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ORIGINAL PAPER

Unequal gradients: gender, skin tone, and intergenerational economic mobility

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Abstract

This paper studies how the intersection between skin tone and gender shapes intergenerational mobility of economic resources in Mexico. Using two recent social mobility surveys, we estimate rank persistence and transition matrices by gender and skin tone groups. We find no differences in intergenerational mobility patterns between light-skinned men and women. The colorist mobility pattern observed in previous literature affects men and women differently. For instance, the colorist gradient of expected current ranks, penalizing darker skin tonalities, is steeper for men starting at the bottom of the origin distribution, while the gradient in persistence rates at the top is steeper for women. Within each gender, the graded differences in expected ranks between light and intermediate skin tonalities are generally not statistically significant. Women of intermediate and darker skin tones have lower persistence rates at the top of the distribution of economic resources compared with their male peers.

Keywords Stratification economics · Socioeconomic mobility · Gender inequality · Skin tone · Mexico

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1 Introduction

Intergenerational economic mobility is a lens through which we analyze how society distributes resources among its members throughout their lifetimes. This enables us to observe whether specific social groups are persistently disadvantaged regarding their access to opportunities and resources (Roemer 1998; Fleurbaey 2008). In this paper, we document differences in patterns of economic mobility in Mexico by gender and skin color to better understand differences and similarities in the allocation of resources and opportunities across groups formed by the intersection of those two demographic traits.[1] By doing so, we provide a more accurate assessment of the actual life trajectories experienced by members of a stratified society such as Mexico (Darity 2022; Davis 2015).[2]

Mexico offers an interesting case study since the country has long abandoned formal institutions legitimizing discrimination based on skin tone while developing a more inclusive institutional framework toward women in various aspects of life. Differences in skin tone are also less stark than in other societies, such as the United States. This observation is not exclusive to Mexico but rather characterizes much of Latin America (Telles 2014). Thus, our paper offers a first step toward a research agenda aimed at understanding the mechanisms underpinning stratification regimes, with particular emphasis on the role of norms and institutions in shaping these outcomes.

For our analysis, we pooled two surveys focused on social mobility: the Modulo de Movilidad Social Intergeneracional (MMSI 2016) and the Encuesta ESRU de Movilidad Social en México 2017 (ESRU-EMOVI 2017). Both publicly available datasets contain current and retrospective information on numerous demographic and socioeconomic indicators from representative samples of Mexican adults between 25 and 64 years old. Our outcome variable of interest is household socioeconomic status, measured using indices of household resources that include assets, services, and durable goods.

We implement two methods to estimate intergenerational mobility patterns. First, we apply rank-to-rank regressions, as used by Chetty et al. (2015), which allow us to estimate summary measures of intergenerational persistence for the different

[1] A stratification economics approach examines how the institutional setting of society creates adscriptive social identities through which resources are distributed, thereby shaping the stratification regime (Darity. 2005). Identifying the adscriptive characteristics that construct social categorical identities, and locating these identities within the distributive structure implicit in the stratification regime, is the first step in pinpointing the institutions that produce and sustain inequality of opportunity. In this sense, stratification economics offers a broader perspective on inequality than traditional economic theories of discrimination (Krueger 1963; Becker 1971; Arrow 1972; Phelps 1972), as it considers not only specific acts of discrimination against particular groups but also the ways in which institutional arrangements generate systematic and persistent disadvantages. This structural perspective can be traced back to Lewis (1985) in economics. Brundage and Tavani (2024) formalize its main arguments, while Bohren et al. (2022) provide a more detailed discussion of inference issues related to structural discrimination.

[2] In recent years, there has been growing interest in labor market inequalities from a stratification economics perspective, particularly at the intersection of gender, race, and occupational prestige (Alonso-Villar and Río 2023, 2024; Tomaskovic-Devey et al. 2024; Paul et al. 2022; Buder et al. 2022).

population subgroups. That is, we regress the rank of adult offspring in their generation's asset distribution on the rank of their parents in their respective distribution, while controlling for other relevant factors. The ensuing slope coefficient measures the association between the positions of children and those of their parents. Second, we compute quintile transition matrices (e.g., see Formby et al. 2004) and model their persistence rates at the worst and best categorical outcomes as functions of the demographic characteristics of interest.

Our findings, which portray a nuanced picture of the intersection between gender, skin tone, and intergenerational mobility in Mexico, can be summarized as follows: First, we find no evidence of gender differences in intergenerational mobility patterns among light-skinned Mexicans. Second, the colorist mobility pattern observed in previous literature affects men and women differently. For instance, the colorist gradient of expected (i.e., average) current ranks, penalizing darker skin tonalities, is steeper for men at the bottom of the origin distribution. Moreover, the colorist gradients of persistence rates at the two extremes of the distribution are both steeper for women. Third, within each gender, the graded differences in expected current ranks between light and intermediate skin tonalities are not statistically significant. However, among women, we discover a significant advantage of light skin over both intermediate and dark skin tonalities in persistence rates at both ends of the distribution, particularly at the top. Fourth, women of intermediate and darker skin tones have significantly lower persistence rates at the top of the distribution of economic resources compared with men of the same skin tonality (7 and 18 percentage points lower, respectively). These results are robust to alternative groupings of skin tone, alternative percentile partitions in the rank regressions and transition matrices, and the exclusion of the Indigenous population from the sample.

These findings warrant attention for at least three reasons. First, as we demonstrate later, the light-skinned population constitutes a minority in the country, with most of the population falling into the intermediate skin tone category that corresponds to the image of the "mestizo"—a combination of Spanish and Indigenous ancestry. Moreover, Mexico has never enacted anti-miscegenation laws based on skin color (Tenorio-Trillo 2023; Knight 1990). Thus, we could expect the distribution of economic resources and mobility patterns among the light-skinned population to resemble those of the majority, given that the colonial regime was abolished 200 years ago. Our findings show that a lighter skin tone still provides an advantage over the rest of the population in terms of persisting at the top of the distribution, suggesting a status persistence mechanism at play. They also suggest that this status persistence mechanism also affects the dark-skinned population, particularly women, who face the worst outcomes of positional mobility, with the highest persistence at the bottom, and the lowest persistence at the top.

Second, we find that dark-skinned women face less favorable intergenerational mobility, as Jácome et al. (2025) also document for the United States. This is surprising, given that Mexico lacks formal institutions that enforce practices such as redlining or the restriction of civic rights based on ethno-racial characteristics, as exemplified by Jim Crow laws in the United States. Existing research on beauty preferences in the labor and dating markets suggests that dark-skinned women are perceived less favorably because their appearance diverges from a "traditionally

European look" (Campos-Vázquez 2021; Krozer and Urrutia-Gómez 2023). Indeed, our analysis indicates that dark-skinned women are less likely to participate in the labor market, conditional on gender and skin tone, which is consistent with the findings reported in the aforementioned studies. Similarly, we find that the higher persistence at the top and lower persistence at the bottom of light-skinned women support the notion that proximity to a "traditionally European look" is rewarded. Thus, our paper contrasts with Jácome et al. (2025) as it suggests similar mobility outcomes for dark-skinned women vis-à-vis other groups through different mechanisms and in contrasting institutional settings. In this sense, it provides an exemplary justification for studying colorism in contexts where phenotype-based discrimination is not legally encoded but persists through informal institutions.

Third, our results showcase the complexity of stratification systems infused by miscegenation, which led to intermediate-skin-tone groups constituting the majority of the population. Contrasting with more "binary" cases such as the United States, we find that men with intermediate skin tones face the same persistence rate at the bottom of the distribution as their light-skinned peers. Likewise, we find no statistically significant differences between both groups in terms of their labor market participation and occupational sorting. We argue that this further warrants the need for expanding the research on social stratification and economic mobility to cases such as Mexico, as insights obtained from the United States are not considered sufficiently generalizable.

Studying intergenerational mobility differences by skin tone presents significant challenges in terms of causal inference. Using the terminology of the potential outcomes framework, the "treatment" variable here refers to a person's skin tone, which varies due to genetic factors. This is problematic, as information on the genetic profile of human populations only became available starting in the 1980s and has only recently been linked to the economic outcomes of individuals.[3] Thus, those with available information on genetic and economic outcomes are too young to be subject to intergenerational analyses. Moreover, this type of information does not yet exist for Mexico. An alternative is the study of twins with different skin tones. However, this population is relatively small within any country and requires a dedicated survey. Although twin registries or surveys are becoming more common in developed countries, they remain scarce in developing ones, or, in the case of Mexico, nonexistent.[4] For these reasons, even the most recent studies on mobility differences by skin tone or race in the United States are observational (e.g., see Chetty et al. 2020; Jácome et al. 2025; Ward 2023).[5] In this paper, we follow this observational approach, acknowledging the limitations as outlined by the literature.

[3] See the polygenic scores included in the Future of Families and Child Wellbeing Study, which began in 2000 (https://ffcws.princeton.edu/).

[4] See, for example, Miller et al. (1995); Bonjour et al. (2003); and Van Hootegem et al. (2025).

[5] The cited papers were published in the *Quarterly Journal of Economics*, the *Journal of Political Economy*, and the *American Economic Review*, respectively; all of which are widely recognized as belonging to the leading five journals in economics.

