruling party (Enciso, 2007).

The reform had three main components: making secondary education compulsory, a new Law of Education to update the curriculum, and the revision and upgrading of teacher training. While the reform also gave more control to the local states' authorities, the central government retained a number of normative and evaluative functions to continue exerting great control over the system (Tatto, 1999). Among the functions the federal government retained were the allocation of educational budgets, the definition of the school curriculum and teacher training, the professional development of teachers, and the monitoring of the education system (Tatto, 1999).

To guarantee that the new constitutional amendment was implemented, the federal government adopted a construction program to build more schools. This program was rolled out at different points in time across Mexico's 32 states, with particular focus on the poorest states such as Oaxaca, Guerrero, and Michoacán. It also focused on a particular type of modality known as telesecundarias. Telesecundarias usually serve rural locations, while the general and vocational modalities are built primarily in urban and semi-urban areas. Over a period of ten years (1993-2003), telesecundarias were the modality that grew the most (111

⁵While the 1993 legislation made grades 9th through 11th compulsory and parents responsible for ensuring their children completed at least 9th grade, neither parents nor children are prosecuted if they drop out after completing elementary education

Neither the General Law of Education nor the constitutional amendment specified a starting age for secondary school. However, in 1990, the government's Program for the Modernization of Education 1990-1994 defined that children aged 6 to 14 were to attend primary school and those aged 12 to 14 should enroll in secondary education. Students who were 15 years old and had not finished grade 9 would attend adult education centers (Presidencia de la República, 1990). These restrictions implied that a student following an ideal trajectory throughout the education system would enroll in grade 7 when he or she was 12 years old.

3.4 Data

To identify the causal effect of educational attainment on attitudes towards Indigenous peoples and Afrodescendientes, I use the 2022 National Survey on Discrimination (*Encuesta Nacional sobre Discriminación 2022, ENADIS* in Spanish). ENADIS is a nationally representative survey that has two primary goals. First, it aims to identify the magnitude of discrimination and its manifestations in daily life. And second, it measures the perceptions of discrimination of underrepresented minorities (indigenous, LGTBQIA +, afrodescendientes, women, etc.) and the attitudes of the general population towards those minorities. The survey is representative at the national and state level for the population aged 18 years or older.

The analysis for this paper uses data from two of the three modules of the survey: the General Questionnaire (GQ), where I obtain the sociodemographic information (such as age and ethnicity) of the surveyed population and the Module on Opinions and Experiences (MOE). The MOE asks a randomly chosen person from each household aged 18 years or older to respond to questions related to attitudes towards diverse groups. These groups are broadly defined and include ethnicity, sexual orientation, gender identity, and disability.

For this paper, the outcomes of interest include eight questions related to attitudes towards Indigenous peoples and six questions that measure attitudes towards Afrodescendientes. These questions focus on hiring practices, marriage, affirmative action, and political representation.

The survey also includes two questions for the Indigenous peoples that allows me to examine whether respondents favour individual or structuralist explanations for ethno-racial inequality. The first question asks individuals whether they agree that Indigenous peoples value education and the second question whether they think the rights of the indigenous peoples are respected.

The full set of questions is on Table 3.1. Potentially, one reason why there are less questions for the Afrodescendientes might be due to their recent recognition as a distinct ethnic group. As individuals reaffirm their sense of ethnic identity, it may be possible that non-Afrodescendientes do not recognise any specific stereotype of have concrete measures to assess whether the government takes into account their opinions.

Given that the data is collected 29 years after the secondary school reform was enacted, my results provide evidence of the long term effects, but do not provide evidence of any short term effects. They also do not provide evidence of the shape of the functional form of the relationship between education and attitudes towards ethno-racial groups in Mexico.

Table 3.1: ENADIS Survey Questions

Question about indigenous peoples		
Item	Wording	Response Categories
1	If you could rent a room in your house, would you rent it to an indigenous person?	Yes/No
2	Regardless of whether you have children, would you agree if your son or daughter were to marry an indigenous person?	Yes/No
3	How much would you like to have an indigenous person elected as President of the Republic?	A lot/Somewhat/Little/Nothing/Don't know
4	If you managed a company, how willing would you be to hire an indigenous person?	A lot/Somewhat/Little/Nothing/Don't know
5	In your opinion, to what extent are the rights of indigenous peoples respected in the country?	A lot/Somewhat/Little/Nothing/Don't know
6	How much should the government take into account the opinion of indigenous peoples?	A lot/Somewhat/Little/Nothing/Don't know
7	Do you agree with the following statement: Indigenous people do not value continuing their studies?	Yes/No/Don't know
8	Do you support quotas to have Indigenous or Afro descendants candidates?	Yes/No/Don't know.
Question about Mexicans of Afro descendants		
1	If you could rent a room in your house, would you rent it to a black afrodescendant?	Yes/No
2	Regardless of whether you have children, would you agree if your son or daughter were to marry a black afrodescendant?	Yes/No
3	How much would you like to have a black afrodescendant elected as President of the Republic?	A lot/Somewhat/Little/Nothing/Don't know
4	If you managed a company, how willing would you be to hire a black Afro descendant?	A lot/Somewhat/Little/Nothing/Don't know
5	In your opinion, How much are rights of afrodescendants respected in the country?	A lot/Somewhat/Little/Nothing/Don't know
6	How much should the government take into account the opinion of the afrodescendants?	A lot/Somewhat/Little/Nothing/Don't know

Since the focus of the study is to identify the causal effect of educational attainment on attitudes towards Indigenous and Afrodescendientes, my sample data will only include individuals that are non-Indigenous, non-Afrodescendientes. To ensure that people in my sample were exposed to the 1993 reform, I will further exclude individuals who were born outside of Mexico or who resided outside the country in 2017.

The analysis only includes individuals close enough to the constitutional amendment who were not studying at the time of the 2022 survey. To make this calculation, I use the variable age reported in the survey. Age is an adequate proxy for year of birth and I can obtain accurate estimates from the ENADIS 2022. Considering that the survey was collected from July 18 to September 9, 2022, the reported age of the individuals would coincide with their eligibility to enrol in grade 7th. To estimate year of birth, I just subtract 2022-age.

I then define the pivot cohort (the first cohort affected by the reform) as j and denote the birth year of the cohort as by . I then define $k = (b - by)$ as the number of years between any cohort b and the pivot cohort.

After estimating the year of birth, I identify individuals within a particular analytical sample. Individuals with $k \in [-10, -1]$ comprise the pre-reform sample and individuals with $k \in [0, 10]$ belong to the post-reform sample and includes the pivot cohort 0. Finally, we include only individuals who answer the educational attainment question and all questions in table 3.1. The total sample includes 10,698 individuals, which represents 88 % of the eligible sample.

The variable years of schooling derives from the questions on the GQ on maximum level of educational attainment. I top coded the years of schooling to 18 since very few individuals in the sample completed a master's (0.38%) or a PhD (1.95%) degree. The conversion between educational attainment and years of schooling following the Secretary of Education's guidelines (SEP) (INEE, 2018)

Table 3.2 shows the descriptive statistics of the sample with a bandwidth of 10 and 7 years. I use a bandwidth of 7 since it matches the window chosen by other research on educational reforms and attitudes⁶ (c.f. Meyer (2017) and Yang (2022)).

⁶I refer to the main sample as the group with a bandwidth of 10 years

Table 3.2: Summary statistics for Attitudes Towards Indigenous Peoples

Variable	N	Mean	Std. Dev	Min	Max
<i>Bandwidth of 10 years</i>					
Years of schooling	10,698	11.21	4.38	0	18
Reform	10,698	0.54	0.50	0	1
Male	10,698	0.46	0.50	0	1
Age	10,698	40.48	6.13	31	51
<i>Bandwidth of 7 years</i>					
Years of schooling	7,487	11.2	4.42	0	18
Reform	7,487	0.50	0.50	0	1
Male	7,487	0.46	0.50	0	1
Age	7,487	40.9	4.6	34	48

Note: Sample size excludes individuals that self-identified as indigenous or afrodescendientes.

In the sample, the average years of schooling is 11.20 years, with more than half of them exposed to the Reform (54%). The sample is also predominantly female (55%) and has an average age of 40.5 years.

Outcome measures

To analyse the eight outcome measures for the indigenous peoples, I first recode the ordinal variables into indicators. Keeping the ordinal categories in some of the questions may impose a linear relationship that may not hold if respondents perceive differences between levels of the responses as non-linear (Cavaille & Marshall, 2019). I recoded the ordinal items so that a value of 1 would indicate positive responses ("A lot" and "Somewhat") and 0 negative ("Little" and "Nothing"). I also reversed coded items to indicate that a value of 1 was positive and 0 negative. For example, the question about *Do you agree with the following statement: Indigenous people do not value continuing their studies*, a response of 1 was re-coded to imply disagreement with the statement. Then, I estimated Cronbach's α to assess the internal consistency of the scale and I ended up removing two items: *In your opinion, to what extent are the rights of indigenous peoples respected in the country* and *Do you agree with the following statement: indigenous peoples do not value continuing their studies?*. The final scale with six items has a Cronbach's α of 0.57. Estimating Cronbach's α has been shown to be appropriate even if data are binary (Yu, 2001).

Given the low value of Cronbach's α , I examine the outcome measures in three ways. The first approach is a standardized summated scale; the second approach is to estimate standardise scores of these six items through an Item Response Theory (IRT) model. Finally, for the third approach, I analyse each item separately. By looking at the scale using three estimation methods, I assess how robust my results are against different ways to estimate an aggregated scale of indigenous attitudes.

To select the variables to include in the summated scale, I first examine if they can measure a common construct (unidimensionality of the scale) through an Exploratory Factor Analysis (EFA). The EFA is estimated by using tetrachoric correlations, which are appropriate when the data is binary (Yu, 2001) The selected items have generally low uniqueness values (ranging from 0.36 to

0.74), and the eigenvalues indicate one factor solution. The eigenvalue of the first factor was 2.72 whereas the second factor had an eigenvalue of 0.22. The IRT scores are estimated using a 2pl model with the same variables identified in the factor analysis. More information about the different models and how they differ between each other are in Appendix A2.

For the Afrodescendiente scale, I follow a similar procedure. The only item that I excluded was "In your opinion, how much are rights of Afrodescendientes respected in the country?" due to a low internal consistency estimate. The Cronbach's α of the remaining items is 0.60 and The EFA also shows a one-factor solution⁷.

Table 3.3 shows the descriptive statistics for each item analysed for Indigenous and Afrodescendientes. The Indigenous and Afrodescendiente scales are the summated scores of the items that were part of a factor.

