Livia Morales
January 2026

Has Popular Music Become More Homogenous Over Time?

1: Introduction:

A common critique of current popular music is that it has become increasingly similar over time, with modern hits perceived as less stylistically diverse than those of earlier decades. Despite the prevalence of this claim in cultural commentary, systematic empirical evidence remains limited, and existing discussions rarely distinguish between aggregate convergence and changes occurring within specific musical genres.

This paper investigates whether mainstream charting music has become more homogenous over time, and whether any observed convergence reflects broad, industry-wide dynamics or instead arises from genre-specific patterns. I focus on commercially successful charting songs, which reflect popular consumption rather than the full universe of musical production, and examine whether perceived homogenization represents universal convergence or changes in genre composition and within-genre variation.

I operationalize musical homogeneity as within-group dispersion of measurable audio features provided by Spotify's standardized measures: tempo, energy, danceability, and song duration. Lower dispersion indicates greater homogeneity, as songs within a group exhibit less variation along these dimensions. This approach allows for consistent quantitative comparison across decades and genres.

The analysis proceeds in three steps. First, I document aggregate trends in musical homogeneity over time. Second, I examine changes in genre composition of charting music to assess whether aggregate trends reflect shifting genre prevalence rather than within-genre convergence. Third, I estimate regression models that allow homogeneity trends to vary by genre, distinguishing between universal and genre-specific patterns. Throughout, the analysis emphasizes robustness to weighting schemes, genre composition, and alternative aggregation choices.

1.1: Data

The primary dataset used in this analysis is the *Top 10,000 Spotify Songs - ARIA and Billboard Charts*, updated October 14, 2024. This dataset includes commercially successful songs released between the 1950s and the 2010s that appeared on either Billboard charts (United States) or ARIA charts (Australia).

Importantly, this dataset captures mainstream charting music, rather than the full universe of recorded songs. Inclusion is based on chart appearance rather than a fixed rank cutoff, so the number of songs varies across years and decades. Variation in song counts reflects the structure of music charts themselves and changes in mainstream exposure over time.

For consistency, I drop songs with missing audio features, and retain only the earliest charting appearance for each unique track. An alternative approach would count songs in each decade in which they charted, reflecting exposure rather than entry. However, this would overweight durable hits and mechanically increase similarity in later decades. The baseline analysis therefore focuses on first chart

appearances. The resulting sample consists of 8,853 unique songs. As a result, the analysis speaks to trends in mainstream popular music consumption rather than underground or niche musical production.

1.2: Audio Features

Each song is characterized by Spotify-provided audio features computed using consistent algorithmic methods. This analysis focuses on four features that capture distinct music dimensions:

1. Danceability: suitable for dancing based on rhythm and tempo
2. Energy: intensity and activity level
3. Tempo: beats per minute
4. Duration: song length in minutes.

While these features do not capture all dimensions of musical similarity, they reflect production- and consumption-relevant characteristics that are measured consistently across the full sample period. Because these features are measured on different scales, all analyses involving multiple features rely on standardized (z-scored) values, so the index is not driven by units; however, features can still drive trends if their dispersion changes substantially over time.

1.3: Genre Classification and Aggregation

Songs in the dataset are assigned to genre categories based on Spotify's detailed genre tags, which often include multiple descriptors per track. For descriptive analysis of genre composition I classify songs into eight genres: Pop, Rock, Hip-Hop, R&B/Soul, Electronic, Country, Oldies/Standards, and Other. This allows for a detailed description of how the mix of charting music evolves over time.

For the purpose of measuring musical homogeneity and estimating regression models, genres are aggregated into a smaller set of broad genre groups. This aggregation ensures that decade x genre cells contain a sufficient number of songs to yield stable within-group dispersion estimates, particularly in earlier decades. Each song is therefore mapped to a single broad genre category, which is used consistently throughout homogeneity indices, counterfactual analyses, and regression results.

All dispersion measures are constructed at the decade x broad-genre level. This approach balances descriptive rigor with statistical reliability and allows homogeneity trends to be interpreted as changes occurring within major musical styles rather than artifacts of sparse data or shifting genre definitions.

2: Results

2.1: Aggregate Trends in Musical Homogeneity Over Time

I begin by examining aggregate trends in musical homogeneity across decades. Figure 1 presents decade-level means and standard deviations for individual audio features including duration, tempo, energy, and danceability. While average feature levels evolve gradually over time, feature-specific dispersion does not decline uniformly, suggesting that no single musical dimension alone drives changes in similarity.