The rest of the paper proceeds as follows: Section 2 provides a literature review guided by a conceptual framework based on an ethical benchmark of mobility patterns unaffected by skin tone or gender differences (whether separately or combined) and on notions of disadvantage in mobility patterns by gender and/or skin tone. Section 3 discusses the data, emphasizing the distributions of gender and skin tone, as well as the construction of economic indicators. Section 4 explains the methods used, namely mobility matrices and rank regressions, together with their decompositions. Section 5 presents the results, followed by robustness checks in Sect. 6. Then, Sect. 7 explores potential mediating mechanisms. Finally, the paper concludes with remarks on the significance of the results, policy implications, and future research directions in Sect. 8.

2 Literature review

We structure our review of the literature on stratification by skin tone, race, and gender in intergenerational mobility by first considering the benchmark case in which no such stratification is observed. In a society in which characteristics such as gender or skin tone are not considered for allocating resources across social groups, the mobility patterns observed for all subgroups should mirror national mobility patterns.[6] Rather than proposing alternative hypotheses of differences in mobility patterns across groups, we wish to highlight differences in parts of the mobility pattern that can be ethically identified as advantageous or disadvantageous.

The evidence from the literature, mostly in the United States, invariantly rejects this hypothesis of absent stratification in intergenerational mobility, pointing to substantial differences in mobility patterns across demographic groups determined by gender and race-construed phenotypes. For example, Jácome et al. (2025) estimate the long-run mobility patterns of the U.S. population in the twentieth century, disaggregating by gender and racial origin. They find that, for cohorts born between 1910 and 1950, the Black population reduced the gap in average income with respect to the White population, leading to a decline in intergenerational income persistence. However, even after these gains, Black women remained at the bottom of the rank distribution. These trends were reversed for the younger cohorts, leading to a U-shaped pattern in the aggregate intergenerational income elasticity across cohorts and an L-shaped pattern in rank persistence. This implies that Black Americans remained at the bottom of the distribution of economic resources and experienced a high intergenerational rank persistence rate; namely, positions between one generation and the next are highly correlated, albeit less than at the beginning of that century. The same is also observed among cohorts born in the last quarter of the twentieth century (Lee and Sun 2020; Nguyen et al. 2005).

[6] This paper does not offer ethical judgments on mobility patterns in the population as a whole. Instead, it focuses on differences in mobility patterns across subgroups. For ethical evaluations of the dependence of current socioeconomic outcomes on past counterparts in mobility assessments, see, for example, Fleurbaey (2008), Van De Gaer et al. (2001), and related references.

Chetty et al. (2020) found that Black and Indian Americans showed significantly lower rates of upward income mobility in the United States from 1989 to 2015. They also showed that for those born in the top income quintile, Blacks had the same probability of staying there as falling to the bottom quintile. Whites with similar origins were five times more likely to remain at the top than to fall to the bottom. They also found that the male gap mainly explained the White–Black intergenerational gap.

The intersection between national origin and gender is the subject of analysis in other studies. Platt (2005) compares intergenerational class mobility in the UK across ethnic groups, focusing on individuals with migrant parents, specifically Indians, Caribbeans, and non-migrant white populations. Comparing class in 1991 for those aged 28–35 with parental class measured in 1971, Platt finds that, contrary to the case for men, class origins outweigh the importance of ethnicity in determining destination classes among women. For the United States, Chen et al. (2007) find that daughters of migrants are more mobile than sons, positing that migrant daughters face adverse discrimination both in the labor market and within households. Similarly, Flake (2013) examines the intersection of migration and gender in earnings mobility in Germany and finds that migrant women are more mobile than migrant men.

Research on the implications of intersecting stratification by skin tone and gender for mobility remains limited in developing countries. Using the 1991 census for South Africa, Thomas (1996) found that Black and Asian populations exhibited the lowest levels of intergenerational mobility in education. When comparing daughters and sons, no difference was found in the impact of parental education, unlike for daughters of Black mothers. For South Africa, Nimubona and Vencatachellum (2007) also discovered higher educational mobility for Whites than for Blacks. Among the latter, they found that females experienced less intergenerational persistence in education than males. In India, Emran et al. (2025) underscored a relationship between the type of community of origin and differences associated with gender in educational mobility. For instance, in rural communities, women experience less absolute mobility than their male peers, while no such gap exists in urban communities.

Asher et al. (2022) analyzed differences in mobility patterns across historically disadvantaged groups in Indian society, as well as by gender. They found that in the second half of the twentieth century, men from the Scheduled Castes and Tribes narrowed the gap in upward educational mobility relative to their peers from non-disadvantaged groups. However, similar progress has not been observed for Muslims or for women from other subaltern groups. At the other end of the spectrum, Azam (2016) finds that daughters from upper castes have a higher probability of experiencing upward educational mobility, even after controlling for parental education. Duryea et al. (2019) compare educational mobility by gender and race among students in a public university in Pernambuco, Brazil. They show that persistence at the top of the social ladder and upward mobility from the lower end are both higher for men than for women, and they identify the same pattern for the white population relative to Afro-Brazilians.

2.1 The case of Mexico

Mexican society is stratified by gender and skin tone, affecting intergenerational mobility patterns. Recent studies show a colorist gradient in economic rank mobility, where light-skinned individuals generally start higher in the economic distribution and maintain their position better than those with darker skin tones and those of Indigenous origin (Campos-Vázquez and Medina-Cortina 2019; Monroy-Gómez-Franco and Vélez-Grajales 2021; Monroy-Gómez-Franco 2023a, b; Baldomero-Quintana et al. 2025; Woo-Mora 2020). Additionally, research indicates that women from the bottom of the social ladder experience higher persistence rates than men, while women who start at the top of the distribution have a higher chance of falling down the distribution of economic rank compared to their male counterparts (Torche 2015, 2019).

Existing literature has not yet examined whether the effects of skin tone and gender intersect differently than when considered separately. Some experimental evidence on labor market outcomes (Arceo-Gómez and Campos-Vázquez 2014, 2019) and qualitative studies on beauty preferences (Campos-Vázquez 2021; Krozer and Urrutia-Gómez, 2023) suggest that this intersection is significant, with a more pronounced colorist gradient effect on women. Both studies indicate that this "preference for whiteness" is rooted in the country's history and the enduring presence of individuals with European ancestry in influential roles. This aligns with national and local historical evidence (Knight 1990; Sue 2013; Tenorio-Trillo 2023). Our paper examines whether this short-term evidence translates into longer-term outcomes such as intergenerational mobility. If it does, the intersection of gender and skin tone stratification influences multiple life dimensions; if not, short-run effects may not substantially alter an individual's life trajectory.

3 Data

We rely on the MMSI 2016/ESRU-EMOVI 2017 composite dataset, used by Delajara et al. (2022) and detailed by Monroy-Gómez-Franco (2022). This dataset comprises pooled observations from two surveys on social mobility in Mexico: The Intergenerational Social Mobility Module of 2016 (MMSI-2016), conducted by the National Statistics Office (INEGI), and the ESRU Social Mobility Survey of 2017 (ESRU-EMOVI 2017), conducted by the Centro de Estudios Espinosa Yglesias. Both surveys target non-institutionalized Mexican men and women aged 25 to 64, use the same reference point for retrospective questions (14 years of age), follow the same sample design and basic questionnaire, and employ the same measurement instrument for skin tone. Additional analysis confirming the distributional homogeneity of the samples appears in Appendix A.

Both surveys rely on self-identification of skin tone using the PERLA tone palette, developed by Telles (2014) as part of the Project on Ethnicity and Race in Latin America (PERLA). This palette has been used in previous studies on social mobility

and skin tone in Mexico.[7] Campbell et al. (2020) demonstrate that this palette provides a distribution of skin tones consistent with those obtained using colorimeters. Solis et al. (2023) show that self-identifying skin tone with the PERLA palette replicates the variability recorded in the country through optical instruments.

Both surveys interview adult men and women regardless of their household head status. Female labor force participation in the country was below 50% until recently (López-Acevedo et al. 2020). Focusing exclusively on household heads would result in a sample with mostly men and few working women, excluding a significant segment of women who do not participate in the labor market.[8] This is particularly true for women in Mexico, who are less likely to be household heads (see Table 1). The surveys addressed this limitation by interviewing household heads of both genders and other adults (i.e., non-household heads).

Both surveys collect data on household living arrangements when the informant was 14 years old and at present. This allows exploration of differences in mobility patterns related to living arrangements in the household of origin and to the respondent's gender, as well as the relationship between mobility patterns and the presence of a partner in the current household.

There are limitations to using retrospective surveys for studying social mobility, with recall bias being the most significant. Recall bias refers to inaccuracies in respondents' reports due to the time elapsed between the interview and the reported information (Beckett et al. 2001; Bernard et al. 1984). These inaccuracies increase with the length of time between the reference point and the interview date. In this case, the period extends from when the respondent was 14 years old to the interview date in 2016–2017, ranging from 11 years for 25-year-olds to 50 years for 64-year-olds. In countries such as the United States, where both retrospective and panel data exist for the same phenomenon, the magnitude of bias in retrospective sources can be modeled (Peters 1988). However, this is not feasible in countries such as Mexico, which lack intergenerational panel surveys to benchmark results.