Table 3.3: Summary statistics for outcome measures: Individual items and indigenous and afrodescendiente scales

Item	N	Mean	S.D.	Min	Max
Questions about indigenous peoples					
If you could rent a room in your house, would you rent it to an indigenous person?	10,698	0.82	0.39	0	1
Regardless of whether you have children, would you agree if your son or daughter were to marry an indigenous person?	10,698	0.95	0.22	0	1
How much would you like to have an indigenous person elected as President of the Republic?	10,698	0.88	0.33	0	1
If you managed a company, how willing would you be to hire an indigenous person?	10,698	0.93	0.26	0	1
In your opinion, to what extent are the rights of indigenous peoples respected in the country?	10,698	0.40	0.49	0	1
How much should the government take into account the opinion of indigenous peoples?	10,698	0.96	0.20	0	1
Do you agree with the following statement: Indigenous people do not value continuing their studies?*	10,698	0.36	0.48	0	1
Do you support quotas to have Indigenous or Afro descendants candidates?	10,698	0.78	0.42	0	1
Indigenous Scale	10,698	5.3	1.05	0	6
Questions about afrodescendientes					
If you could rent a room in your house, would you rent it to a black afrodescendant?	10,698	0.78	0.41	0	1
Regardless of whether you have children, would you agree if your son or daughter were to marry a black afrodescendant?	10,698	0.93	0.26	0	1
How much would you like to have a black afrodescendant elected as President of the Republic?	10,698	0.77	0.42	0	1
If you managed a company, how willing would you be to hire a black Afro descendant?	10,698	0.91	0.28	0	1
In your opinion, How much are rights of afrodescendants respected in the country?	10,698	0.46	0.28	0	1
How much should the government take into account the opinion of the afrodescendants?	10,698	0.93	0.50	0	1
Afrodescendiente scale	10,698	4.3	1.03	0	5

Notes: The indigenous and afrodescendiente scales are the summated scores of the items that form one factor.

*The responses to the question were inverted in the EFA, but remain unchanged for this descriptive table that indigenous people do not value continuing their studies

In general, responses to the items indicate that individuals in the sample (members of the cohorts affected 10 years after and before the 1993 reform) hold positive attitudes towards Indigenous and Afrodescendientes. Items with the highest responses were related to hiring and promoting racial mixture. However, items related to affirmative actions and representation had lower values. For example, 78% of the respondents would agree with having an Afrodescendiente president while 77% would support quotas to have Indigenous or Afrodescendientes as political candidates.

⁷The eigenvalue of the first factor is 2.51 while the second factor had an eigenvalue of 0.233

3.5 Identification Strategy

To identify a causal effect, I need to compare groups that are similar on average to each other, but that only differ in their exposure to the reform. Usually, this process would require a randomised control trial (RCT), where individuals are randomly assigned to treatment or control. When randomisation is not feasible, a quasi-experimental design can be used.

A quasi-experiment aims to replicate RCTs by reducing biases derived from unobserved variability, but it requires a source of randomisation that is "as if" randomly assigned. Such a source might involve the treatment (D) being "as if" randomly assigned by conditioning on a matrix of control variables X . Alternatively, there could be a variable Z that influences treatment D and is "as if" randomly assigned, allowing Z to be used as an instrument for D .

My primary research design is a fuzzy regression discontinuity design (RDD). Fuzzy RDD is a type of instrumental variables regression, where the 1993 compulsory education reform is used as an instrument. To be valid instrument, the reform must meet three criteria. First, the reforms must have affected the average educational attainment of those exposed to it (Relevance). Second, the 1993 reform must not have a direct effect on the attitudes towards Indigenous and Afrodescendientes (exclusion restriction). In other words, the reforms only affect the outcome measures through the individual's educational attainment and not through unobservable factors (Joshua D. Angrist & Rubin, 1996; Bollen, 2012). Such criteria is feasible given that the reform was promulgated when individuals in the sample were in primary school or younger or were not even born. Finally, the instrument must be uncorrelated with the error term (Independence). This is also a feasible assumption given that it is unlikely that the government implemented the reform based on an individuals' particular characteristics.

Researchers have also found Educational reforms to be a valid instrument (Brunello, Fabbri, & Fort, 2013) and they remain robust to potential violations of the exclusion restriction. For example, oftentimes compulsory laws are implemented along curricular and funding reforms that could change the quality of schooling; however, simulations studies have shown that even unmeasured changes derived from the reforms (such as changes in the quality of education) do not affect the validity and estimates of these reforms (Brunello et al., 2013; Bolzern & Huber, 2017).

Using a linear fuzzy RDD also has the advantage of reducing differences of the effect of societal trends on different cohorts. By comparing cohorts of people that were born close together (e.g. 1981), we expect that they would experience almost the same developments while growing up (Chen, Lin, & Yang, 2023). The only differences between cohorts is that some of them would have been exposed to the 1993 compulsory education reform while those born before would not have. Including a term in the regression to control for cohort trends addresses the empirical concern that the effects reflect trends that differ between affected and unaffected cohorts (Cavaille & Marshall, 2019). A limitation of this approach is that the findings are not generalizable, but are applicable only to those that were exposed to the reform and were enrolled in secondary school, an effect that is known as the Local Average Treatment Effect (LATE).

The central idea of the Fuzzy RDD is that the probability of receiving an additional year of schooling (or being affected by the reform) is a discontinuous function of year of birth (Lee & Lemieux, 2010). The key identifying assumption of the RD design is that attitudes towards diversity are continuous across cohorts in all other variables except years of schooling (Kunst, Kuhn, & van de Werfhorst, 2020b). I will compare cohorts that are just young enough to be affected by the reform to cohorts that are old enough to have been affected.

A fuzzy RD leads to a two-equation model specification, similar to an instrumental variables

approach:

$$Education_{ic} = \alpha_0 + \alpha_{ic}R + g(k_{ic}) + B_2\mathbf{X}_{ic} + \varepsilon_{ic} \quad (3.1)$$

and

$$Attitudes_{ic} = \beta_0 + \hat{\beta}_{ic}Education + f(k_{ic}) + \mathbf{X}_{ic} + v_{ic} \quad (3.2)$$

where $g(k_{ic})$ and $f(k_{ic})$ are controls for cohort trends, $\mathbf{X}$ is a vector of exogenous controls that include sex, but excludes endogenous controls such as income. Exogenous controls can reduce sampling variability and produce more precise RD estimates (Lee & Lemieux, 2010). However, including variables that also affect educational attainment could bias the results (Lee & Lemieux, 2010). My initial bandwidth is ± 10 years, but I also explore seven years as other studies analysing educational reforms and attitudes have done (A. G. Meyer, 2017; Yang, 2022; Cavaille & Marshall, 2019). I report results for all other possible bandwidths for 2-6 and 8-9 years for each outcome and the scale as robustness checks.

3.6 Results

First Stage

As a first step, I provide evidence that the reforms increased educational attainment among those cohorts exposed to the reform. To present graphical evidence of a discontinuity, I first regress years of schooling on two subsamples: the first subsample includes individuals not affected by the reform and the second subsample is for the cohorts affected by the 1993 reform (A. G. Meyer, 2017). I also check for a quadratic trend by adding a k^2 term and compare the model through a likelihood ratio test. Results indicate that adding the quadratic term does not improve the fit of the model, but I report the models with this quadratic term to control as a robustness check.

Figure 3.1, which uses linear controls, shows a discontinuity in average educational attainment in the year of the reform. Individuals born in the cohort immediately prior to the 1993 reform ($k=-1$) are predicted to leave school 0.44 years earlier than the cohort born during the reform ($k=0$) and 0.52 years earlier than the cohort born immediately after the reform ($k=1$).

Table 3.4 and table 3.5 present results from the first stage regression using the IV approach with the Indigenous and Afrodescendiente scale respectively. The selected bandwidths are ± 10 and ± 7 and include linear and quadratic cohort trends. Selecting a bandwidth of ten years incorporates most of the cohorts that were exposed to the same educational policy. Changes to the General Law of Education and further constitutional amendments would occur in 2006. Results indicate that exposure to the 1993 reform increased the average years of schooling by 0.79 with the largest bandwidth and slightly decrease when I use the smaller bandwidth to 0.66 years. These results are consistent with findings from other papers that examine the effect of the 1993 secondary school reform in Mexico (Ma, Yahirun, Saenz, & Sheehan, 2021; Gutierrez, Courtin, Glymour, & Torres, 2024).

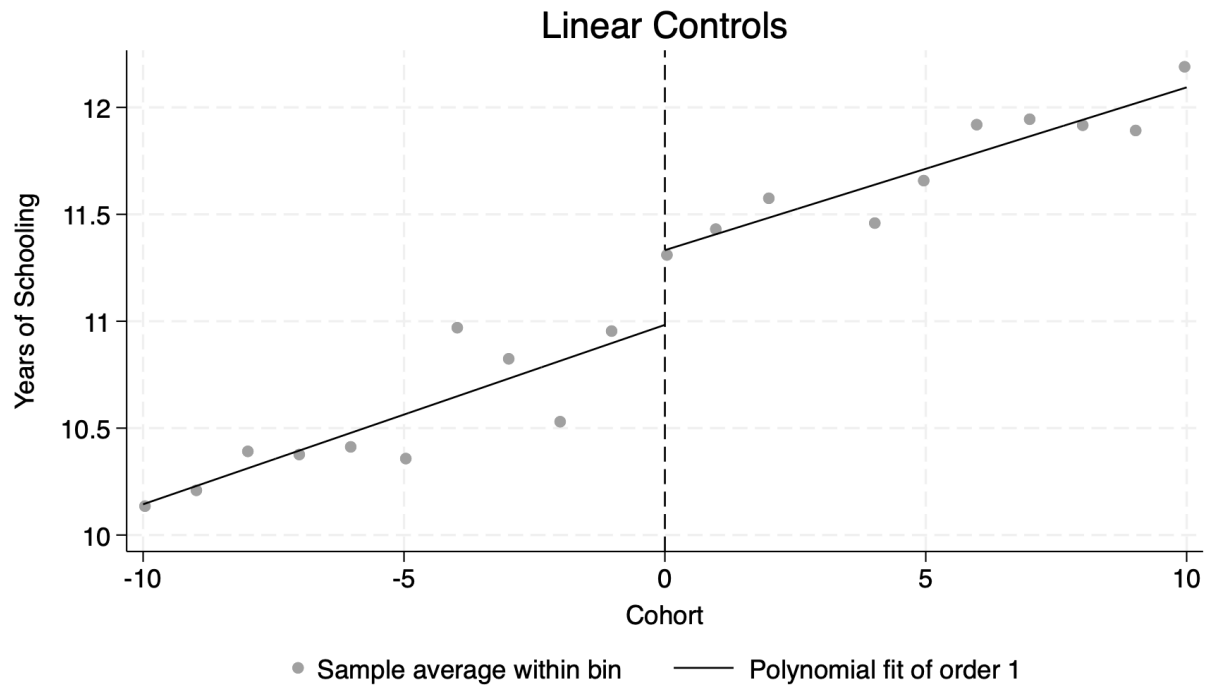


Figure 3.1: Years of schooling vs interval (k) bandwidth of 10

To show the strength of using the 1993 compulsory reform as an instrument, I present first stage regression results in table 3.4. The results from the first stage show that the educational reform does have a statistically significant positive effect. The F-statistic is well above 10, which is considered the minimum value for an instrument to provide reliable estimates (James H Stock & Yogo, 2002).

Effects on Attitudes towards diversity

Results for the Indigenous Peoples: Scale and Questions

Columns 1 and 2 of table 3.4 present 2SLS results from the bandwidth of 10 years with robust standard errors for the indigenous and afrodescendiente scale. Table 2.4 and 2.5 presents results for each question separately.