To capture overall music homogeneity, I construct a composite decade-level index based on within-decade dispersion across the four standardized audio features. For each decade I compute

within-feature standard deviations of z-scored features and a composite dispersion index equal to the mean of these within-decade standard deviations. This index reveals a pronounced increase in dispersion during the late 1960s and into the 1970s, followed by a decline in subsequent decades. From the 1980s onwards, dispersion remains lower and exhibits a gradual downward trend, consistent with increasing homogeneity in mainstream charting music.

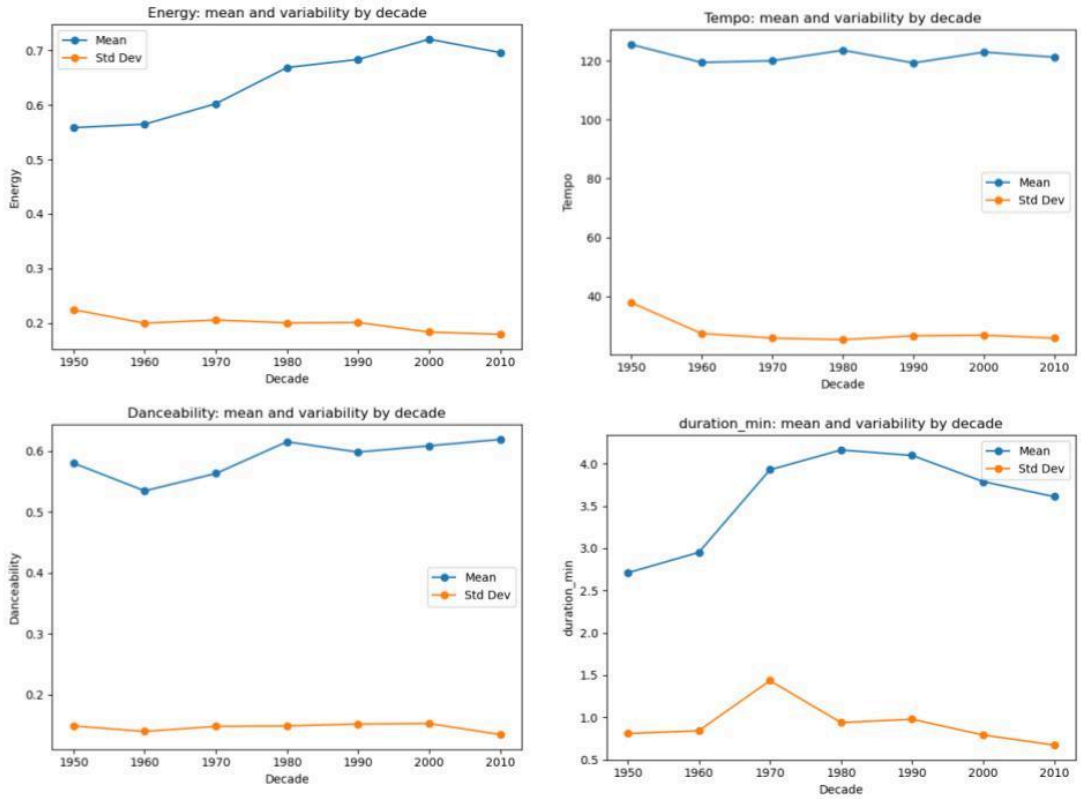

Figure 1.

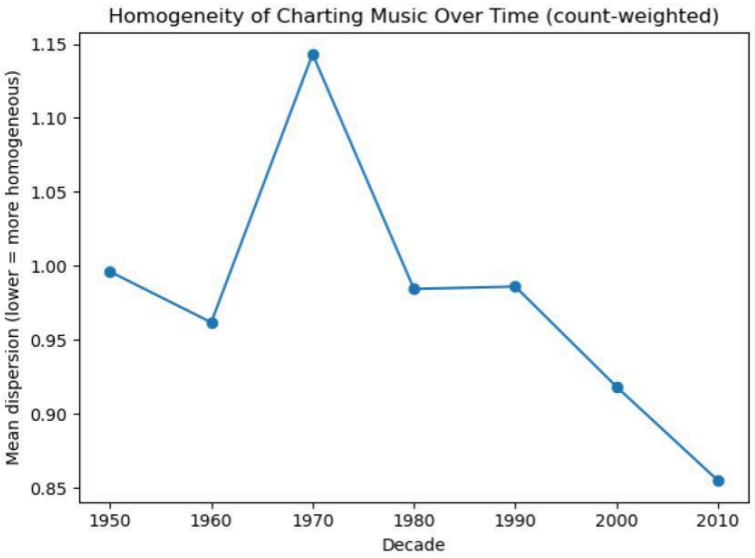

Figure 2.