The questionnaire designs of both MMSI 2016 and ESRU-EMOVI 2017 aim to minimize recall bias. First, it sets the reference point for retrospective questions at 14 years of age. Studies in memory and neuroscience indicate that individuals tend to remember more about their adolescence than about other life stages (Janssen and Murre 2008). Second, the surveys reduce memory demands for retrospective questions about living conditions by using dichotomous questions on ownership of durable goods, dwelling characteristics, and access to utilities and services. This approach aims to keep questions general to help respondents recall more accurate memories. However, it does not capture information about the value of goods or specific service characteristics. As a result, we lack information on income or wealth and rely on proxy measures of the household's economic status, such as an index constructed through data reduction techniques.

[7] See, e.g., Villarreal (2010), Flores and Telles (2012), Martínez Casas et al. (2014), Campos-Vázquez and Medina-Cortina (2018, 2019), Monroy-Gómez-Franco and Vélez-Grajales (2021), Monroy-Gómez-Franco (2022), Gómez-Echeverri (2024), and Woo-Mora (2025).

[8] This is the case for the 2006 ESRU Social Mobility Survey.

Additionally, we conduct a robustness check on our main results by estimating them for a restricted sample of individuals aged 30 to 50. By limiting the age range, we reduce the distance between the reference point and the interview moment, making it more homogeneous. The drawback is a reduction in sample size, which affects the precision of our estimates.

Table 1 presents the descriptive statistics, considering only observations with information on the identity of the household head in the origin household, resulting in 37,259 observations from an initial 43,299 after pooling both surveys. Column 2 shows the characteristics of the total sample, while the other columns present characteristics of each subgroup defined by four possible origin household arrangements: two cases with only one parent present (single mother and single father) and two arrangements with both parents present, with the head being either the father or the mother.

As Table 1 shows, most respondents lived in a household with a male head (82%) when they were 14 years old. The predominant arrangement was a two-parent family with a paternal head (78%). In these households, fathers were more likely to have more years of education than mothers. In contrast, the reverse was true in female-headed households. Most respondents who reported living in a household with both parents, headed by the mother, were women, while other household arrangements had a more balanced gender composition. Despite these differences, the household arrangements had a distribution similar to that of the other variables considered. Notably, respondents' skin tones were similarly distributed across different household arrangement groups.

Although we have information on each respondent's region of origin, the sampling design of the MMSI 2016 does not allow disaggregation at the regional or state level because the intra-regional distribution of the variables is not representative of the region's population. In contrast, the ESRU-EMOVI 2017 is representative at the regional level (Monroy-Gómez-Franco 2023a). Therefore, while we can use the region or state of origin as a control variable, we cannot conduct regional heterogeneity analysis, as the pooled data are not representative at that level of disaggregation.

Figure 1 shows the distribution of skin tones by respondents' gender. Both distributions are similar at the extremes; roughly 10% of men and women report having the lightest and darkest skin tones. However, there are differences in the intermediate tonalities, with a higher proportion of women reporting a lighter intermediate tonality, 10 percentage points higher than among men. Following Campos-Vázquez and Medina-Cortina (2019) and Monroy-Gómez-Franco and Vélez-Grajales (2021), we collapse the full PERLA scale into three tonality groups: light skin corresponds to tones 1–3, intermediate tone corresponds to tones 4–6, and dark skin tone corresponds to tones 7–11. Although this reduces the variability in the population's skin tonalities, it increases the sample size for each group and provides more precise mobility estimates.

We measure intergenerational economic mobility with an index of household resources that aggregates information on durable goods, services, and assets owned by the current and origin households using multiple correspondence analysis (MCA). Proposed by Monroy-Gómez-Franco (2022), the index uses ownership

Table 1 Descriptive statistics

Variable	Full sample	Single mother	Single father	Dual parent, male household head	Dual parent, female household head
Female respondents	0.53 (0.003)	0.54 (0.010)	0.47 (0.022)	0.52 (0.004)	0.61 (0.017)
Current community is urban	0.83 (0.010)	0.88 (0.010)	0.84 (0.027)	0.82 (0.010)	0.87 (0.013)
Community of origin is urban	0.59 (0.013)	0.66 (0.146)	0.62 (0.037)	0.57 (0.014)	0.61 (0.019)
Respondent's years of education	9.88 (0.061)	9.99 (0.109)	9.14 (0.235)	9.99 (0.066)	10.32 (0.163)
Mother's years of education	4.69 (0.061)	5.22 (0.118)	–	4.52 (0.064)	6.033 (0.196)
Father's years of education	5.01 (0.065)	–	4.51 (0.247)	5.05 (0.067)	4.389 (0.161)
Light skin population	0.12 (0.005)	0.12 (0.007)	0.13 (0.016)	0.13 (0.005)	0.10 (0.011)
Intermediate skin population	0.80 (0.003)	0.81 (0.009)	0.80 (0.023)	0.80 (0.005)	0.83 (0.013)
Dark skin population	0.07 (0.003)	0.07 (0.007)	0.07 (0.013)	0.07 (0.002)	0.07 (0.009)
Indigenous population	0.13 (0.006)	0.10 (0.008)	0.15 (0.018)	0.13 (0.007)	0.15 (0.015)
Share of population	1	0.14 (0.003)	0.04 (0.003)	0.78 (0.004)	0.04 (0.002)
Sample size	37,259	4873	1126	27,711	1618

Sample weights are employed. Standard errors are clustered at the primary sampling unit. The column for single-mother (respectively, single-father) households refers to respondents whose origin household was headed by a single mother (respectively, single father). The columns for dual-parent households refer to respondents whose origin household had both parents present, with the primary economic supporter (household head) varying by gender. Communities with more than 2500 inhabitants are classified as urban for both origin and current households. Respondents with at least one parent who spoke an Indigenous language are classified as Indigenous. Light skin tone corresponds to tones 1–3 of the PERLA scale, intermediate skin tone to tones 4–6, and dark skin tone to tones 7–11

profiles based on respondents' answers regarding goods and services in their origin and current households to derive a latent measure of household economic resources. The choice of MCA is suitable for the binary responses on ownership or service access that are available in the survey.[9] Campos-Vázquez and Medina-Cortina (2019), Torche (2015), and Delajara et al. (2022) also construct a similar economic resources index using principal components analysis (PCA).[10] Table 2 shows the variables included in the origin and current household indices.

[9] Besides Monroy-Gómez-Franco (2022), this approach appears in Monroy-Gómez-Franco and Vélez-Grajales (2021) and Monroy-Gómez-Franco and Corak (2019).

[10] But PCA is unsuitable for binary indicators unless implemented with tetrachoric correlations.

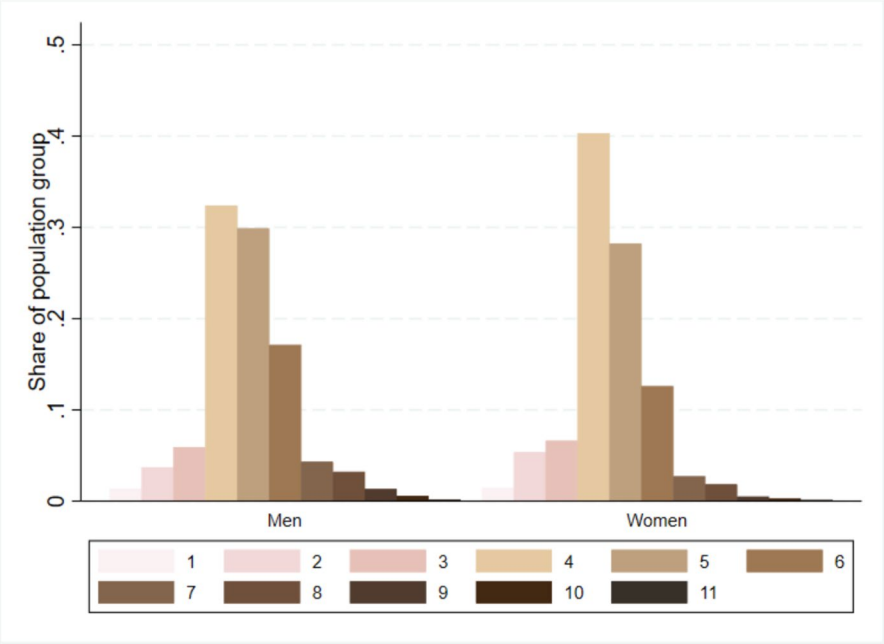

Fig. 1 Distribution of skin tones by gender. Note: Sample weights were employed. Data are from the MMSI 2016/ESRU-EMOVI 2017 composite sample. The numbers represent the tone number in the PERLA scale

We rank current and origin households using their respective indices, generating a distribution of 50 quantiles to minimize ties while maximizing variability in outcomes. The rank of each household is our outcome variable, representing the relative level of economic resources at both origin and at present. Rank-based measures are more robust to life cycle bias than level-based measures (Nybom and Stuhler 2017). As a precaution against life cycle bias, Monroy-Gómez-Franco (2022) proposes constructing the index for each 10-year cohort in the sample. If differences exist in the importance of a particular asset across cohorts, the MCA weights will capture that difference and produce a consistent ranking of households.