Table 3.4: 2SLS Regression Results for the Indigenous Scale

	(1)	(2)	(3)	(4)
	2SLS	2SLS	2SLS	2SLS
2nd stage. Outcome is standardized indigenous attitudes scale				
Years of schooling	0.077***	0.077***	0.088***	0.087***
Female	0.030	0.030	0.014	0.015
1st stage. Outcome is years of schooling				
Reform	0.740***	0.753***	0.600***	0.688***
Female	0.104	0.104	0.237**	0.237**
F-stat	79.36	59.58	37.02	27.90
(p-value)	(0.001)	(0.001)	(0.001)	(0.001)
Bandwidth	+10	+10	+7	+7
Cohort trends	Linear	Quadratic	Linear	Quadratic
N	10,698	10,698	7,487	7,487

Notes: 'Instrument' is a dummy, which equals 1 if individuals are subject to the 1993 secondary school reform. Cohort trend includes the assignment variable cohort and its interaction with the 'reform dummy instrument.

Standard errors are Robust standard errors.

****p<0.01; **p<0.05; *p<0.1.

For the second stage, among students that complied with the reform, an additional year of schooling reduces the probability of expressing anti-Indigenous and anti-Afrodescendientes attitudes in the long-term. For the Indigenous scale, the reduction in probabilities were the highest in the items related to renting (three percentage points) and quotas for candidates (three percentage points). Similarly, the probability of answering "No" on the question *Indigenous peoples do not value continuing their education* increased by two percentage points (table A.4.1). The values were the lowest for marriage (less than one percentage point). There difference in the questions about how much Indigenous rights are respected in the country and whether the government should consider the opinions of Indigenous peoples are non-statistically significant. In the overall Indigenous scale, staying in secondary school (9-12 grades) increases by 0.07 standard deviations in the tolerance towards Indigenous individuals.

Table 3.5: 2SLS Regression Results for the Afrodescendiente Scale

	(1) 2SLS	(2) 2SLS	(3) 2SLS	(4) 2SLS
2nd stage. Outcome is standardised afrodescendiente scale				
Years of schooling	0.096***	0.096***	0.084***	0.085***
Female	0.006	0.006	0.010	0.009
1st stage. Outcome is years of schooling				
Reform	0.789***	0.805***	0.659***	0.727***
Female	0.107	0.107	0.247**	0.247**
F-stat	79.36	59.58	37.02	27.90
(p-value)	(0.001)	(0.001)	(0.001)	(0.001)
Bandwidth	+10	+10	+7	+7
Cohort trends	Linear	Quadratic	Linear	Quadratic
N	10,698	10,698	7,487	7,487

Notes: ‘Instrument’ is a dummy, which equals 1 if individuals are subject to the 1993 secondary school reform. Cohort trend includes the assignment variable cohort and its interaction with the ‘reform dummy instrument.

Robust standard errors.

****p<0.01; **p<0.05; *p<0.1.

The effects of the reform are larger for Afrodescendientes than for Indigenous peoples as measured by the standardised summated scales. Probability estimates of an additional effect of schooling range from 1.2 to 3.7 percentage points. The effects are largest for items related to renting and having a president of Afrodescendiente origin (see table A.4.2. They are lowest for taking into account the opinion of Afrodescendientes by the government. Marriage with an Afrodescendientes and whether rights are respected in the country for that group are non-statistically significant. For the overall Afrodescendiente scale, staying in secondary school (9-12 grades) leads to an increase of 0.10 standard deviations in the tolerance towards Afrodescendientes. A.3.1)

Together, these effects provide evidence that educational attainment can affect individuals’ views of different ethnic groups in the long term. However, marriage with Afrodescendientes and the government taking into account the opinion of Indigenous peoples were not statistically significant. One reason for such lack of statistical significance might be due to the already high levels of support in the population.

These effects are consistent with effects found in high income countries. Cavaille & Marshall (2019) find that secondary school reforms (grades 10th-12th) in France, the Netherlands, and Denmark reduced the probability of anti-immigration feelings by 0.1 standard deviations, which is similar to the effect for Afrodescendientes and slightly higher than for Indigenous peoples.

Discussion

This paper has examined how educational attainment influences attitudes towards Indigenous and Afrodescendientes populations in Mexico. While theories explaining attitudes towards ethno-racial minorities have been extensively tested in North American and European contexts, they remain relevant for framing these relationships in Latin America. Latin America, particularly Mexico, has a

long history with *mestizaje*, where Indigenous cultural symbols were instrumental in nation-building efforts. Conversely, Afrodescendientes were rendered invisible and presumed to have assimilated into the national identity. Throughout most of the 20th century, the concept of racial mixing was propagated through cultural and educational campaigns (Vasconcelos, 1925). As Mexico transitioned from a *mestizaje* discourse to one of multiculturalism, educational policies remained pivotal in shaping ethno-racial attitudes and integrating Indigenous peoples. Afrodescendientes, however, were not formally recognized until 2019.

This paper investigates the hypothesis that education influences individuals' attitudes towards ethno-racial groups. Using data from ENADIS 2022, I leverage the exogenous variation in exposure to the 1993 reform that made secondary school compulsory in Mexico. The evidence shows that among the compliers, an additional year of education leads to long term positive attitudes towards Indigenous and Afrodescendientes populations. While there are some limitations to the analysis, robustness checks strengthen the argument that this relationship is causal.

The positive relationship between educational attainment and attitudes towards Indigenous and Afrodescendientes weakens the self-interest theory as an explanatory framework for the case of Mexico. Under the self-interest hypothesis, we would expect that highly educated individuals would be less supportive of redistributive or equity-based policies. Item analysis shows, for example, that those affected by the 1993 reform and obtained more schooling supported broader consultations for ethno-racial minorities. They were also more likely to hire an Indigenous or Afrodescendiente individual if they managed a company.

While the effect size is similar for the overall scale, it is smaller for individual items compared to similar studies conducted in high income countries. These results suggest that the effect of the reform might have decreased over time. Alternatively, the results could suggest that the effect of education to shape individuals' beliefs under *mestizaje* could have been overestimated.

Despite this smaller results at the item level, the results suggest that attitudes towards ethno-racial minorities could begin earlier than previous studies have examined. Current sociological and political science research on how early the educational system can contribute to shape ethno-racial attitudes is limited with most studies focusing on advanced levels of education. For example, Sue, Riosmena & Telles (2024) in their analysis of how aligned public and popular discourse about blackness were focus on individuals of working age (25 to 64) and Cavaille & Marshall (2018) study on secondary reforms focus mostly on the later years of lower secondary and earlier years of upper secondary. Weber (2022) longitudinal study examines the attitudes of German students towards immigrants starting at age 15.

Item-level analysis indicates that among individuals who complied with the 1993 reform, an additional year of education correlates with decreased support for individualistic explanations of ethno-racial inequalities. However, this additional education does not significantly increase support for structuralist perspectives. Given that the curricular content of the 1993 secondary school textbooks emphasised the historical challenges faced by Indigenous peoples until the end of the Porfiriato (1910), these findings offer partial evidence against the socialisation hypothesis. According to this hypothesis, extended schooling would enhance individuals' awareness of societal social stratification.

Robustness checks

I ran three types of checks to ensure the robustness of my results. First, I examined whether the assignment variable (e.g. year of birth) was manipulated, then I assessed whether the 1993

secondary education reform was an appropriate instrument. Finally, I checked whether the results were not contingent on how the outcome variable was defined.

For the first set of tests, I ran manipulation tests based on density discontinuity that are constructed using the results of local-polynomial density estimators as defined by Cattaneo, Jansson & Ma (2018). I used these set of tests because they have better size properties and power than other conventional approaches, such as the McCrary test (Cattaneo, Jansson, & Ma, 2018)

The idea of a manipulation test is that it checks for discontinuities in the density of the running variable (e.g. year of birth) at the cutoff (September 1993, the time of the reform). If there are any discontinuity, then there is evidence of manipulation. In practice, this means that parents could enrol their children outside the eligibility range (e.g. not being 12 years old by September 1993 to enrol in 7th grade) and violate the exogeneity assumption. A violation of the exogeneity assumption means that groups that systematically different from each other are compared and could result in biased estimates of the effect of the reform.

Looking at figure 3.2, we can infer a discontinuity in the density of the cohort affected by the reform. However, using the non-parametric local polynomial density estimator with robust bias-correction of Cattaneo, we cannot reject the null hypothesis of no discontinuities in the running variable(Cattaneo et al., 2018). The p-value of the robust bias-corrected statistic is 0.9786.

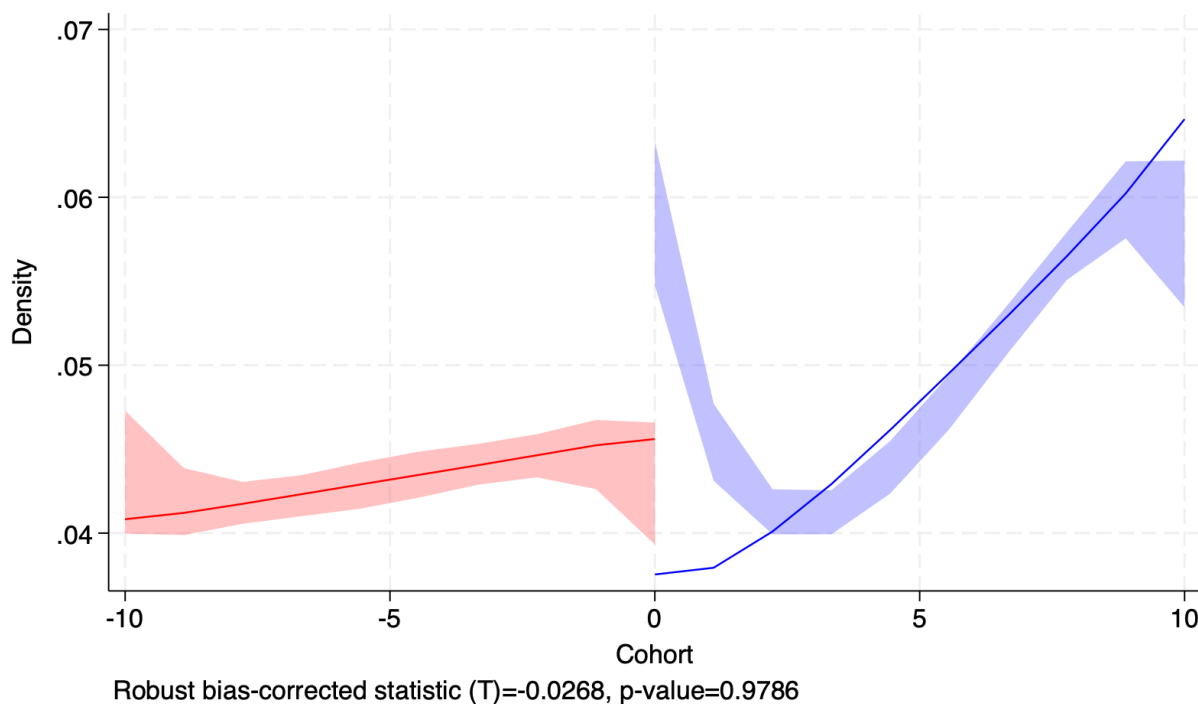


Figure 3.2: Density test for Manipulation of the Running Variable

To assess whether my results depend on the size of the bandwidth, I estimate my results with a bandwidth of 2-6 and 8-9 cohorts. Table A.1 and table A.1 show that the first stage of the regression (the effect of the reform on years of schooling) remained statistically significant across different bandwidth sizes. The F-statistic of the instrument remains larger than 10 for most bandwidths, which indicates that the reform is a strong instrument. But it becomes smaller than 10 in the cohorts

affected in the second, third, and fourth year of the reform. The implication is that the identification of an effect is weaker for cohorts that were exposed immediately to the reform.