2.2: Chart Convergence and Data Availability

Figure 3 illustrates the number of unique charting songs per year included in the dataset. Two features of the figure are particularly noticeable.
First, the number of charting songs increases substantially over time. In the 1950s and 1960s, fewer than 50 songs per year appeared in the dataset. Song counts rose gradually through the 1970s and 1980s, before increasing sharply beginning in the late 1990s and peaking in the 2000s and early 2010s, with several years exceeding 350 songs.

The figure highlights meaningful variation in data density across time which has important implications for interpreting aggregate homogeneity trends. Later decades contain many more charting songs than earlier decades, raising the possibility that observed changes in dispersion could be driven mechanically by sample size rather than underlying musical convergence. To address this concern, all subsequent analyses rely on within-decade dispersion measures that are constructed from standardized features and, when appropriate, weighted by the number of songs contributing to each estimate. Regression specifications further account for unequal cell sizes by incorporating count-based weights and heteroskedasticity-robust standard errors.
Overall, Figure 3 underscores that the dataset reflects evolving chart infrastructure rather than uniform sampling across time. As a result, the analysis emphasizes robustness to unequal song counts and focuses on within-group dispersion patterns, ensuring that conclusions about musical homogeneity are not artifacts of changing data availability.

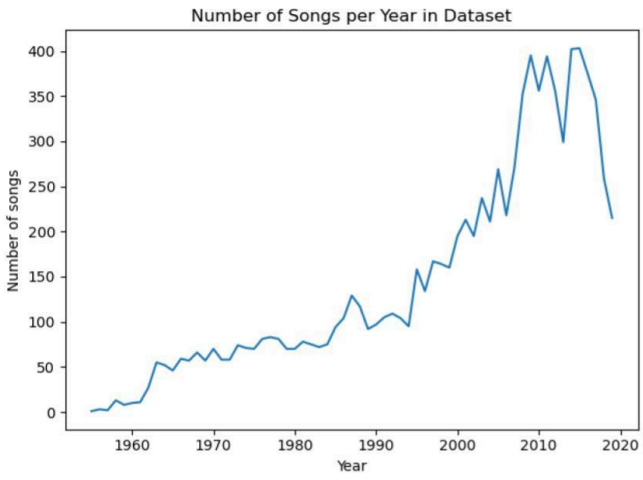

Figure 3.

2.3: Changes in Genre Composition

Figure 4 presents the genre composition of charting songs by decade, expressed as the proportion of songs in each genre category. Several clear compositional shifts emerge over the sample period.

In the 1950s through the 1970s charting music was overwhelmingly dominated by Rock, which accounts for the vast majority of songs in each decade. Pop music represents a relatively small share during this

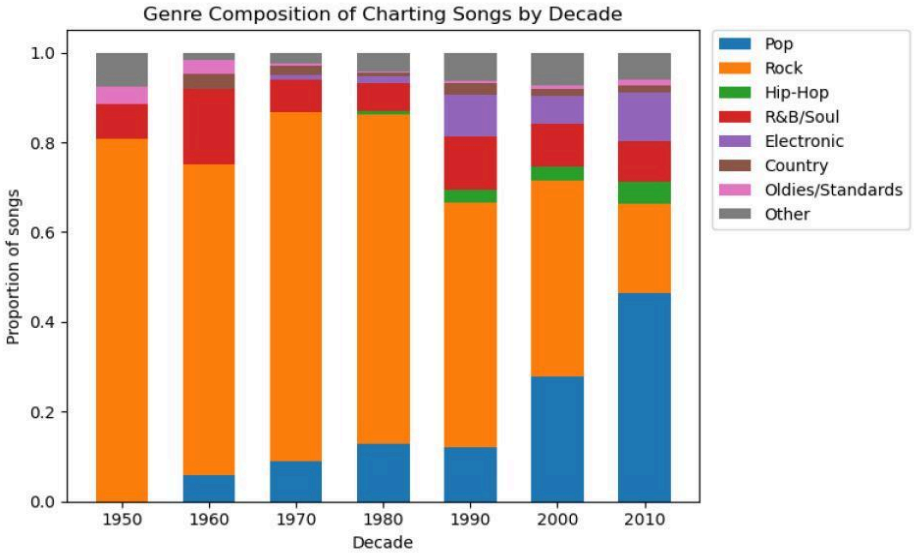

Figure 4.

period, while R&B/Soul contributes a modest but visible fraction. Other genres, including Electronic, Hip-Hop, and Country, are either absent or negligible in the earliest decades.