McKenzie (2005) and Filmer and Scott (2012) show that indices of economic resources can reproduce inequalities observed with other welfare measures, such as income or expenditure, but this capacity decreases in the distribution's tails. The indices are less capable of characterizing welfare differences among people (or households) in the tails, impacting our ability to produce detailed rankings, such as percentile-wise rankings. Consequently, we limit ourselves to 50 quantiles as the most detailed rankings in our analysis.

Table 2 Goods and services included in the economic resources index

Good or service	Origin household	Current household	Good or service	Origin household	Current household
Overcrowded household	X	X	Bank account	X	X
Credit card	X	X	Electricity	X	X
Landline	X	X	Cellphone		X
Toaster	X	X	Car	X	X
Stove	X	X	Refrigerator	X	X
Washing machine	X	X	Tablet		X
Access to potable water	X	X	T.V. set	X	X
DVD player/cassette recorder		X	Video-game console		X
Cable TV		X	Owner of commercial venue	X	X
Microwave		X	Domestic service		X
Tractor		X	Owner of another dwelling	X	X
Computer		X	Owner of non-agricultural lands		X
Owner of the inhabited dwelling		X	Water heater		X
Internet		X			

4 Methods

We explain the methods for analyzing differences in mobility patterns by gender and skin tone. First, we use rank regressions to estimate the correlation between the rank of the current household of person i in the distribution of current households in period t and the rank of the same person's origin household in the distribution of origin households in period *t-1*, when they were 14 years old ($R_{i,t-1}$).[11] The basic form of this type of regression is presented in Eq. (1):

$$R_{it} = \alpha + \beta R_{i,t-1} + \epsilon_i \tag{1}$$

where β is the intergenerational persistence rate, which measures the extent to which a household's rank is transmitted from one generation to the next. In other words, it captures the association between the positions of an adult's current and origin households in their respective distributions. The error term is included. Following Chetty et al. (2015), the intercept represents the expected (or average) rank for current households when their corresponding origin households are at the bottom (rank zero) of their distribution of economic resources. Standard errors are clustered at the primary sampling unit unless stated otherwise.

[11] Both ranks are measured on a quantile scale from 1 to 50. To convert results into percentiles, we multiply rank values by two.

If the population is divided into mutually exclusive and exhaustive groups, Hertz (2008) and Monroy-Gómez-Franco (2023a) demonstrate that the slope coefficient in Eq. 1 can be broken down into the contributions of each group to the aggregate intergenerational persistence rate (the association between the two rank distributions at the national level). Each group's contribution can also be divided into within- and between-group components. The within-group component reflects the positional persistence within each group, indicating the likelihood that an individual's position relative to other group members remains consistent across generations, or indicating the association between the positions of current and origin households within each group.

The between-group component measures how group differences in expected (or mean) ranks persist across generations. It assesses the association between group means in the current household distribution and their counterparts in the origin household distribution. The mean rank of each group is not necessarily the 25th quantile (out of 50) or the median generally, unless groups are evenly distributed across the entire distribution. If not, group means usually differ from the national mean. Formally, the between-group component is the product of the association measure (γ in Eq. (2)) and the variance among the groups' expected ranks (i.e., $\sum_{g=1}^{G}\widehat{\pi}_{g}\left(\overline{R_{g,t-1}}-\overline{R_{t-1}}\right)^{2}$ in (Eq. 2)), divided by the variance of ranks in the origin-household distribution (i.e., $\widehat{\sigma^{2}_{R_{t-1}}}$ in (Eq. 2)).

This decomposition allows us to observe each gender-skin-tone group's contribution to the aggregate persistence rate and to assess how this contribution relates to (i) the positional mobility pattern within each group and (ii) the difference between the average group position and the national mean position, multiplied by the persistence rate of these differences across group ranks.

Following Monroy-Gómez-Franco (2023a), let $\widehat{\pi}_{g}$ be the share of the total population corresponding to the gender-skin-tone group g; $\widehat{\beta}_{g}$ be the estimate of the persistence (slope) coefficient among members of group g; $\widehat{\sigma^{2}_{g,t-1}}$ be the estimate of the variance of the origin rank, $R_{g,t-1}$, among members of group g; and $\widehat{\sigma^{2}_{R,t-1}}$ be the estimate of the variance of the origin rank at the national level. The estimates of the group and national means of the current and origin rank are $\overline{R_{g,t}}$, $\overline{R_{g,t-1}}$, and $\overline{R_{t}}$, $\overline{R_{t-1}}$, respectively. $\widehat{\gamma}$ is the slope coefficient from a between-group rank regression where each individual rank is replaced by the expected rank of the individual's group. The slope coefficient from Eq. (1), estimated for the national sample, can be decomposed as follows:[12]

$$\widehat{\beta}=\sum_{g=1}^{G}\widehat{\pi}_{g}\left(\widehat{\beta}_{g}\frac{\widehat{\sigma^{2}_{R_{g,t-1}}}}{\widehat{\sigma^{2}_{R_{t-1}}}}\right)+\widehat{\gamma}\frac{\sum_{g=1}^{G}\widehat{\pi}_{g}\left(\overline{R_{g,t-1}}-\overline{R_{t-1}}\right)^{2}}{\widehat{\sigma^{2}_{R_{t-1}}}} \tag{2}$$

[12] Alternatively, β can be expressed as the population-weighted sum of the contributions of each gender–skin tone group to the aggregate persistence rate, as follows:

In addition to the general persistence rate and the decomposition described above, we estimate a modified version of the rank regression that accounts for differences in both the persistence rate and the intercept across social groups (Goldsmith et al. 2006, 2007). Let $WT_{\mathrm{i}}^{\mathrm{C}} = 1$ if person i is a woman with a skin tone from group c and zero otherwise. Similarly, define $MT_{\mathrm{i}}^{\mathrm{C}} = 1$ if i is a man with a skin tone from group c. The reference group for the estimation is men with a skin tone in the lightest group ($c = 1$). Thus, the resulting equation is

$$\begin{aligned} R_{\mathrm{it}} = \alpha + \beta R_{\mathrm{i,t-1}} + \sum_{c=1}^{3} \Phi_{\mathrm{c}} WT_{\mathrm{i}}^{\mathrm{c}} + \sum_{c=2}^{3} \Gamma_{\mathrm{c}} MT_{\mathrm{i}}^{\mathrm{c}} \\ + \sum_{c=1}^{3} \Theta_{\mathrm{c}} \left(WT_{\mathrm{i}}^{\mathrm{c}} \times R_{\mathrm{i,t-1}} \right) + \sum_{c=2}^{3} \eta_{\mathrm{c}} \left(MT_{\mathrm{i}}^{\mathrm{c}} \times R_{\mathrm{i,t-1}} \right) + u_{\mathrm{i}} \end{aligned} \tag{3}$$

Estimates of Θ_{c} and η_{c} capture differences in persistence rates among men of intermediate and dark skin tones, women of all tones, and men of light skin tone (the reference group). Light-skinned men are chosen as the reference group based on the hypothesis that they occupy the top of Mexico's stratification structure when gender and skin tone are jointly considered. Accordingly, the estimates of Φ_c and Γ_c capture the difference in the expected current rank of non-light-skinned men and women of all tonalities at the bottom of the distribution of origin with respect to the expected current rank of light-skinned men who start at the same position of origin.[13]

The estimates from Eq. 3 correspond to the unconditional persistence rates and intercepts. Although helpful for describing mobility patterns, these factors may confound differences associated with gender and skin tone with variations due to other circumstances of origin, which can differ systematically across gender-skin-tone groups. This complicates our understanding of the mechanisms that produce and sustain intergenerational outcome differences. To reduce this effect, we include control variables to account for variations in current outcomes due to circumstances different from gender and skin tone. These variables include the average years of parental education, the type of community of origin (urban or rural), the parents' ethnic origin, and the respondent's age with its quadratic term. We also include 31 state dummies, following Monroy-Gómez-Franco and Vélez-Grajales (2021), who found that the regional distribution of skin tones in the country is not random.[14]

Furthermore, including state dummies allows us to control for non-random regional differences in resources and opportunities relevant to our outcome of interest in the current period. These dummies correspond to the respondent's state of origin. The resulting Eq. (4) is as follows:

$$\begin{aligned} R_{\mathrm{it}} = \alpha + \beta R_{\mathrm{i,t-1}} + \sum_{c=1}^{3} \Phi_{\mathrm{c}} WT_{\mathrm{i}}^{\mathrm{c}} + \sum_{c=2}^{3} \Gamma_{\mathrm{c}} MT_{\mathrm{i}}^{\mathrm{c}} \\ + \sum_{c=1}^{3} \Theta_{\mathrm{c}} \left(WT_{\mathrm{i}}^{\mathrm{c}} \times R_{\mathrm{i,t-1}} \right) + \sum_{c=2}^{3} \eta_{\mathrm{c}} \left(MT_{\mathrm{i}}^{\mathrm{c}} \times R_{\mathrm{i,t-1}} \right) \\ + \sum_{r=1}^{31} \tau_{\mathrm{r}} + \sum_{d=1}^{D} \delta_{\mathrm{d}} X_{\mathrm{i}}^{\mathrm{d}} + u_{\mathrm{i}} \end{aligned} \tag{4}$$

[13] u_{i} is the error term.

[14] Mexico consists of 32 states, with Aguascalientes serving as the omitted state category.