While the effects of the reform on the Indigenous scale are not statistically significant for bandwidths smaller than 5, the direction of the effect is consistent with our initial hypothesis that educational attainment increases positive attitudes. In the case of the Afrodescendientes scale, the direction of the effect is similar with effects very close to zero for a bandwidth of three and two. The results for the Afrodescendiente scale suggest that the identification and consistency of the results are weaker than for Indigenous people.

In terms of using the estimated scores of the 2-parameter logistic IRT model, my results are also statistically significant to the summated scores (Table A.3.1 and table A.3.2). The magnitude of the effect decreases, but not significantly as the effect remains within 0.04-0.05 standard deviations for the Indigenous scale and 0.06 and 0.07 standard deviations for the Afrodescendiente scale.

Limitations

The paper has three central limitations. First, the survey measures feelings of individuals 20 years after the reform was enacted, which means I cannot compare individuals before and after transitioning to higher levels of education and I cannot control for unmeasured time-varying variables that could have affected entire cohorts. For example, changes in the return to education has shown to influence individuals' attitudes towards immigrants in Germany (Weber, 2022)—and under the Group conflict theory this could be a mechanism. Conceptions about what constitutes an Afrodescendiente person might also change over time as elite and ethnic groups discourses shape ethno-racial boundaries.

The second limitation is that individuals might have given socially desirable responses. It is possible that respondents thought that answering negatively to some of the questions related to Indigenous and Afrodescendientes might affect how interviewers saw them. Further research should examine whether those attitudes translate into actual behaviours.

The third limitation is about the generalizability of the results. As mentioned in earlier sections, the treatment effect for Fuzzy RDD designs applies specifically to the subpopulation around the cutoff value. While this allows for the identification of a treatment effect, it does not provide information about the effect in other subgroups or in the overall population (Suk, 2024).

Appendix: A1

Table A.1: 2SLS regression results, alternative bandwidths for the Indigenous scale.

Bandwidth	(1) +/-9	(2) +/-8	(3) +/-6	(4) +/-5	(5) +/-4	(6) +/-3	(7) +/-2
2nd stage. Outcome is standardised Indigenous scale							
Years of school	0.0739***	0.0760***	0.0730***	0.0824**	0.033	0.057	0.045
1st stage. Outcome is years of school							
Reform	0.729***	0.642***	0.579***	0.562**	0.476**	0.469**	0.482**
F -Stat on excluded instrument	57.52	44.94	22.39	12.77	6.89	6.35	5.15
(p -value)	(p=0.000)	(p=0.000)	(p=0.000)	(p=0.000)	(p=0.000)	(p=0.000)	(p=0.002)
N	9,722	8,489	6,488	5,369	4,327	3,224	2,741

Note: Robust standard errors. All regressions include gender controls and linear cohort trends.

Table A.1: 2SLS regression results, alternative bandwidths for the Afrodescendientes scale.

Bandwidth	(1) +/-9	(2) +/-8	(3) +/-6	(4) +/-5	(5) +/-4	(6) +/-3	(7) +/-2
2nd stage. Outcome is standardised Afrodescendiente							
Years of school	0.089***	0.082***	0.067**	0.068**	0.030	-0.007	-0.011
1st stage. Outcome is years of school							
Reform	0.729***	0.642***	0.579***	0.563**	0.477*	0.468*	0.482*
F -Stat on excluded instrument	57.52	44.94	22.39	12.77	6.89	6.35	5.15
(p -value)	(p=0.000)	(p=0.000)	(p=0.000)	(p=0.000)	(p=0.0001)	(p=0.0003)	(p=0.0015)
N	9,722	8,489	6,488	5,369	4,327	3,224	2,741

Note: Robust standard errors. All regressions include gender controls and linear cohort trends.

Appendix A2

While research has shown that scores from IRT models are highly correlated to summated scores, the results largely apply to assessments with a high number of items (Xu & Stone, 2012). The following table compares the Likelihood Ratio of a Rasch model (1pl) versus a model that includes a difficulty parameter (2pl) and a pseudo-guessing parameter (3pl). The selected items were those dichotomous items that formed a one factor in the Exploratory Factor Analysis.

Table A.2: Likelihood Ratio Comparing IRT Models

Model	LR	p-value
Items about Indigenous Peoples		
1pl	.	.
2pl vs 1pl	1017.12	p=0.000
3pl vs 2pl	-0.08	p=1.000
Items about Afrodescendientes		
1pl	.	.
2pl vs 1pl	383.26	p=0.000
3pl vs 2pl	0.00	1.000

The likelihood ratio shows that there is no statistical difference between model 3pl and 2pl, but that the fit is better in the 2pl versus the Rasch model. Since each model is nested, model 2pl is preferred over any other option.

Appendix A3

Table A.3.1: 2SLS Regression Results for the Indigenous Scale with IRT Modelling

	(1) 2SLS	(2) 2SLS	(3) 2SLS	(4) 2SLS
2nd stage. Outcome is standardized Indigenous attitudes scale				
Years of schooling	0.044***	0.044***	0.047**	0.046**
Female	0.021*	0.021*	0.237**	0.236**
1st stage. Outcome is years of schooling				
Reform	0.740***	0.753***	0.600***	0.689***
Female	0.104	0.104	0.237**	0.236**
F-stat	75.41	56.61	34.25	25.91
(p-value)	(0.001)	(0.001)	(0.001)	(0.001)
Bandwidth	+10	+10	+7	+7
Cohort trends	Linear	Quadratic	Linear	Quadratic
N	10,698	10,698	7,487	7,487

Notes: Dependent variable is estimated by a 2pl IRT model.

‘Instrument’ is a dummy, which equals 1 if individuals are subject to the 1993 secondary school reform. Cohort trend includes the assignment variable cohort and its interaction with the ‘reform dummy instrument.

Standard errors are Robust standard errors.

***p<0.01; **p<0.05; *p<0.1.

Table A.3.2: 2SLS Regression Results for the Afrodescendiente Scale with IRT Modelling

	(1) 2SLS	(2) 2SLS	(3) 2SLS	(4) 2SLS
2nd stage. Outcome is standardized Afrodescendientes Scale				
Years of schooling	0.068***	0.068***	0.059***	0.059***
Female	0.0021	0.002	0.004	0.004
1st stage. Outcome is years of schooling				
Reform	0.740***	0.753***	0.600***	0.689***
Female	0.104	0.104	0.237**	0.236**
F-stat	75.41	56.61	34.25	25.91
(p-value)	(0.001)	(0.001)	(0.001)	(0.001)
Bandwidth	+10	+10	+7	+7
Cohort trends	Linear	Quadratic	Linear	Quadratic
N	10,698	10,698	7,487	7,487

Notes: Dependent variable is estimated by a 2pl IRT model.

‘Instrument’ is a dummy, which equals 1 if individuals are subject to the 1993 secondary school reform. Cohort trend includes the assignment variable cohort and its interaction with the ‘reform dummy instrument.

Standard errors are Robust standard errors.

***p<0.01; **p<0.05; *p<0.1.

Appendix: A4

Table A.4.1: 2SLS Item Analysis for Items Related to Indigenous Peoples

Question	Item 1 Renting	Item 2 Marriage	Item 3 President	Item 4 Hiring	Item 5 Rights	Item 6 Opinion	Item 7 Studies*	Item 8 Quotas
2nd Stage: Items related to Indigenous Peoples								
Years of School	0.028***	0.008**	0.014**	0.010**	-0.009	0.007	0.020**	0.015**
1st stage. Outcome is years of school								
Reform	0.740***	0.740***	0.740***	0.740***	0.740***	0.740***	0.740***	0.740***
F -Stat on excluded instrument	75.41	75.41	75.41	75.41	75.41	75.41	75.41	75.41
(p-value)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
N	10,698	10,698	10,698	10,698	10,698	10,698	10,698	10,698

Notes: 'Reform' is a dummy, which equals 1 if individuals are subject to the 1993 secondary school reform.

Cohort trend includes the assignment variable cohort and its interaction with the 'Reform' dummy instrument.

Standard errors are Robust standard errors.

P-values are adjusted using the Benjamini-Hochberg Correction

*The responses to the question were inverted to reflect the proportion of individuals that disagree with the statement that indigenous people do not value continuing their studies

Table A.4.2: 2SLS Item Analysis for Items Related to Afrodescendientes

Question	Item 1 Renting	Item 2 Marriage	Item 3 President	Item 4 Hiring	Item 5 Rights	Item 6 Opinion
Years of School	2nd Stage: Items related to Afrodescendientes					
	0.037***	0.012	0.030***	0.016***	0.004	0.018***
Reform	1st stage. Outcome is years of school					
	0.740***	0.740***	0.740***	0.740***	0.740***	0.740***
F -Stat on excluded instrument	75.41	75.41	75.41	75.41	75.41	75.41
(p-value)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
N	10,698	10,698	10,698	10,698	10,698	10,698

Notes: 'Reform' is a dummy, which equals 1 if individuals are subject to the 1993 secondary school reform. Cohort trend includes the assignment variable cohort and its interaction with the 'Reform' dummy instrument. Standard errors are Robust standard errors
P-values are adjusted using the Benjamini-Hochberg Correction

Chapter 4

Ethnic Mobility in Mexico

4.1 Introduction

In this paper, I describe patterns of ethnic trajectories collected in three waves and identify characteristics related to an individual's change in self-reported ethnicity over time. By looking at these trajectories, I argue that studies of ethnic stratification in Mexico need to incorporate the dynamic nature of ethnic identity. The study will focus on Mexico for two reasons. First, Mexico is one of the Latin American countries with the largest number of indigenous peoples in the region, which makes issues related to ethnic identification and stratification relevant to understand socioeconomic inequalities. And second, Mexico is one of the few countries that has collected individual longitudinal data on ethnicity, which allows me to understand how individuals self-identify over time.

Over the past few years, Mexico has undergone institutional and societal changes that have contributed to blur the notion of ethnic identity. Institutionally, governments have abided to international conventions that recognise indigenous rights, have constitutionally recognised multiculturalism and have developed school modalities with intercultural and linguistic approaches to indigenous peoples. Societally, indigenous movements have gained increased visibility in the policy agenda—most notably through the 1994 Zapatista movement. Large numbers of indigenous peoples migrating from urban to rural areas have also contributed to change how indigenous individuals are perceived and have challenged predominant narratives of who they are—particularly, the notion that indigenous peoples live in rural areas, are monolingual and wear a specific type of clothing (Telles & Torche, 2018).

More recently, a growing body of research has documented that individual changes in social status also contribute to form a sense of ethnic identity. These changes include migration to a new area, higher educational attainment or any change that affects the ethnic and racial interactions of individuals. Behind these interactions lie processes related to acculturation, experiences with discrimination and racism as well as ethnic pride. Such situations may explain, for example, why indigenous parents with higher levels of education are also likelier to report their children as indigenous compared to their counterparts with lower levels of education (Villarreal, 2012b).