Beginning in the 1980s and accelerating after 1990, the genre mix became substantially more diversified. The share of Rock declines steadily, while Pop grows sharply, becoming the dominant genre by the 2000s and especially the 2010s. At the same time, Electronic music emerges as a meaningful component of charting songs, and Hip-Hop, though still representing a smaller proportion than Pop or Rock, increases consistently across later decades. R&B/Soul maintains a relatively stable presence over time, while Country and Oldies/Standards remain minor contributors throughout the sample.

These compositional changes imply that aggregate trends in musical homogeneity may reflect shifts in which genres dominate the charts rather than uniform convergence within genres. In particular, the rise of Pop and Electronic music in later decades, genres that may exhibit different internal dispersion patterns than Rock, could mechanically influence overall dispersion measures even if within-genre variation remains stable. This motivates the subsequent analysis, which explicitly distinguishes between aggregate convergence driven by changing genre shares and within-genre changes in musical similarity.

2.4: Within-Genre Homogeneity Trends

To assess whether aggregate changes in musical homogeneity reflect convergence within genres rather than shifts in genre composition, I examine within-genre dispersion trends over time. Figure 5 plots decade-level within-genre dispersion for each broad genre category, constructed from the standardized audio features described in Section 1.2. Lower values indicate greater homogeneity among songs within a given genre.

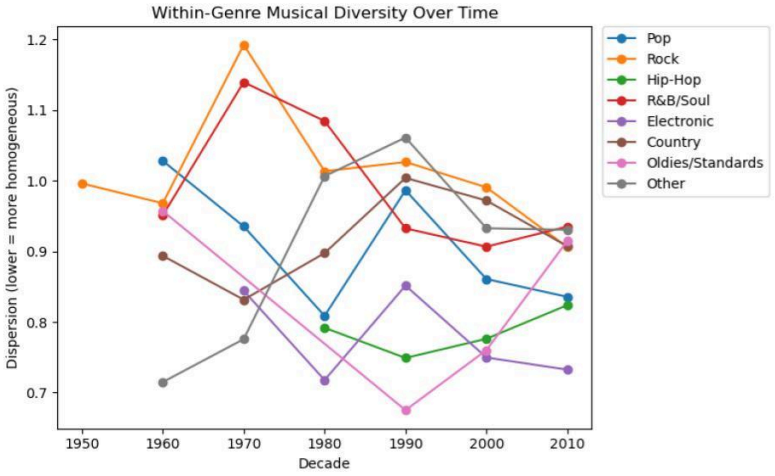

Figure 5.

Several patterns emerge. First, there is no evidence of uniform convergence across all genres. Instead, homogeneity trends vary substantially by genre, both in magnitude and timing. Rock and R&B/Soul exhibit pronounced increases in dispersion during the 1960s and 1970s, followed by gradual declines in later periods. This pattern suggests a period of stylistic experimentation and diversification during the height of these genres commercial prominence, followed by partial reconvergence as genre conventions stabilized.

Pop music shows a different trajectory. Within-pop dispersion declines modestly after the 1990s, indicating increased homogeneity among charting pop songs in more recent decades. This pattern is consistent with narratives of formulaic production in contemporary pop music, though the magnitude of convergence is relatively small compared to earlier dispersion spikes observed in other genres.

Emerging genres such as Hip-Hop and Electronic music exhibit lower dispersion when they first appear in the data, followed by modest increases as these genres expand stylistically. For Hip-Hop in

particular, dispersion remains relatively stable after its induction, suggesting that increased chart presence reflects broader adoption rather than rapid stylistic convergence.

Country exhibits fairly stable dispersion, with a period of gradual increase until 1990, followed by a period of gradual decrease in dispersion. The "Other" genre follows a similar trend, with a slightly more prominent increase, followed by a decrease in dispersion after 1990, and remaining stable from 2000 to 2010.

Figure 6 augments this analysis by scaling marker sizes in proportion to the number of charting songs within each decade-genre cell. This visualization highlights that several apparent fluctuations, particularly in the early decades and for less prevalent genres, occur in periods with relatively few observations. Larger marker sizes in later decades indicate that post-1990 within genre trends are estimated from substantially larger samples, lending greater confidence to observed patterns during this period.