A concern with Eq. 4 is that societal differences in gender treatment and the reproductive life cycles of men and women can bias our estimates. Two possible solutions are to estimate separate equations for men and women or to use a fully interacted model. We implement both strategies, presenting the split-sample results in the main text and the fully interacted model results in Appendix B. Let $T_{\mathrm{i}}^{\mathrm{c}}$ be a binary variable equal to 1 if individual i belongs to skin tone group c. Using the same notation as before, we estimate Eq. (4a) separately for men and women:

$$R_{\mathrm{it}} = \alpha + \beta R_{\mathrm{i,t-1}} + \sum\nolimits_{c=2}^{3} \psi_{\mathrm{c}} T_{\mathrm{i}}^{\mathrm{c}} + \sum\nolimits_{c=2}^{3} \pi_{\mathrm{c}} \left(T_{\mathrm{i}}^{\mathrm{c}} \times R_{\mathrm{i,t-1}} \right) + \sum\nolimits_{r=1}^{31} \tau_{\mathrm{r}} + \sum_{d=1}^{D} \delta_{\mathrm{d}} X_{\mathrm{i}}^{\mathrm{d}} + u_{\mathrm{i}} \tag{4a}$$

Now $\pi_{\mathrm{c}} + \beta$ represents the intergenerational persistence rate for members of group c, and $\alpha + \psi_{\mathrm{c}}$ represents the expected rank for members of group c at the bottom of the national origin distribution. In both cases, we omit the lightest skin tone. A possible factor affecting our estimates is the origin household composition, which may influence the current household rank; for example, the number of parents present can impact the resources (economic, social, and educational) available to respondents during childhood. We control for this bias by including household arrangement dummies in the regressions for the entire sample and by estimating the regressions separately for subsamples based on the household of origin (i.e., single father, single mother, dual parent with male head, and dual parent with female head).[15]

We aim to analyze whether the mobility relationship between skin tone, gender, and economic resources is constant across the latter's distribution. To do this, we estimate transition probabilities for different social subgroups. Transition probabilities measure the likelihood of reaching quantile d conditional on starting at quantile o. We divide the origin and current economic resource distributions into five quintiles to calculate these probabilities.[16] Letting $N_{\mathrm{o}}^{\mathrm{d}}$ be the population with origin (period $t-1$) in quintile o and currently (period t) in quantile d, and N_{o} be the population with origin in quintile o, we define the transition probability between quantile o and quantile d, $P_{[\mathrm{d|o}]}$, as follows:

$$P_{[\mathrm{d|o}]} = \frac{N_{\mathrm{o}}^{\mathrm{d}}}{N_{\mathrm{o}}} \tag{5}$$

The corresponding 25 transition probabilities are then collected into a transition matrix $M_{\mathrm{d,o}}$ of 5×5 dimension, in which the rows correspond to the quintile of origin, and the columns correspond to the current quintile. Formally, this is

[15] The omitted household-arrangement category in the regression for the entire sample is dual-parent household headed by a man.

[16] We test the robustness of these results to alternative percentile partitions in Appendix E.

$$M_{\mathrm{d,o}} = \begin{bmatrix} P_{[1|1]} & \cdots & P_{[5|1]} \\ \vdots & \ddots & \vdots \\ P_{[1|5]} & \cdots & P_{[5|5]} \end{bmatrix} \tag{6}$$

The quantiles for the transition matrices and rank regressions are defined for the complete sample, including men and women with different skin tonalities. This enables comparison of intergenerational movements across subgroups by providing common support. However, the measured mobility is not strictly positional; it is influenced by both intergenerational re-rankings (exchange mobility) and changes in the marginal distributions (Deutscher and Mazumder 2023; p. 1000).

5 Results

We estimate Eq. 4a for the total sample and four subsamples of men and women based on household of origin arrangements. Table 1 shows that these groups do not represent equal shares of our sample and of the Mexican population. In particular, the sample sizes of respondents who (i) lived with a single father at age 14 and (ii) lived with both parents where the mother was the household head are relatively small. Consequently, the estimations for both subgroups are less precise than those for the rest of the population.

Table 3 presents the estimation results for the sample of women, focusing on two subgroups: (i) respondents who lived with a single mother at 14 years old (third column) and (ii) respondents who lived with both parents in a male-headed household at 14 years old (fifth column). Notably, there is no statistically significant in the mobility patterns of light-skinned and intermediate-skinned women regarding both the regression slope (intergenerational rank persistence) and the intercept (expected rank for those starting at the bottom). In contrast, dark-skinned women show a statistically significantly lower intercept compared to light-skinned women. For women born in single-mother households, this difference equates to nearly a decile of the economic resources distribution, while the difference is smaller for those raised in dual-parent households.

Table 4 indicates that the same pattern applies to men. These findings align with previous studies by Campos-Vázquez and Medina-Cortina (2019), Monroy-Gómez-Franco and Vélez-Grajales (2021), and Monroy-Gómez-Franco (2023b), suggesting that the significant average intergenerational persistence rate observed nationally affects all groups. However, the distributional positions differ, with dark-skinned individuals achieving a lower expected rank. No statistically significant difference is found between the intercept values for intermediate-skin-tone and light-skin-tone men, consistent across the whole sample and in both subsamples of interest (single-mother households and dual-parent households headed by men).

The next step in our analysis is to decompose the parameter from Eq. 1 by gender-skin-tone group, as outlined in Eq. 2. This results in six gender-skin-tone groups. Table 5 displays the decomposition results. The second and fifth rows present the positional component (in absolute and relative terms, respectively), representing the

Table 3 Main regression, conditional persistence rates for women

Dependent variable: current rank	Full sample	Single mother households	Single father households	Dual-parent households, male household head	Dual-parent households, female household head
Origin rank	0.433 (0.020)	0.437 (0.048)	0.269 (0.168)	0.441 (0.021)	0.309 (0.084)
Intermediate skin tone	−0.971 (0.640)	−2.820 (1.563)	−5.222 (5.981)	−0.0867 (0.628)	−5.921 (2.489)
Dark skin tone	−2.141 (0.920)	−4.235 (1.823)	−10.24 (6.843)	−1.698 (0.953)	−1.594 (5.299)
Intermediate skin tone *X* origin rank	−0.027 (0.019)	0.028 (0.051)	0.076 (0.165)	−0.047 (0.020)	0.105 (0.079)
Dark skin tone *X* origin rank	−0.056 (0.038)	0.037 (0.083)	0.359 (0.231)	−0.067 (0.039)	−0.175 (0.228)
Intercept	2.827 (2.182)	2.543 (4.800)	16.38 (11.16)	2.224 (2.316)	14.05 (8.179)
Observations	22,017	3042	653	17,051	1181
R-squared	0.464	0.449	0.389	0.478	0.459

Standard errors (in parentheses) are clustered at the primary sampling unit. The column for single-mother (respectively, single-father) households refers to respondents whose origin household was headed by a single mother (respectively, single father). The columns for dual-parent households refer to respondents whose origin household had both parents present, with the primary economic supporter (household head) varying by gender. The estimations include state dummies to control for the non-random distribution of skin tones across the country. All specifications include controls for parents' maximum years of schooling, age, age squared, and parents' ethnic origin, and whether the community of origin was rural. For the total sample estimation, the vector of controls additionally includes the household structure of origin (single father, single mother, or dual-parent household). The reference group for all estimations is light-skinned women

Table 4 Main regression, conditional persistence rates for men

Dependent variable: current rank	Full sample	Single mother households	Single father households	Dual-parent households, male household head	Dual-parent households, female household head
Origin rank	0.415 (0.028)	0.390 (0.060)	0.262 (0.092)	0.417 (0.031)	0.549 (0.087)
Intermediate skin tone	−1.229 (0.951)	−2.908 (1.928)	1.555 (3.654)	−1.380 (1.061)	4.362 (3.006)
Dark skin tone	−3.263 (1.182)	−6.671 (2.885)	2.892 (3.846)	−3.681 (1.293)	4.984 (4.618)
Intermediate skin tone *X* origin rank	−0.008 (0.027)	0.068 (0.058)	−0.0737 (0.100)	−0.010 (0.029)	−0.160 (0.0835)
Dark skin tone *X* origin rank	−0.015 (0.039)	0.112 (0.101)	−0.248 (0.127)	−0.005 (0.041)	−0.303 (0.160)
Intercept	6.689 (2.236)	10.69 (5.062)	21.46 (10.61)	5.158 (2.475)	14.11 (8.949)
Observations	15,252	1870	503	12,206	616
R-squared	0.484	0.488	0.521	0.491	0.448

Standard errors (in parentheses) are clustered at the primary sampling unit. The column for single-mother (respectively, single-father) households refers to respondents whose origin household was headed by a single mother (respectively, single father). The columns for dual-parent households refer to respondents whose origin household had both parents present, with the primary economic supporter (household head) varying by gender. The estimations include state dummies to control for the non-random distribution of skin tones across the country. All specifications include controls for parents' maximum years of schooling, age, age squared, and parents' ethnic origin, and whether the community of origin was rural. For the total sample estimation, the control vector additionally includes household structure of origin (single father, single mother, or dual-parent household). The reference group for all estimations is light-skinned men

Table 5 Decomposition of the national intergenerational persistence by group (coefficients multiplied by population share)