Another reason for the change in self-reports of ethnicity may derive from situational and context effects. These effects refer to the situation in which the instrument was administered as well as the perceived purpose of the survey. While survey research has approached this situation as a methodological concern known as context effects, the responses of the individuals still show that the borders of ethnic identity can be porous.

The fluidity of ethnic identity has several implications for our understanding of the nature of ethnicity and its dynamics; measurement of inequality and deprivation; and data collection

practices. First, a fluid ethnic identity is consistent with theories that posit that ethnicity is constantly negotiated and its boundaries are defined through social interaction, both inside and outside ethnic communities (Cerulo, 1997; Flores & Sulmont, 2020). As individuals negotiate their identity, their shifting ethnic affiliation may reflect how they understand their society's social hierarchy and the specific characteristics and experiences that they consider are part of the more successful group (Saperstein & Penner, 2012).

In terms of measurement of inequality, changes of ethnic position over an individual's lifetime can affect indicators of marginalisation, especially if these positions are contingent upon changes in their social status. Changes in how individuals identify also depend on how the question is worded and the types of categories allowed in the responses, which affect data collection practices. Research has shown that in some countries, changes to the question have resulted in an increase of self-identified indigenous individuals. In survey methodology, this is known as context effects. But the existence of this phenomenon does not mean that ethnic fluidity does not exist, but rather strengthens the idea that ethnicity can also be understood as situational and is not rigorously fixed.

In so far as questions from the census and surveys capture underlying social processes, the dissociation between one marker of identity with self-identification also shows that we need to adapt our framework of how we understand ethnicity and how it relates to inequality. Earlier research on disparities between ethnic (and racial) groups in Mexico assumed indigenous and non-indigenous categories remained fixed throughout the life of the individual. Partly, these categories remained fixed because they relied on demographic characteristics (Telles & Torche, 2018), most notably language and ancestry, that are unlikely to change over the life of the individual. However, a higher reliance on self-identification as the main criteria indigenous identity and demographic changes has resulted in discrepancies between the markers of ethnic identity. Different surveys in the region, for example, estimate that many self-identified indigenous individuals do not speak an indigenous language and a considerable percentage of individuals speak an indigenous language, but they would not consider themselves as indigenous (INEE, 2017b).

This paper contributes to the literature by identifying the patterns of ethnic mobility over time in Mexico and the variables associated with that change. I will focus particularly in looking at changes in status (such as increased years of education, migration and marriage) and the extent to which they are associated with the probability to change their self-reported ethnicity. By looking at three waves of Mexico's Family Life Survey (MxFLS or *Encuesta Nacional sobre Niveles de Vida de los Hogares*, ENNViH in Spanish) (Rubalcava & Teruel, 2006, 2008, 2013), I present longitudinal evidence of the ethnic trajectories and variables associated with these changes. Concretely, I discuss how a longitudinal survey can contribute to understand temporary ethnic fluidity and context effects in Mexico, one of the countries with the largest ethnic groups in the Latin American region.

4.2 Theoretical framework

Ethnicity as fluid

Countries in Latin America have gradually converged to using self-identification as the main criterion to measure indigenous identity. The preference for self-identification is endorsed by international institutions and agreements and originates from the 169 ILO Convention on Indigenous and Tribal Peoples (Freire et al., 2015). This convention, while aligning with the United Nations (UN) decision against a formal definition of indigenous peoples, provides an operationalisation of the concept: an indigenous person is one that “descends from populations who inhabited the country or geographical region at the time of conquest, colonisation or establishment of present state boundaries” (ILO, 1989) and they retain some of their social, economic, cultural and political institutions.

Despite the prevalence for self-identification, countries have also used alternative criteria to measure indigenous identity, which can be grouped into four dimensions (Del Popolo, Oyarce, Ribotta, & Rodríguez Vignoli, 2007): i) Recognition of identity; ii) Common origin; iii) Territoriality; and iv) Cultural-linguistic. Recognition of identity is the sense of belonging with ethnic identity derived from indigenous consciousness; common origin refers to having common ancestors. It involves incorporating the collective memory of the peoples and the recreation of their past. Territoriality is linked with the indigenous peoples’ occupancy of lands, its use and the material as well as spiritual relations that these groups have. Finally, the cultural-linguistic criteria refer to the closeness with culture, the origin, language and social and political organisations derived from it (Del Popolo, 2017).

In this myriad of criteria, some researchers have proposed that recognition of identity remains the central criterion but prompt for the use of the rest of the dimensions to further characterise the living conditions of indigenous peoples (Del Popolo, 2017; Paredes, 2018; Telles & Torche, 2018). They point to recent studies that challenge the idea that ethnicity is a one-dimensional and fixed characteristic. Instead, demographic, political and social changes have contributed to revive or create new forms of ethnic identity that challenge the traditional notion that an indigenous person “speaks an indigenous language, lives in ancestral lands and maintains certain cultural traits” (Flores & Telles, 2012). For example, in some countries of the region, it is reported that individuals who identify as indigenous do not necessarily speak an indigenous language while those who speak an indigenous language do not identify as indigenous. Countries that also collect information on African ancestry allow individuals to identify both as Afro-Latin Americans and indigenous (for a review for Mexico, see INEE, 2017). As a result of these changes, a growing body of research suggests that in some contexts, self-identification as indigenous may carry more of a symbolic weight (Villarrreal, 2014). This symbolic weight means that indigenous identity is a cultural resource that is devoid of any social implications or attachment to a certain group, but still provides some social grounding.

One consequence of these demographic changes is then that indigenous identity is better conceptualised as being fluid, imprecise and dynamic (Villarrreal, 2012b; Flores & Telles, 2012; Saperstein & Penner, 2012; Saperstein, Kizer, & Penner, 2016; Paredes, 2018; Telles & Torche, 2018). By adopting this approach, it is possible to expand and provide evidence that ethnic identity reflects social dynamics related to socioeconomic inequality. Such perspective marks a shift from studies that had not sufficiently acknowledged ethnic disparities (Paredes, 2018; Carrión & Zárate, 2010) or had explained them as a result of socioeconomic differences (Flores & Telles, 2012). For example, in the United States, there is evidence that part of the reason why socioeconomic

indicators for Mexican-Americans in the United States have remained stagnant over time is because over some generations, specific individuals of Mexican ancestry drop their Mexican ethnicity and consider themselves solely as white (Duncan & Trejo, 2007). Those individuals that drop their Mexican-American ethnicity differ selectively in relevant indicators from those that decide to keep it: individuals who tend to report being white-only have attained higher levels of education and income compared to their counterparts that keep their Mexican or Mexican-American identity. Such situation is similar for American Indians whose average increase in educational attainment is partly due to highly educated individuals changing their ethnic ascription from non-indigenous to indigenous (Eschbach, Supple, & Snipp, 1998)

Several factors at the macro and micro level are thought to contribute to this ethnic fluidity. At the macro level, political, cultural and social changes affect how institutions and the state define the different ethnic groups and how they relate, perceive and define each other. Macro level events that are theorised to affect ethnic fluidity are higher levels of democratisation (Van Cott, 2005), an increasing and recent openness from the institutional framework towards multiculturalism (J. E. Jackson & Warren, 2005), a rise in successful indigenous movements, such as the Zapatistas, that have managed to place their concerns in the policy agenda (Telles & Paschel, 2014); and aligned political demands between indigenous and the elite (Cott, 2005).

At the microlevel, individual changes may lead an individual to reconsider his or her ethnic identity. These changes can be migration (Davenport, 2020), changes in social status such as employment, incarceration, (Saperstein & Penner, 2012; Duncan & Trejo, 2007), marriage, particularly with members of a different ethnic group (mixed marriage), schooling (Villarreál, 2014) or any other factor that changes how individuals relate to each other in terms of their ethnic and racial identities (Duncan & Trejo, 2007).

Both micro and macro level factors are mutually constituted and can alter racial schemas. A racial schema refers to the mental structure that represents knowledge and processes information about how race and ethnicity are understood in a society and culture (Roth, 2012; Telles & Paschel, 2014). As individuals are assimilated into the structures—the clubs, cliques, and institutions—of the dominant group, individuals are confronted with different ways of how ethnicity is conceptualised, valued and understood in every day life. (Roth, 2012).

Racial schemas, in turn, can lead to changes to two types of racial mobility in a society: the structural or circulation mobility. Structural and circulation racial mobility are concepts developed by Saperstein & Gullickson (2013) that are derived from research on occupational mobility. They are meant to capture the aggregate and individual changes of racial (and ethnic) identity in a society. More specifically, structural racial mobility describes the changes that happen to the distribution of ethnic groups in a specific society (Saperstein & Gullickson, 2013) whereas circulation racial mobility reflects the changes in an individual's ethnic self-identification over his or her lifetime without necessarily reflecting changes to the structural components of ethnic stratification (Saperstein & Gullickson, 2013).

Education is one of the main institutions where both micro and macro factors interact to shape racial schemas that can lead, over the long term to structural racial mobility and over the short term to circulation mobility. Through the curriculum, the state can transfer values and perceptions of particular ethnic groups and student as well as student-teacher interactions socialise students into the institutional and organisational framework of a country. As a result, the schooling system became a central place to assimilate indigenous peoples and promote ideas of what were the characteristics of a citizen of the Mexican state during the *mestizaje* period (Soto Quirós & Díaz Arias, 2006). Those that refused to comply were marginalised (Perez Cardenas, 2018), but those who conformed,

obtained citizens' rights.

In the first decades of the XX century, *mestizaje* became a project of nation-building whereby indigenous and afro descendants would assimilate the perceived strong and humanistic values from racial mixing (*mestizaje*). Elites, the main proponents of *mestizaje* sought to oppose the European hegemonic discourse of racialism and signal moral superiority while also trying to gain international recognition (Telles & Paschel, 2014). One consequence was that Latin American societies adopted a discourse of being raceless that made indigenous peoples (and people of African descent) invisible (Soto Quirós & Díaz Arias, 2006).

While racial schemas are helpful to explain why individuals change their ethnic identification, it conceives ethnic identity as the result of a process of assimilation into the dominant ethnic structures of a society, and as such are difficult to change (Telles & Paschel, 2014). Further research will have to elaborate on the extent to which individuals may hold two different racial schemas at the same time and assess in which situation they can state a specific identity, which include the perceived purpose of the instrument that collects the information and real changes of how an individual perceives him or herself.

Measuring ethnic fluidity

Ethnographic research has consistently shown that ethnicity is fluid and situational across different contexts, which can be categorised into four types¹: temporal, which refers when individuals change their self-reported identity over time; contextual, which is when individuals change their stated ethnicity across situations or context. Referential ambiguity refers to the ambiguity around who can be part of a specific racial group. Research in Brazil, for example, has shown that individuals can be classified as members of different races by different people. Finally, categorical ambiguity occurs when there is a lack of consensus about the boundaries between one racial group. Each of these are complementary and interact in different points in time or situations.