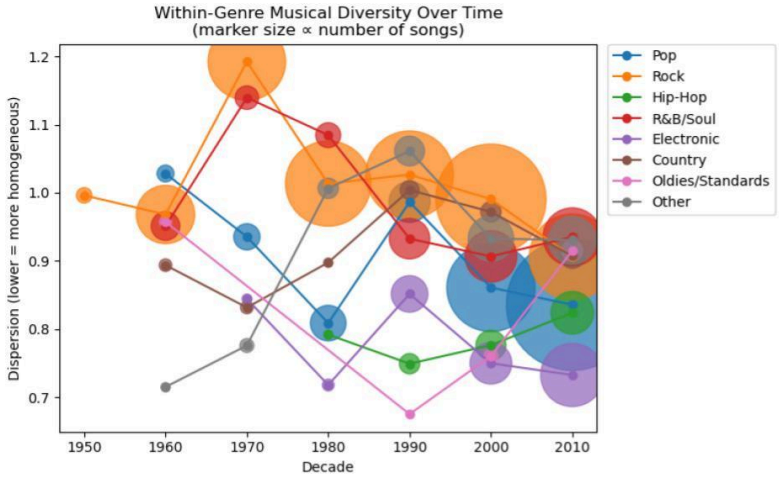

Figure 6.

Taken together, these figures indicate that changes in aggregate musical homogeneity cannot be attributed to a uniform decline in within-genre diversity. Instead, aggregate trends reflect a combination of genre-specific dynamics and shifting genre composition. While some genres, notably Pop, exhibit modest convergence in recent decades, others display long-run stability or earlier periods of diversification. These heterogeneous patterns motivate the regression analysis in the next section, which formally tests time trends in within-genre dispersion while accounting for genre fixed effects and alternative weighting schemes.

2.5: Regression Evidence on Genre-Specific Trends

To formally assess whether trends in musical homogeneity differ across genres, I estimate weighted least squares (WLS) regressions at the decade x broad-genre level. The dependent variable is the within-genre dispersion index constructed from standardized audio features. Each observation corresponds to a genre-decade cell and is weighted by the number of charting songs in that cell to reflect mainstream exposure.

Table 1 reports results from the baseline specifications, which include broad-genre fixed effects and a linear time trend measured in decades (centered at 1980). The estimated time trend is negative (β = -0.0027) and marginally statistically significant ($p = 0.084$), indicating a gradual decline in within-genre dispersion over time after controlling for genre composition. The point estimate implies a reduction in dispersion of approximately 0.003 units per decade, suggesting a modest but persistent pattern within-genre convergence rather than a sharp structural break in musical diversity.

The genre fixed effects reveal substantial and statistically significant differences in the baseline dispersion levels across musical styles. Relative to Pop (the omitted reference category), Rock and

R&B/Soul exhibit significantly higher dispersion, while Electronic music displays significantly lower dispersion, consistent with its more standardized production conventions. These cross-genre differences underscore the importance of controlling for genre when assessing aggregate homogeneity trends.

Importantly, the inclusion of genre fixed effects substantially reduces the apparent strength of the time trend relative to unadjusted aggregate patterns. This finding aligns with the visual evidence in Figures 5 and 6, which show heterogeneous and often non-monotonic within-genre trajectories rather than uniform convergence across all styles. While some genres, most notably Pop and Electronic, exhibit declining dispersion in later decades, others display stable or fluctuating patterns, indicating that aggregate homogenization is not driven by a single universal mechanism.

To assess the robustness of the estimated time trend, Appendix Table A1 reports alternative specifications that vary weighting schemes and standard error assumptions. Across these models, the estimated time coefficient remains negative but varies in magnitude and statistical significance, with p-values generally falling in the marginal range (between 0.05 and 0.10). This pattern suggests directional evidence of within-genre convergence but also highlights that the estimated effect is modest and sensitive to specification choices, warranting cautious interpretation.

Taken together, the regression results reinforce the conclusion that popular music has not experienced a strong, universal convergence within genres. Instead, observed aggregate homogeneity trends reflect a combination of genre composition shifts and genre-specific dynamics, rather than a broad decline in stylistic diversity within all musical categories. The extent to which convergence is observed further depends on how music similarity is defined, an important consideration explored further in Section 3.4.