Region	Within-group regression	Between-group regression	Total	Positional component (share of national)	Structural component (share of national)
Light skin tone, female	0.047	0.004	0.051	0.081	0.138
Intermediate skin tone, female	0.239	0.003	0.242	0.411	0.103
Dark skin tone, female	0.013	0.007	0.020	0.022	0.241
Light skin tone, male	0.035	0.009	0.044	0.060	0.310
Intermediate skin tone, male	0.223	0.002	0.225	0.384	0.069
Dark skin tone, male	0.024	0.004	0.028	0.041	0.138
Total	0.581	0.029	0.610	1	1

Sample weights are employed. The light-skin-tone group corresponds to individuals with tones 1–3 on the PERLA scale; the intermediate-skin-tone group to tones 4–6; and the dark-skin-tone group to tones 7–11. Each row in the positional component column reports the ratio of the contribution of each gender–skin-tone group to the total within-group component. Each row in the structural component column reports the ratio of the contribution of each gender–skin-tone group to the total between-group component. The within group contribution is defined as $\widehat{\pi_g}\left(\hat{\beta}_g \frac{\widehat{\sigma^2_{R_{j,t-1}}}}{\widehat{\sigma^2_{R_{t-1}}}}\right)$ for $g = 1, \ldots, 6$. The between group contribution is defined by $\widehat{\gamma\pi_g} \frac{\left(\widehat{\overline{R}_{j,t-1}} - \widehat{\overline{R}_{t-1}}\right)^2}{\widehat{\sigma^2_{R_{t-1}}}}$ for $g = 1, \ldots, 6$. For more details on the decomposition, see Eq. 2 and the associated footnote

part of the national intergenerational persistence rate attributable to the likelihood of intergenerational rank reproduction within groups. The third and sixth rows show results for the structural component (again, in absolute and relative terms, respectively), which accounts for the part of the persistence rate of differences in mean/expected ranks across groups.

As Table 5 shows, the intergenerational mobility experienced by intermediate-skinned Mexicans largely determines the aggregate positional dynamics (a positional component share of nearly 80%).[17] This result reflects the large share of this group within the total Mexican population (see Fig. 1). Moreover, since the positional component accounts for 95% of the slope coefficient (β) in the full sample, we conclude that intergenerational persistence among individuals with intermediate skin tone is the main driver of persistence at the national level.[18]

The decomposition shows that light-skinned and dark-skinned individuals represent similar shares of the total population (Fig. 1), but the positional persistence of light-skinned persons is higher than that of dark-skinned Mexicans (around 14% versus 10%; the second-to-last column of Table 5, combining men and women). However, this

[17] That is, 41.1% for women and 38.4% for men, corresponding to the second and fifth rows in the positional component column of Table 5, respectively.

[18] That is, 0.581 (the sum of the within-group regression components in the second column) divided by the total of 0.581 and 0.029 (the sum of the between-group regression components in the third column).

difference is not substantial for men (compare "light" and "dark" rows in the positional-component-share column of Table 5). Notably, when calculating the positional component without weighting by population shares, the (population-unweighted) positional components are similar for men across different skin tones (0.62, 0.60, and 0.60 for light, intermediate, and dark skin tones, respectively). In contrast, a clear colorist gradient remains for women, with lighter skin tones exhibiting higher values of positional persistence (0.63, 0.59, and 0.55 for light, intermediate, and dark skin tones, respectively).

The between-group components of light-skinned males and dark-skinned women are the largest (structural component column, Table 5). Since this remains constant throughout the column and the two population shares are similar, their respective (origin) average positions are farthest from the (origin) national average, with the former group enjoying an advantage and the latter being disadvantaged. These results suggest that light-skinned Mexican men experience higher rates of intergenerational persistence at a higher position in the national distribution than dark-skinned women, who persist less frequently but are more likely to start at the bottom. Despite comprising the vast majority of the Mexican population, intermediate-skinned men and women have the lowest between-group components, indicating their average positions are close to the (origin) national average. Combining this with the positional components, we conclude that intermediate-skinned women face persistent rates that are neither as high as those of light-skinned women nor as low as those of dark-skinned women, starting on average at the national mean of the origin distribution. In contrast, intermediate-skinned men face persistence rates similar to their peers of different skin tones but start from a different position in the original rank distribution (the national average).

We further explore these results by estimating the transition matrices for each subgroup of interest. We focus on persistence at the extremes of the distribution of current economic resources: the conditional probability of currently being in the first (bottom) quintile (Q1 in Fig. 2) conditional on being in the first quintile at age 14, and the conditional probability of being in the fifth (top) quintile (Q5 in Fig. 2) conditional on being in the fifth quintile at age 14. Figure 2 shows these conditional probabilities for the eight groups.

Tables 6 and 7 show the *t*-tests for persistence rates at both distributional extremes. The persistence probability at the bottom of the distribution for light-skinned women is the lowest (see Fig. 2a), with statistically significant differences compared to other non-light-skin-tone groups (Table 6). Light-skinned men have a persistence rate similar to intermediate-skin-tone men and women (Fig. 2a; Table 6). In contrast, dark-skinned women have the highest persistence rate at the bottom (Fig. 2a), with significant differences from all other groups (Table 6).

At the top end of the distribution, men's average persistence rate is higher than women's, confirming Torche's (2015) findings. However, light-skinned men's and women's persistence rates are not statistically significantly different (see Table 7). Both groups have the largest persistence rate at the top of the distribution (Fig. 2b). Men of intermediate and dark skin tones have similar persistence rates at the top, smaller than those of the light-skinned groups but larger than their female peers. Dark-skinned women have the lowest persistence rate at the top, followed by intermediate skin tone women and dark-skinned men (Fig. 2b). All pairwise differences in persistence rates at the top are statistically significantly different at 10%, except for light-skinned men versus women, and intermediate-skin men versus dark-skin

counterparts (Table 7, third and sixth rows). This implies that dark-skinned women face the lowest probability of persisting at the top of the distribution, unlike dark-skinned men, who have the same probability as their intermediate skin tone peers.

For the intermediate skin tone population, which is the majority in Mexico, the probabilities of remaining at the bottom quintile are not statistically different from those of light-skinned men (Table 6, rows 1 and 4). However, they are higher than those faced by light-skinned women (Table 6, rows 7 and 13). This population exhibited less persistence at the bottom of the distribution than the dark-skinned population (Table 6). In contrast, both light-skinned men and women have higher persistence rates at the top of the distribution than their intermediate skin tone peers (Table 7, rows 1, 3, 7, and 13). There is no statistically significant gender gap among the intermediate skin tone population at the bottom (Table 6, row 8), but it is present at the top (Table 7, row 9), as it is among the dark skin tone population (Table 7, row 12).

These differences between light-skinned and dark-skinned populations are economically relevant. For example, the gap in persistence rates at the top quintile for light-skinned women compared to the average for all women is 15 percentage points, equivalent to the probability that a woman starting at the bottom quintile reaches the median (see Appendix Tables C1 and C3). The gap between light and dark-skinned women in their persistence rates at the top is 30 percentage points, more than the probability that a woman from the bottom reaches the median or a better position (see Table 7 and Appendix Table C1). Meanwhile, the gap for light-skinned men compared to the average for that gender is eight percentage points, larger than the probability that an average man starting at the top quintile falls below the median in adulthood (see Appendix Tables C2 and C4).

Our results suggest a complex stratification regime where skin tone and gender intersect differently based on an individual's starting position in the distribution of economic resources. Women with dark skin tones face the highest persistence rates in the bottom and the lowest in the top, indicating significant hurdles in accumulating economic resources. Dark-skinned men have the second-highest persistence probabilities in the bottom quintile. The intermediate-skin-tone population has the same persistence rate in the bottom quintile as light-skinned men, suggesting that skin tone differences are not relevant for climbing out of poverty for these two groups (though they are for women, as light-skinned women face the lowest persistence rate in the bottom). However, the difference between intermediate and light skin tones becomes relevant in the top quintile. The greater salience of skin tone in the top than in the bottom aligns with several ethnographic works documenting skin tone as a status differentiator among the economic elite (Nutini 2004; Nutini and Isaac 2009; Cerón-Anaya 2019, 2024; Krozer 2024). This literature shows that members of Mexican economic elites use lighter skin tone as a proxy for membership, allowing lighter-skinned individuals to blend into those social circles and access more resources than those at higher echelons without light skin.