First, the ambiguity of census categories. It is widely acknowledged that census categories reflect technical and political considerations that are idiosyncratic and may differ from how individuals understand, use and experience indigenous identification in daily life (Telles, Flores, & Urrea-Giraldo, 2015; Angosto-Ferrández & Kradolfer, 2014; Del Popolo et al., 2007). For example, Chile in 2002 allowed indigenous peoples to identify their ethnicity based on a list of legally recognised groups, which excluded indigenous immigrants. Bolivia, in its most recent censuses, decided against including a mestizo (mixed) category, leaving “non-indigenous” without a category to select. The government argued that including mestizo would imply endorsing the “whitening” of Bolivian society as the term had such connotation in the country (CEJIS, 2013). The census agency also changed the phrasing of the question in the 2012 exercise—it coalesced both indigenous and Bolivians of African-descent—which resulted in a reduction of Bolivians who identified as indigenous by 20 percentage points, a change unexplained by demographic change alone (Chirino, Almeida Garcia, & Morales Torrez, 2017).

Second, self-identification questions may result in incomplete or imprecise estimates of racial inequalities derived from discrimination or racism, as much of this process depends on how others perceive a given individual (Telles et al., 2015; Saperstein & Penner, 2012). A study conducted among several Latin American countries comparing different criteria to measure ethnicity found that self-identification provides inconsistent estimates of the educational conditions of adult indigenous

¹Telles & Pasche (2014) identify these types for racial identification, but they can also explain changes for ethnic identification

populations. In half of the countries surveyed—Colombia, Ecuador and Dominican Republic—self-identified indigenous had negative but non-statistically significant relationship with educational attainment net of class origins. This study, and subsequent others, have found that skin colour is a better predictor of years of schooling than the census criteria even after controlling for class origins (Flores & Telles, 2012).

Research on ethnic fluidity has used three analytical approaches to assess the extent to which societies are ethnically mobile and the factors driving this change. The first approach looks at inter-generational transmission of identity between parents and children (Villlarreal, 2014). Studies of this strand have shown how relevant household and parental factors are, such as education and intermarriage, in transmitting language, and potentially, a sense of indigenous identity. A limitation of this approach is that it relies on data collected through a main informant, which is generally an adult. In consequence, it fails to capture whether the child actually appropriates the indigenous identity of his or her parents. A crucial assumption of this approach is that it assumes that once a child has developed his or her ethnic identity, it becomes fixed over the course of the individual.

The second approach looks at the added value of different criteria to identify indigenous identity (Telles et al., 2015; Paredes, 2018; Saperstein et al., 2016). This research recognises and assesses the extent to which self-indigenous identity, the central criterion that countries have adopted, captures all the components of what constitutes indigenous identity. Researchers from this strand argue that if indigenous identity were fixed and one-dimensional, then self-identification would capture all the phenotypic and cultural variation of more precisely defined categories, such as language or skin colour. One limitation of this approach is that it often fails to adjust for the endogeneity present in some variables, for example, language. In other words, changes in language proficiency are not only due to parental characteristics, but also educational assets, which in turn may also affect an individual's linguistic proficiency.

Finally, a third strand, and the one I adopt in this paper, looks at the dynamic and individual changes of ethnic identity (Saperstein & Penner, 2014). By looking at longitudinal data, it is possible to explore whether changes in social status drive changes in self-identification and vice versa. Longitudinal data can also describe the ethnic transitions of individuals over time and assess how homogeneous or different these transitions are. One limitation of this approach is that there are not many longitudinal surveys that collect extensive data on socioeconomic variables and many of them have a small sample sizes for indigenous peoples as well as has high attrition response rates.

4.3 Data Analysis

Mexico's Family Survey (MxFLS, ENNVIIH in Spanish)

ENNVIIH or MxFLS² is a nationally representative survey of the Mexican population and the data can be disaggregated at the country, urban, rural and regional level. The survey follows individuals across three waves (MxFLS1: 2002, MxFLS2: 2005-2006 and MxFLS3: 2009-2012). The first round of the MxFLS collected information on a sample of 35,000 individuals from 8,400 households throughout Mexico in 2002. Due to the extensive data collection efforts, ENNVIIH has a high response rate: approximately 90% of the original household sample was recontacted successfully. ENNVIIH collects information through face-to-face interviews on a wide range of variables, which include demographics, income, migration, health and violence. If an individual was not present at the time of the interview, a main informant provided some basic details about him or her and the data was collected on a proxy book.

While the ENNVIIH was not specifically designed to measure ethnic mobility, it can provide useful information to describe this phenomenon in Mexico. First, the survey allows the same individuals to repeatedly declare their indigenous identity over several years. Second, the consistent sampling design and wording of the question indicates that we can rule out that changes in indigenous self-identification are due to measurement error. Finally, ENNVIIH, unlike other household surveys or the census, does not rely on a main informant to obtain individual characteristics of the members of the household. Instead, individuals themselves aged 15 or over are asked about their ethnic identification. This methodological aspect of ENNVIIH allows us to estimate intra-generational ethnic mobility for an individual and assess the extent to which several socioeconomic variables relate to any change in ethnic identification. It also allows us to test the extent to which other aspects of data collection of indigenous identity (i.e. main informant) are reliable in the aggregate.

To describe indigenous ethnic fluidity, I will proceed first by looking at the number of changes among individuals based on their original indigenous identification. Then, I estimate the transition rates to measure what group changes more often of ethnic identification. Finally, I control for individual and household characteristics and estimate the probability of a person changing her ethnic identity over time.

Descriptive Results

Ethnic consistency over time

Figure 1 shows the different ethnic transitions during the three waves for the overall weighted sample. I use the base year (2002) weight of the book 3A of MxFLS, which is the book that has information about the schooling and ethnicity of the individual. My initial sample consists of the individuals sampled during the first MxFLS wave in 2002 that are 15 years or older: 19,756, which account for a weighted number of 68,287,631 persons. Individuals were personally asked about their ethnic identity. If at the time of the follow-up survey in waves 2 and 3 the individual was not home, a household's main informant filled a proxy book with detailed information about additional schooling, employment history, health, and reasons for not being present in the household (moving out, migration, etc.)

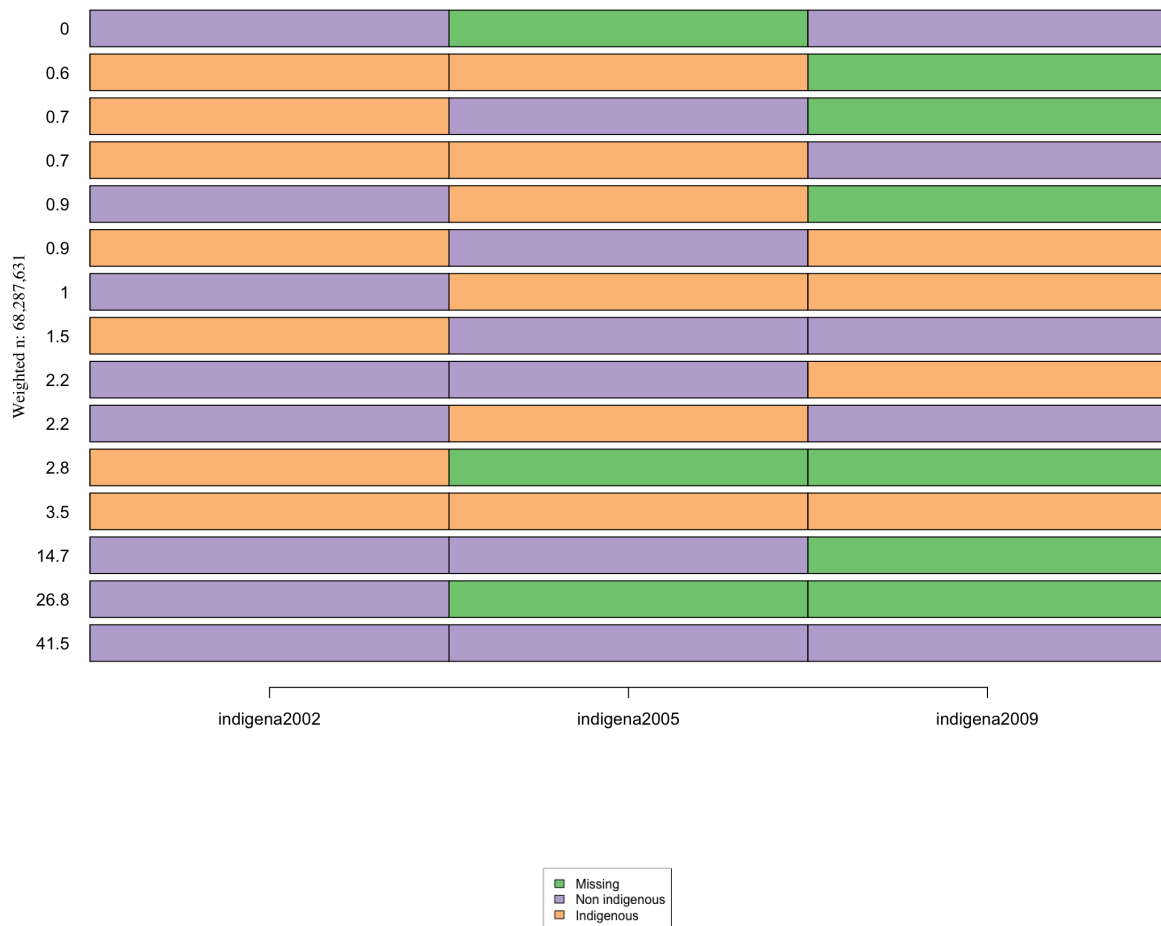
The weighted data shows that in 2002, around 11 percent of the individuals above 15 years and older self-identified as indigenous—a number consistent with that reported by the 2000 census:

²Throughout the paper ENNVIIH and MxFLS will be used indistinctly to refer to the same survey

9.4%. Over the next two waves, approximately 40 percent of individuals who reported indigenous ethnicity in 2002 would migrate, die or refuse to answer the ethnicity question during at least one year. Among those individuals who identified as non-indigenous in 2002, the percentage of those not answering the question in at least one subsequent year was 50 percent.

Figure 1 shows the ethnic transitions of the weighted individuals, which shows a significant degree of ethnic mobility. Approximately 1 out of 10 individuals in the total sample reported at least a different ethnic identity (indigenous or non-indigenous) at some point during the three waves. Individuals that initially self-identified as indigenous that subsequently reported being non-indigenous in at least one subsequent wave accounted for 4.1% of the weighted sample. Individuals who initially identified as non-indigenous, but later on reported being indigenous at some point during the other two waves accounted for 6.5% of the sample. Approximately 1 out of 4 individuals had missing information in the following two waves (22.1+2.1 percent=24.2 percent).

Figure 1: Weighted Transition of ethnic self-identification



We also estimate the transition matrix for each wave of the survey. A transition matrix gives information about the probability to switch at a given position from state s_i to state s_j . Let $n_t(s_i)$ be the number of sequences that do not end in t with state s_i at position t and let $n_{t,t+1}(s_i, s_j)$ be the number of sequences with state s_i at position t and state s_j at position $t + 1$. Then the transition rate

$p(s_j|s_i)$ between these two states s_i and s_j is given by the formula (Gabadinho, Ritschard, Muller, & Studer, 2011):

$$p(s_j|s_i) = \frac{\sum_{t=1}^{L-1} n_{t,t+1}(s_i, s_j)}{\sum_{t=1}^{L-1} n_t(s_i)}$$

where L is the maximal observed sequence length.