Gender differences are not significant among the light-skinned population at the top of the distribution. In contrast, light-skinned women have the lowest persistence rate at the bottom. For other skin tones, gender differences are relevant both at the

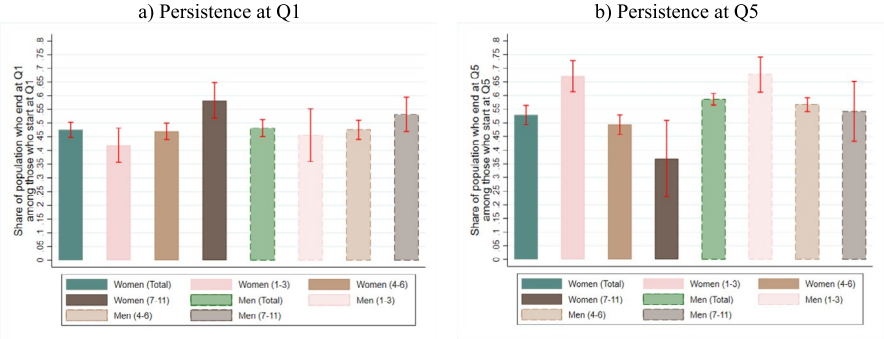

Fig. 2 Persistence at the extremes of the distribution (the total sample). Notes: Quantiles are defined over the national population. Sampling weights are employed, and standard errors are clustered at the primary sampling unit. Full transition matrices are provided in Tables C1–C8 of the Appendix. Red vertical segments indicate 95% confidence intervals

Table 6 Differences in persistence probabilities at Q1 conditional on starting in Q1

	Difference	Standard error	*t*-statistic
Light skin tone men vs. intermediate skin tone men	0.034	0.036	0.948
Light skin tone men vs. dark skin tone men	−0.073	0.036	−2.042
Light skin tone men vs. light skin tone women	−0.002	0.036	−0.045
Light skin tone men vs. intermediate skin tone women	−0.016	0.030	−0.530
Light skin tone men vs. dark skin tone women	−0.145	0.037	−3.914
Intermediate skin tone men vs. dark skin tone men	−0.578	0.024	−2.373
Intermediate skin tone men vs. light skin tone women	0.050	0.023	2.145
Intermediate skin tone men vs. intermediate skin tone women	−0.000	0.012	−0.031
Intermediate skin tone men vs. dark skin tone women	−0.129	0.024	−5.263
Dark skin tone men vs. light skin tone women	0.108	0.031	3.511
Dark skin tone men vs. intermediate skin tone women	0.057	0.024	2.442
Dark skin tone men vs. dark skin tone women	−0.071	0.032	−2.263
Light skin tone women vs. intermediate skin tone women	−0.050	0.022	−2.247
Light skin tone women vs. dark skin tone women	−0.179	0.031	−5.807
Dark skin tone women vs. intermediate skin tone women	0.129	0.024	5.336

For each comparison of the form "Group A vs. Group B" in the first column, the respective row value in the "Difference" column is equal to Group A's persistence probability minus Group B's persistence probability. The complete transition matrices used for these calculations are in Appendix Tables C1-C8

bottom and the top, with men facing a lower probability of remaining at the bottom and a higher probability of remaining at the top than their female peers.[19]

[19] Abramitzky et al. (2023) reach a remarkably similar conclusion for the neighboring case of the United States. There, they empirically confirm that skin-tone penalties in education, earnings, and marital outcomes were worse among African-American women than men between the late nineteenth and early twentieth centuries.

Table 7 Differences in persistence probabilities at Q5 conditional on starting in Q5

Comparison	Difference	Standard error	*t*-statistic
Light skin tone men vs. intermediate skin tone men	0.094	0.022	4.237
Light skin tone men vs. dark skin tone men	0.102	0.040	2.542
Light skin tone men vs. light skin tone women	−0.012	0.026	−0.047
Light skin tone men vs. intermediate skin tone women	0.168	0.022	7.644
Light skin tone men vs. dark skin tone women	0.284	0.054	5.286
Intermediate skin tone men vs. dark skin tone men	0.008	0.036	0.218
Intermediate skin tone men vs. light skin tone women	−0.106	0.019	−5.632
Intermediate skin tone men vs. intermediate skin tone women	0.074	0.013	5.663
Intermediate skin tone men vs. dark skin tone women	0.190	0.051	3.749
Dark skin tone men vs. light skin tone women	−0.114	0.038	−2.963
Dark skin tone men vs. intermediate skin tone women	0.066	0.036	1.840
Dark skin tone men vs. dark skin tone women	0.182	0.061	3.001
Light skin tone women vs. intermediate skin tone women	0.180	0.019	9.680
Light skin tone women vs. dark skin tone women	0.296	0.052	5.646
Dark skin tone women vs. intermediate skin tone women	−0.116	0.051	−2.296

For each comparison of the form "Group A vs. Group B" in the first column, the respective row value in the "Difference" column is equal to the persistence probability of Group A minus the persistence probability of Group B. The complete transition matrices used for these calculations are in Appendix Tables C1-C8

6 Robustness checks

One concern regarding our results is that they may be driven by a composition effect within the Mexican population. As documented by González de Alba (2010) and Canedo (2018), members of the Indigenous population are more likely than the rest of the population to experience poverty across multiple dimensions.[20] Monroy-Gómez-Franco (2023b) shows that intergenerational economic mobility patterns differ for Indigenous populations, who face higher persistence rates at the bottom of the economic distribution. Additionally, Monroy-Gómez-Franco et al (2021) find that the Indigenous population, on average, has a darker skin tone than non-Indigenous people in Mexico. These findings suggest that the mobility patterns of the Indigenous population may influence our results. To investigate this, we estimate rank regressions and transition matrices for a sample excluding individuals with at least one parent speaking an Indigenous language. The complete regression results and transition matrices are in Appendices D1 and D2.

[20] Although the constitutional criterion for defining membership in an Indigenous group is self-ascription, statistical instruments have been slow to adopt this standard. Both the MMSI and ESRU-EMOVI 2017 identify the Indigenous population as individuals who report that at least one parent spoke an Indigenous language. In this paper, we follow this criterion. For a detailed discussion of the challenges involved in identifying the Indigenous population through surveys and censuses, see Barbary (2015).

The regression analysis results align with our main findings. For the non-indigenous full sample, a dark skin tone is associated with a lower intercept than for the light skin population, while no significant difference exists for those with intermediate skin tones (second and third rows of Tables D1.1 and D1.2). For subsamples, the direction of the association is present but less precisely estimated. In the transition matrices, persistence at the bottom of the distribution is similar for light-skin and intermediate-skin populations, while dark-skin women face a higher persistence rate. At the top quintile, light-skin individuals show the highest persistence rate, followed by intermediate-skin men. Dark-skin women have the lowest persistence at the top, with dark-skin men and intermediate-skin women having rates similar to intermediate-skin men (Tables D2.3–D2.8).

However, it is important to note that, given Mexico's history of interracial mixing and the absence of genetic data, it is virtually impossible to distinguish completely between dark-skinned Indigenous and dark-skinned non-Indigenous populations, as ethnic ancestry cannot be disentangled with precision.[21] Due to state policies in the twentieth century (Terborg et al. 2006) and the economic impact of discrimination (Cano-Urbina and Mason 2016; Arceo-Gómez and Torres 2021), the intergenerational loss of Indigenous languages has persisted (Yoshioka, 2010; Alcántara and Solís, 2023), limiting the effectiveness of the linguistic identification criterion in our dataset. These factors restrict our robustness analysis's ability to separate the effects of ethnic origin from skin tone.[22]

Ideally, we would use the complete PERLA palette to construct transition matrices for 11 groups per gender. However, sample size constraints compel us to merge color categories, which may introduce bias and affect our results, as it is unclear if there is a better way to collapse the PERLA palette into fewer categories. We rely on the partition into three groups proposed by Monroy-Gómez-Franco (2023b) for our main results. As a robustness check, we also estimated the transition matrices and regressions using two alternative categorizations: one with four categories and another with five. The main difference is that the alternatives disaggregate the intermediate group.

Despite this difference, the paper's main results hold in the alternative specifications (see Appendix E). First, the persistence rates at the bottom for the light-skinned population are the smallest, while those of dark-skinned women are the largest. Secondly, the largest persistence rates at the top accrue to the light-skinned population, while dark-skinned women face the highest probability of falling even when born at the top (see the transition matrices in Appendices E2 and E4). The point-estimate difference in persistence rates at extremes is smaller between people with lighter intermediate skin tone ("intermediate skin tone I" in the Appendix) and light-skinned people than between the latter and those with darker intermediate skin tone ("intermediate skin tone II" in the

[21] See Granados (2008) and Saldívar, Arenas, and Binmoeller (2024).

[22] It may also be argued that, given the complex history of interracial mixing and the construction of Indigenous identity in Mexico, separating these effects may not be entirely appropriate. Skin tone functions as a signaling device for perceived proximity to the social conception of the Indigenous population, regardless of actual ethnic origin. See Nutini (1997) and Nutini and Isaac (2009) for a related discussion.

Appendix). A similar result holds when the intermediate skin spectrum is divided into three groups: those with lighter intermediate skin tone feature persistence rates closer to their same-gender light-skinned peers.

Furthermore, for both men and women, we find evidence of a colorist gradient favoring lighter skin tones in the intercepts of the rank regressions using either alternative grouping of people with intermediate skin tones (see rank regressions in Appendices E2 and E4). The expected rank for those starting at the bottom increases with lighter skin tones for both genders. A similar colorist gradient is apparent for the slope coefficients among women, with lighter-skinned women having higher expected ranks for any rank of origin. However, the differences between the slope coefficients among men with varying skin tonalities are not statistically significant. As with the persistence probabilities at the extremes of the distribution, the difference between lighter intermediate and light skin tones is not statistically significant.

Another possible source of bias is that using 50 quantile rank regressions may be too granular for our data, leading to multiple ties across quantiles and biasing our regression results. To mitigate this bias, we estimate the separated and fully interacted models using deciles instead of 50 quantiles. The Appendix F tables show that our main result regarding the disadvantage of dark-skinned females is robust to changes in the coarseness of the ranking. For the subsamples of single-father-headed households and dual-parent, female-headed households, we lose precision in the estimates; however, their signs remain consistent with our previous results. We again find little evidence of statistically significant differences in mobility patterns between intermediate and light skin tonalities within each gender.

As mentioned in our discussion of the data, we also estimated the main regressions and transition matrices for a restricted sample of individuals between 30 and 50 years old. This sample reduces the variability in the distance between the reference point and the interview date, thus mitigating both recall bias and life-cycle bias. The main results hold: dark-skinned Mexicans converge to a lower rank than their light-skinned peers, while differences in expected rank between intermediate and light-skinned individuals are not statistically significant. Dark-skinned Mexican women are most likely to remain in the bottom quintiles of the distribution. Meanwhile, there are no significant differences in the probability of remaining at the top between light-skinned men and women; these groups are most likely to remain at the top of the distribution (see Appendix G). Additionally, for each gender separately, the differences in persistence rates at the extremes between light and intermediate-skinned individuals are statistically insignificant. In the gender-split-sample regressions, we obtain the same results, although the estimates in the fully interacted model lack enough precision to be statistically significant.

7 Mechanisms

The Mexican state that emerged from the Revolution of 1910–1921 employed the ideology of mestizaje as a tool to forge a unified national identity in the aftermath of the civil war (see, for example, Knight 1990; Saldívar 2014; Varner 2020).[23] This ideology linked mestizo origin and lighter skin tones to modern sectors of Mexican society, fostering a social desirability for whiteness. The preference for whiteness was more pronounced for women, as the ideal of a "beautiful Mexican woman" was associated with lighter skin tones and European facial features. This notion of feminine beauty was represented in cinema, paintings, beauty pageants, and other media throughout the twentieth century (García-Blizzard 2022; Varner 2020). Qualitative research indicates that this preference still exists. For instance, Campos-Vázquez (2021) finds that white female escorts charge higher prices than those with darker skin tones, even after controlling for other physical characteristics. Moreno-Figueroa (2010) and Krozer and Urrutia-Gómez (2023) show that women are aware of the value of being perceived as white or lighter-skinned and invest in cosmetic products to achieve this.

If the preference for white skin is stronger for women than for men, we would expect dark-skinned women to face worse outcomes in multiple markets, especially in labor and marriage, compared to men or their lighter-skinned peers. This would lead to higher downward mobility rates for dark-skinned women and lower upward mobility rates than those of the rest of the population, which is our finding. Due to limited information on respondents' partners in our dataset, this section focuses on quantitative evidence regarding the relationship between skin tone and labor market outcomes, particularly participation and occupation type.[24]

We estimate the raw shares of working men and women aged 30 to 60 with different skin tones (Appendix Table H.1). The results show no significant differences among men (all groups have a participation rate of nearly 90%). However, there is a significant difference between light-skinned women and dark-skinned women, with the working share of dark-skinned women lower than that of light-skinned women (0.58 versus 0.67). These differences may arise from other factors such as educational attainment, region, and community type. To control for these other sources of variation, we estimate a logit model for the probability of being employed, including covariates like state, educational attainment, community type (rural or urban), age, age squared, household size, economic resource quintile, partnership status, and whether at least one parent spoke an Indigenous language.

[23] The ideology of mestizaje refers to the notion that all Mexicans share a common ancestry as descendants of Spaniards and Indigenous peoples inhabiting the territory of present-day Mexico. Its implications were several: the non-recognition of Afro-Mexicans as bearers of a distinct cultural heritage; the characterization of Indigenous populations as "backward" in contrast to the modern mestizo population; and the association of modernity with processes of whitening and Europeanization. See, among others, Sue (2013), Knight (1990), Tenorio-Trillo (2023), Saldívar (2014), and Varner (2020).

[24] Güémez and Solis (2022) examine patterns of homogamy and heterogamy in Mexico by ethno-racial characteristics and educational attainment. They find substantial homogamy across dimensions, with relatively higher levels of heterogamy in education and skin tone.

To allow for gender differences, we estimate separate models for men and women, with results in Appendix Table H.2. We also estimate the marginal effect of intermediate and dark skin tones compared with light skin tones, as shown in Table 8. Despite controlling for the aforementioned factors, a gap in employment probability remains linked to women's skin tone. While the marginal effects of an intermediate skin tone are not statistically significant, a dark skin tone is associated with a nearly 6 percentage point lower probability of employment compared with light-skinned women. For men, the marginal effects follow the same trend but are smaller and statistically insignificant. This suggests that lower upward mobility and higher downward mobility rates for dark-skinned women in Mexico are linked to greater obstacles in the labor market, consistent with Arceo-Gómez and Campos-Vázquez (2014), who found evidence of discrimination against dark-skinned Mexican women.

We also examine systematic differences in occupation type by gender and skin tone. Our dataset includes occupation information coded using the Mexican occupation classification system from 2011. We use a crosswalk between that system and the International Standard Classification of Occupations 2008 (ISCO 2008) to categorize occupations into nine major groups, excluding the armed forces.[25] We estimate a multinomial logit model using the same conditional variables as our labor-market participation model, in which the outcome variable is a categorical variable indicating occupational groups (Appendix H). Additionally, we estimate the marginal effects of each skin tone on the probability of employment in each occupation type (Appendix Table H.4). We find that dark-skinned Mexicans are less likely to be employed in managerial and clerical positions than their light-skinned peers and are more likely to work in elementary occupations, such as cleaning, manual labor, street vending, and food preparation.

8 Conclusion

We investigated how intersecting gender and skin tone affect economic mobility in Mexico, marking the first attempt of its kind. We isolated mobility patterns related to these characteristics while controlling for confounding factors. Additionally, we analyzed four household arrangements.

Our findings revealed varied mobility patterns. Notably, we found no gender differences in intergenerational economic mobility among light-skinned individuals. In contrast, women with intermediate and dark skin tones experienced higher rates of downward mobility from the top. Furthermore, we observed steeper color gradients among women, favoring lighter-skinned women with higher expected ranks, greater upward mobility from the bottom, and less downward mobility from the top, compared to men.

The mechanisms underlying these results are illuminated by qualitative evidence (Campos-Vázquez 2021; Krozer and Urrutia-Gómez 2023), which points to a premium associated with "looking white," reflected in labor market earnings differentials

[25] See Monroy-Gomez-Franco (2021).

Table 8 Marginal effect on the probability of being employed with respect to the probability of a light skin individual being employed

Group	Intermediate skin tone	Dark skin tone
Women	−0.697	−5.868
	(1.019)	(1.763)
Men	−0.379	−1.672
	(0.828)	(1.065)

Standard errors are clustered at the primary sampling unit level. Controls include respondent's educational attainment (four levels: complete primary or less, middle school, high school, college or more), state of residence, an indicator for whether the community is urban (more than 2500 inhabitants), respondent's age and age squared, the origin household's quintile in the economic resources distribution, partnership status, number of current household members, and a binary variable indicating whether at least one parent spoke an Indigenous language. Intermediate skin tone corresponds to PERLA tones 4–6 and dark skin tone to tones 7–11

(Reeskens and Velasco (2021). In addition, Arceo-Gómez and Campos-Vázquez (2014) document discrimination specifically against dark-skinned Mexican women in the labor market. Our empirical exploration indicates a Mexican labor market partly segregated by skin tone, with dark-skinned Mexicans more likely to occupy menial service-sector jobs and less likely to hold managerial or clerical positions compared to lighter-skinned counterparts. We also found specific barriers for dark-skinned women, resulting in lower employment rate probabilities. The negative effect on labor participation is not statistically significant for the intermediate skin tone population of either gender, suggesting that only the dark-skinned population faces this segregation, leading to higher persistence rates at the bottom.

Although not empirically tested, we conjecture that patriarchal gender norms in Mexico, transmitted intergenerationally (Campos-Vázquez and Vélez-Grajales, 2014), interact with the preference for "whiteness," penalizing dark-skinned women more severely. This penalization may also extend to the dating and marriage markets, affecting the formation of new household units with more resources. This could explain the higher persistence rates at the top of the distribution for the light-skin-tone group, as a dating or marriage market rewarding "whiteness" facilitates status consolidation. Experimental evidence suggests that teenagers internalize this information, negatively impacting aspirations and cognitive test performance, particularly among dark-skinned female teenagers (Campos-Vázquez and Medina Cortina 2018).

The magnitude of the inequalities in intergenerational mobility by skin tone highlights the need to incorporate this information into policy design. Our findings and those of other studies suggest systematic discrimination against the dark-skinned population, particularly women, in the Mexican labor market, despite federal laws banning such practices (Vela-Barba 2017). This underscores the ineffectiveness of the current policy framework and the need to make legal complaints about skin tone discrimination more accessible, along with more proactive actions by federal regulators. Tipa (2020a, 2020b) documents a bias in the representation of light-skinned versus non-light-skinned Mexicans in media and government communications,

reinforcing cognitive biases that contribute to the documented mobility differences. A first step toward addressing this issue would be to ensure that government communications do not reinforce these biases.

Future research should explore the causes of the patterns we documented, particularly gender inequalities in mobility across the skin-tone spectrum and across different coloring gradients within populations of varying genders.

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Declarations

Conflict of interest The authors declare no competing interests.

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