Since we are interested in understanding the transition rates at every wave of the survey, we allow the transition rates to be time variant. Table 1 shows the transition probabilities (or rates) between 2002 and 2005 and 2005 and 2009: the data shows that indigenous individuals have the highest probability of changing their ethnic identity compared to non-indigenous individuals during the entire period of data collection and that such probability remains very similar across different periods. Specifically, the probability of self-declared non-indigenous individuals transitioning to indigenous in 2005 was 0.05 while there was a 0.29 probability that indigenous individuals would transition to non-indigenous during the same period of time. From 2005 to 2009, the probability of a self-reported indigenous individual declaring to be non-indigenous was 0.31 and from non-indigenous to indigenous, it was 0.05.

Table 4.1: Transition Matrix for Self-Reported Ethnicity per Year

From 2002 to 2005			
	Missing	Non-Indigenous	Indigenous
Missing	0.00	0.00	0.00
Non-Indigenous	0.30	0.65	0.05
Indigenous	0.26	0.29	0.45
From 2005 to 2009			
	Missing	Non-Indigenous	Indigenous
Missing	0.82	0.16	0.03
Non-Indigenous	0.29	0.66	0.05
Indigenous	0.20	0.31	0.49

Source: MxFLS 2002-2009

Table 4.4 in the appendix shows the transition matrix for all individuals with complete information. Results show that self-identified indigenous individuals are likelier to report changes in their ethnicity in a subsequent wave compared to individuals that reported being non-indigenous.

Ethnic fluidity can also vary by cohorts given the different policies over time from the government towards indigenous peoples. I report transition tables for three age groups affected by different attitudes, policies and politics towards indigenous identity. The first group includes those aged 60 and older by 2002, which means the youngest were born in 1942, during the latter years of the period of *indigenismo* (1910-1940) (Mijangos Diaz & López Torres, 2011). *Indigenismo* was a project that the elite supported, and that aimed to renegotiate the relationship between the state and the indigenous peoples of Mexico. Ideologically, it involved extolling and including indigenous culture as part of Mexico's main history: elites believed that they could reach a compromise and assimilate the indigenous peoples if they created a sense of shared history, predominantly indigenous, between indigenous and mestizos. However, this shared history implied that the indigenous would remain a

historical relic, an identity stripped by the Spanish conquest (Mijangos Diaz & López Torres, 2011). The *Indigenismo* movement differed from *mestizaje*, which roughly covers the period of 1940-1970s, because the former advocated for the Mexican state to take a predominant role in determining what values, attitudes and cultural artefacts from the indigenous peoples were appropriate to preserve to build an unified Mexican state (Doremus, 2001).

Individuals that lived during the *mestizaje* period are ages 59-30 in 2002 in the sample. Given the discussed characteristics of *mestizaje*, I would expect a weaker sense of indigenous identity, which suggests a higher ethnic transition over time. Finally, the third group comprises individuals born during 1970-1987 or aged 29-15 years old at the time of the first wave. Starting the 1970s, historians recognise a change in policy in Mexico characterised by greater attention to the distinctive cultural heritage of the indigenous peoples and early attempts to provide bilingual education and other forms of cultural re-evaluation (Reinke, 2004).

The results (Appendix B) show that the older and middle age group had similar rates of response levels to the ethnicity question while the youngest group reported an increase in non-response. Across all age groups, the individuals that reported being non-indigenous in the first wave showed the largest stability rates in subsequent waves. On the contrary, individuals that identified as indigenous in 2002 reported varying levels of subsequent ethnic identification depending on their age. The older group (60 and older) reported a slight level of stability than the middle age group (30-59).

Multivariate models

To run a multivariate model, I use a conditional fixed effects logistic regression model to estimate the effect of years of education and other characteristics on self-reported ethnic identity. The model is defined as:

$$P(y_{it} = 1 | \mathbf{x}_{it}) = \frac{\exp(\alpha_i + \mathbf{x}'_{it}\beta)}{1 + \exp(\alpha_i + \mathbf{x}'_{it}\beta)}$$

where y_{it} is the outcome variable of individual i over time t ; $\mathbf{x}'_{it}$ is a matrix of values of explanatory variables for each individual i during each time period t ; and β is a vector of unknown parameters. α_i refers to the individual specific effect or an individual time-invariant variable. In other words, when holding all unobserved and observed time-invariant variables constant, we can make within-person comparisons. This feature of fixed-effects is important because we want to control for time-invariant characteristics that can also predict indigenous self-identification such as status as speaker of an indigenous language or skin colour. Language, an important indicator of indigenous identity used in many government statistics was not included in the analysis because this information was only collected if the individual declared previous indigenous identity. As a result, speaker of an indigenous language perfectly predicts indigenous self-identification in the survey, a situation not necessarily supported in census data (INEE, 2017a).

The regression coefficients of the fixed effects logistic regression reflect the changes in the likelihood of a person reporting herself as indigenous versus non-indigenous as a function of changes in that person's life. In this case, we refer to changes in civil and employment status and household income. A variable about migration status helps us identify if the individual has moved for one year or more since the last wave of the survey. We estimate models for two age groups using their age in 2002: a young cohort (individuals aged 15-29 years old), where we test changes in years of education over the likelihood of changing their ethnicity while for the older cohort (30-65) we treat such variable as fixed since most individuals after 30 would have already finished off their

schooling. Given that we also include employment as an explanatory variable, I limit the analysis to individuals aged 15 to 65 to minimise age-related explanations for not working, such as retirement. A description of the selected variables is in Table 2. All analyses reported here are weighted using the weight in the 2002 socio-demographic characteristics book (3A).

Table 4.2: Description of variables

Variable	Source question (s)	Description	Notes
Self-reported ethnicity	Do you recognise yourself as member of an indigenous or ethnic group?	1. Yes 2. No 3. Missing	
Years of education	1. What is the highest level of education you attained? 2. What is the highest grade within a level of education that you attained?	0-18 years	Constructed variable and converted into years.
Employment	1. Last week, did you work (or had an activity that contributed to household expenses) for at least an hour?	1. Unemployed 2. Employed	
Income level	1. In the last 12 months, approximately, how much did X person receive for her work or activity that contributed to household expenses?	1. Five quintiles and a no-income category/ no income reported	No income reported or no income are treated as similar categories.
Partner	1. Identified by relationship with the household head. For example, if head of household said to be married or in co-habitation and there was a person who identified as partner of household head, then we coded it as 1: there is a household partner. Indigenous status was identified for the partner.	1. Married/Co-habitation to a non-indigenous individual 2. Married/Co-habitation to an indigenous individual 3. Not married	Missing civil status excluded.
Urban area	Location of the survey	1. Rural (locations smaller than 15,000 inhabitants) 2. Urban (locations greater or equal to 15,000 inhabitants)	

Data Source: MxFLs 2002-2009.

Our primary variables of social status are years of education, employment status and household income. We also control for age of the respondent. If age and years of education had missing values in a specific wave, I inferred its value by looking at subsequent or previous waves and imputed it. For example, if an individual reported being 21 years old in 2005, I substituted the missing value in 2002 for 18. Household income is grouped into 6 categories: "No household income" (not reported or marked as zero) and five quintiles estimated from those households that did report it. Civil status is a categorical variable that groups, on one hand, head of households that are married, in a domestic partnership or cohabitation with an indigenous person and on the other hand, head of households that married, engaged in a domestic partnership or cohabitation with a non-indigenous person. The third category is individuals that do not fit neither category.

Individuals that were not present at the time of the interview because they had migrated or passed away are necessarily excluded from the analysis. We also exclude information from individuals who were present at the time of the interview but refused to answer the ethnicity question (item non-response) or the survey (survey non-response): approximately 17 percent for each wave. To the extent that the missing values on the outcome variable (self-reported ethnicity) depend on omitted time-invariant co-variables for subject specific effects they can be treated as missing at random under the fixed effects model, (Skrondal & Rabe-Hesketh, 2014) which results in unbiased estimates.

We also exclude individuals whose outcome did not vary—this is a necessary characteristic of our analysis since we are interested in within-unit variation. It is also one of the trade-offs of fixed-effects. While fixed-effects allow us to control for time-invariant characteristics, it comes at the cost of efficiency and external validity. Fixed-effects also allow us to identify an unbiased estimate of our variables related to status, something which is not possible using alternative specifications such as random effects (Collischon & Eberl, 2020). One consequence of this approach is that I obtain a smaller sample size. Our final sample size is 485 young adults (15-29) and 1837 individuals (30-65), which result in 1125 subject-years for the young cohort and 4707 subject-years for the older group.

Social status and ethnicity

Younger cohort

Table 2 shows three fixed-effects models that correspond to the changes in the odds-ratio of self-identifying as indigenous as a result of certain changes in status. The first two models show the bivariate relations between the status variables and ethnic self-identification. The third model uses all of the status variables as controls and adds urban residence and ethnicity of the head of household's partner. To control for any aggregate period changes that may have occurred during 2002-2009, we include a period-fixed effect (δ_t).

Among young individuals, higher levels of education, moving from no income to the first and third quintiles as well as marrying an indigenous partner increased the likelihood of reporting indigenous identity. Education increased the likelihood of reporting indigenous identity by 0.9% for every additional year of education. Similarly, those individuals whose household income shifted from no-income to first or third quintile also had their odds of reporting indigenous identity increased. The variable with the strongest change was, however, marrying an indigenous partner: it increased the odds of identifying as indigenous by 66% ($\beta=1.669, p<0.001$).

Changing residence to an urban area is also associated with a lower likelihood of reporting indigenous identity ($\beta=0.147, p<0.002$), a finding consistent with previous studies (Villarrreal, 2014).

Table 4.3: Odds ratio of self-reporting as indigenous given years of education and other socio-economic variables for young people aged 15-29

	(1)	(2)	(3)
Self-reported ethnicity			
Years of education	1.020*** (0.001)		1.009*** (0.001)
year== 2002.0000	0.748*** (0.002)	0.687*** (0.002)	0.819*** (0.002)
year== 2005.0000	0.757*** (0.002)	0.773*** (0.002)	0.734*** (0.002)
No income		1.000 (.)	1.000 (.)
First quintile		1.744*** (0.007)	1.647*** (0.007)
Second quintile		0.923*** (0.004)	0.740*** (0.003)
Third quintile		1.660*** (0.007)	1.406*** (0.007)
Fourth quintile		0.705*** (0.003)	0.648*** (0.003)
Fifth quintile		0.824*** (0.004)	0.716*** (0.004)
Partner: No indigenous			1.000 (.)
Partner: Indigenous			1.669*** (0.027)
Does not have partner			0.171*** (0.003)
Rural area			1.000 (.)
Urban area			0.147*** (0.002)
Observations	1125	1125	1125

Exponentiated coefficients; Standard errors in parentheses

Dependent variable: Self-reported Ethnicity (1=Indigenous).

Data source: MxFls 2002-2009

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Higher levels of income fourth and fifth), compared to no income reported are also associated with a lower likelihood of indigenous self-identification.

Older cohort

Table 3 shows that in the older cohort (ages 30-65), being employed increases the probability of indigenous self-identification and the effect becomes stronger after accounting for urban residence, income and indigenous partnership ($\beta=1.333$, $p=0.002$). Similar to the younger cohort, being in the highest income levels compared to reporting no income, decreases the odds of reporting indigenous self-identification. The likelihood of reporting indigenous self-identification is the highest when an individual who is head of household is married to an indigenous person compared to an individual head of household married to a non-indigenous ($\beta=17.547$, $p<0.001$). Similarly to the younger cohort, moving to an urban area decreases the likelihood of indigenous-self identification by 37% ($1-0.630$).

The results of this study show that individuals in Mexico cross ethnic boundaries. By using large scale individual data, the results expand on the emerging literature that ethnic mobility occurs not only across generations, but also over the lifetime of individuals (intra-generational ethnic mobility). The fluidity of that identity may be more flexible for indigenous individuals than for the non-indigenous: By identifying the patterns of ethnic identity over three waves and the transition probabilities of the individuals surveyed, I find that indigenous individuals reported higher transition rates than non-indigenous, even after accounting for those that did not report an ethnic identity at some point.

The results also support the notion that changes in self-identification are related to changes in social status. While education, among the younger cohort, had an opposite effect to the one expected, higher levels of income resulted in less likelihood of reporting indigenous identity, which suggests that notions of what constitutes a high income individual may not align with the predominant racial schema of being indigenous.

These changes in self-reported ethnic identification come under a context of multicultural revival in Mexico. During the early 2000s, the federal government sought to expand a new approach to indigenous rights, particularly through education, by developing bi-cultural pedagogical approaches and by increasing the supply of indigenous schools at the tertiary level (Navarrete & Alcantara, 2015). Such approach towards indigenous education may have played a role in how, as individuals gain more education, their odds of indigenous self-identification increase.

Moving to urban areas was one of the factors related with a lower likelihood of indigenous self-identification. Many reasons may explain why this happens. First, patterns of indigenous migration can weaken an individual's attachment to cultural symbols as the connection to members of a social group decreases (Villalreal, 2014). Second, there is evidence that some individuals may have greater incentives to acculturate to the predominant urban culture in order to obtain relevant skills such as speaking Spanish or learning how to drive a car in order to be better prepared to migrate to the United States (Zabin & Hughes, 1995). Finally, it is possible that, due to fear of discrimination, individuals that previously identified as indigenous preferred to report a different ethnicity.

Marrying an indigenous individual had the strongest relationship with indigenous self identification. As individuals marry an indigenous partner, her or his likelihood of reporting indigenous identity increases. Such relationship holds for single male individuals who were head of households

Table 4.4: Odds ratio of self-reporting as indigenous given employment and other socio-economic variables for people aged 30-65

	(1)	(2)	(3)
Self-reported ethnicity			
No	1.000 (.)		1.000 (.)
Yes	1.175*** (0.002)		1.333*** (0.002)
year== 2002.0000	0.743*** (0.001)	0.748*** (0.001)	0.830*** (0.001)
year== 2005.0000	1.034*** (0.001)	1.035*** (0.001)	0.973*** (0.002)
No income		1.000 (.)	1.000 (.)
First quintile		0.947*** (0.002)	1.005* (0.003)
Second quintile		0.873*** (0.002)	0.876*** (0.002)
Third quintile		1.161*** (0.003)	1.243*** (0.004)
Fourth quintile		0.939*** (0.002)	0.842*** (0.003)
Fifth quintile		0.929*** (0.003)	0.841*** (0.003)
Partner: No indigenous			1.000 (.)
Partner: Indigenous			17.547*** (0.139)
Does not have partner			0.569*** (0.004)
Rural area			1.000 (.)
Urban area			0.630*** (0.004)
Observations	4707	4707	4707

Exponentiated coefficients; Standard errors in parentheses

Dependent variable: Self-reported Ethnicity (1=Non-Indigenous).

Data source: MxFls 2002-2009

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

during the baseline year (2002) and subsequently married an indigenous partner³. Social status and ethnicity of one's partner has been found to relate in countries such as Brazil and the United States, particularly for mulattos and black individuals (Saperstein & Gullickson, 2013) and for Mexican-Americans, inter-marriage is associated with the loss of Hispanic identification (Duncan & Trejo, 2007)

Conclusion

Evidence presented in this paper suggests that longitudinal surveys provide additional evidence on how to understand and conceptualise ethnicity. Longitudinal surveys allow us to understand the extent to which occupational mobility and ethnic fluidity occur at the individual level and reflect structural, or aggregate, changes in a given society.

Besides measuring fluidity, longitudinal surveys allow us to check whether many of the changes related to changing ethnic self-identification are associated with differences in social status. As Mexico shifts its discourse and government institutions reflect the multicultural paradigm, it is possible that intra-generational changes, or circulation mobility, will lead to greater changes in structural mobility. There is evidence that increases in ethnic self-identification are already happening: since 2000, the proportion of indigenous individuals in Mexico has increased from 9.4% to 21.5% in 2015.

³I estimated a Fixed Effects Linear Probability Model because the fixed effects logistic regression did not converge

4.4 Appendix A: Transition Matrix

Table A.1. Transition Matrix for Self-Reported Ethnicity per Year

From 2002 to 2005		
	Non-Indigenous	Indigenous
Non-Indigenous	0.93	0.07
Indigenous	0.39	0.61
From 2005 to 2009		
	Non-Indigenous	Indigenous
Non-Indigenous	0.93	0.07
Indigenous	0.39	0.61

Source: MxFLS 2002-2009

4.5 Appendix B: Transition Matrices by Age Groups

Appendix B1. Transition Matrix for Self-Reported Ethnicity per Year

From 2002 to 2005			
	Missing	Non-Indigenous	Indigenous
Missing	0.00	0.00	0.00
Non-Indigenous	0.27	0.68	0.05
Indigenous	0.19	0.26	0.56
From 2005 to 2009			
	Missing	Non-Indigenous	Indigenous
Missing	0.87	0.11	0.02
Non-Indigenous	0.30	0.65	0.04
Indigenous	0.20	0.23	0.57

Note: Includes individuals aged 60 and older

Source: MxFLS 2002-2009

Appendix B2. Transition Matrix for Self-Reported Ethnicity per Year

From 2002 to 2005			
	Missing	Non-Indigenous	Indigenous
Missing	0.00	0.00	0.00
Non-Indigenous	0.24	0.71	0.05
Indigenous	0.20	0.31	0.50
From 2005 to 2009			
	Missing	Non-Indigenous	Indigenous
Missing	0.77	0.20	0.04
Non-Indigenous	0.23	0.72	0.05
Indigenous	0.14	0.34	0.52

Note: Includes individuals aged 30-59

Source: MxFLS 2002-2009

Appendix B3. Transition Matrix for Self-Reported Ethnicity per Year

From 2002 to 2005			
	Missing	Non-Indigenous	Indigenous
Missing	0.00	0.00	0.00
Non-Indigenous	0.39	0.58	0.05
Indigenous	0.39	0.27	0.45
From 2005 to 2009			
	Missing	Non-Indigenous	Indigenous
Missing	0.84	0.14	0.02
Non-Indigenous	0.39	0.57	0.04
Indigenous	0.33	0.29	0.38

Note: Includes individuals aged 15-29

Source: MxFLS 2002-2009

Chapter 5

Conclusion

The dissertation explores the role of textbooks and educational reforms in shaping ethnic boundaries and societal attitudes in Mexico, with a focus on Indigenous peoples and Afrodescendientes. The three chapters addressed particular questions related to ethnic-boundary making and how schools can create or reinforce categories. The paragraphs below summarize the main findings of each chapter.

The chapter "Historical Depictions of Indigenous and Afrodescendientes in Mexican textbooks" investigates the historical depictions of Indigenous peoples and Afrodescendientes in Mexican textbooks from 1959 to 2020. My analysis reveals that while early 4th grade History textbooks often portrayed Indigenous peoples in essentialist and derogatory ways, these portrayals have become more nuanced and inclusive over time. The chapter emphasizes the persistence of the *mestizaje* narrative, which promotes a national identity based on the blending of Indigenous and European heritages. However, the representation of Afrodescendientes remains limited, and when they are depicted, it is often in ways that reinforce rigid racial boundaries based on skin color. This suggests that, despite some progress in the portrayal of Indigenous peoples, Afrodescendientes continue to face marginalization within the educational narrative.

The chapter "The Effect of the 1993 Educational Reform on Attitudes Towards Ethno-racial minorities" examines the impact of the 1993 educational reform, which made secondary education compulsory, on societal attitudes toward Indigenous peoples and Afrodescendientes. The results show two main conclusions. First, there is a causal effect of increased educational attainment on inclusive attitudes toward Indigenous peoples, but there is a limited effect on attitudes toward Afrodescendientes. Such positive effect is evidence against the self-interest hypothesis that has predominated in the European literature. The self-interest hypothesis states that highly educated individuals are less likely to support re-distributive policies and adopt policies that support the status quo, which includes less tolerance for political participation of ethnic minorities.

Despite these positive effects for Indigenous individuals and to a limited extent for Afrodescendientes, their magnitude is smaller than in previous studies that have examined similar questions (e.g., immigration in Europe and North America). This finding suggests that the effects of education on attitudes towards ethno-racial minorities might have been overestimated in Mexico, and potentially in similar contexts.

The second set of findings indicate that education correlates with decreased support for individualist explanations for ethno-racial inequalities and does not significantly support structuralist perspectives. These results offer partial evidence against the socialization hypothesis, which states that extended schooling enhances individuals' awareness of societal stratification, and potentially, increased support for structuralist perspectives to explain inequalities between groups.

In terms of broader implications, these two results indicate that education has a limited long term

effect on shaping attitudes towards ethno-racial individuals and that its effect to shape racial schemas has been overestimated. Other mechanisms, such as social networks and the role of the media need to be explored to assess what contributes to transfer ideas of *mestizaje*, and nation-building, in the region.

Finally, the chapter "Ethnic mobility in Mexico" ocuses on the concept of ethnic mobility in Mexico, specifically examining the fluidity of indigenous identity over time. The research reveals that ethnic identity in Mexico is not static; rather, it is influenced by a range of social, economic, and situational factors that can lead individuals to change their self-reported ethnicity.

One of the key findings is that individuals who initially identify as indigenous may later change their identification, often shifting to a non-indigenous identity as their socioeconomic status improves. This shift is particularly associated with factors such as higher educational attainment, increased income, and migration to urban areas. These changes suggest that as individuals' social circumstances evolve, there may be social pressures or perceived benefits that motivate them to align with the dominant cultural norms, which in Mexico often means identifying as mestizo or non-indigenous.

The chapter also highlights the situational nature of ethnic identification, where the context in which individuals are asked to identify their ethnicity can influence their responses. For example, individuals might adjust their ethnic identity based on the perceived purpose of a survey or the environment in which they are questioned, indicating that ethnic identity is not only fluid but also context-dependent.

Another important aspect explored in this chapter is the influence of personal relationships on ethnic identity. The research finds that individuals who marry someone identified as indigenous are more likely to identify as indigenous themselves, suggesting that personal and familial connections play a significant role in shaping ethnic identity.

These findings challenge the conventional view of ethnicity as a fixed characteristic and instead present it as a dynamic and adaptive response to various personal and societal influences. The implications are significant for policy-making, as they indicate the need for a more nuanced approach to addressing ethnic inequalities that considers the fluid and context-dependent nature of ethnic identity. By understanding the factors that drive changes in ethnic identification, policies can be better tailored to the lived realities of individuals, promoting more effective and inclusive interventions in addressing ethnic disparities in Mexico.

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