Table 1: Weighted Least Squares Regression of Musical Dispersion

	Dependent variable: Dispersion	
	Coefficient	Std. Error
Intercept	0.9173***	0.038
Rock	0.1196***	0.027
Hip-Hop	−0.0529	0.057
R&B / Soul	0.0737***	0.028
Electronic	−0.0961***	0.019
Country	0.0540	0.036
Oldies / Standards	−0.0030	0.093
Other	0.0831***	0.023
Decade (centered at 1980)	−0.0027*	0.002
Observations	44	
R^2	0.745	
Adjusted R^2	0.687	

Notes: The dependent variable is the within-genre dispersion index. Each observation corresponds to a genre–decade cell and regressions are estimated using weighted least squares, with weights equal to the number of charting songs in each cell. Robust standard errors (HC3) are reported. The reference genre is Pop. Decade is centered at 1980. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

2.6: Decomposing Within-Genre Homogeneity by Musical Feature

To better understand which musical dimensions contribute most to observed changes in within-genre homogeneity, I decompose the aggregate dispersion index into its four constituent audio features: danceability, energy, tempo, and song duration. Figure 7 plots the count-weighted within-genre standard deviation of each feature by decade, allowing changes in overall dispersion to be traced back to specific musical characteristics.

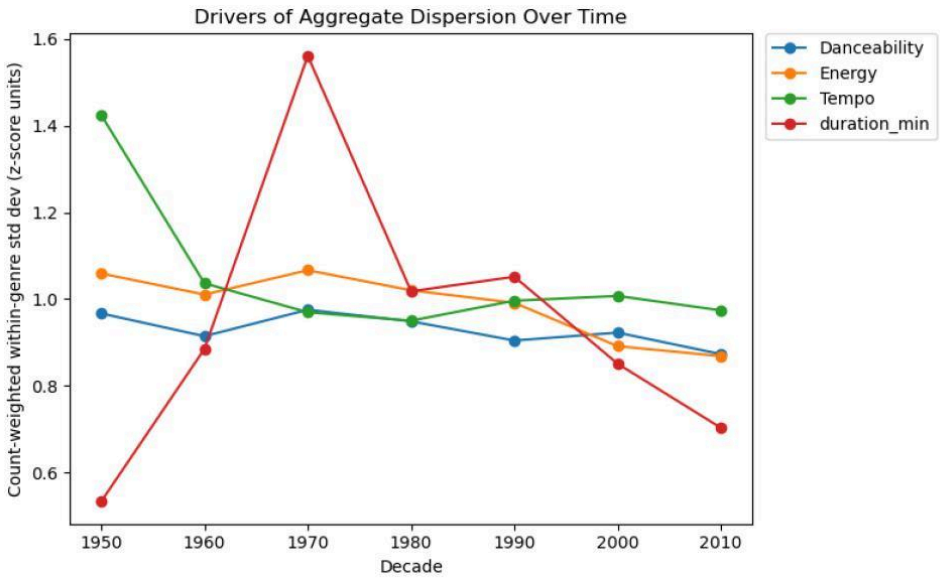

Figure 7.

The figure reveals substantial heterogeneity across features in both levels and trends. Dispersion in tempo is notably high in earlier decades, particularly in the 1950s, but declines sharply by the 1960s and remains relatively stable thereafter. This pattern suggests an early convergence in rhythmic structure that predates more recent discussions of musical homogenization.

In contrast, dispersion in danceability and energy is comparatively stable across decades, exhibiting only modest declines after 1990. These features therefore appear to contribute relatively little to long-run changes in within-genre homogeneity and do not display the pronounced non-monotonic dynamics observed in the aggregate index.

Song duration stands out as the feature with the most pronounced variation over time. Dispersion in duration increases sharply between the 1950s and 1970s, peaks in the 1970s, and then declines steadily through the 2000s and 2010s. Notably, this trajectory closely mirrors the aggregate homogeneity pattern observed in Figure 2, suggesting that changes in song length may play a central role in shaping overall dispersion trends.

Taken together, Figure 7 suggests that within-genre homogeneity does not evolve uniformly across musical dimensions. While some features exhibit early convergence or relative stability, song duration in particular, displays substantial non-monotonic variation. These feature-specific dynamics indicate that aggregate homogeneity reflects structured change in particular musical attributes rather than uniform convergence across all dimensions. The prominence of duration in the decomposition motivates further robustness analysis in the following section.

3: Robustness and Validation

To assess the robustness of the empirical findings, I conduct a series of validation tests that examine the sensitivity of aggregate homogeneity trends to genre composition, weighting schemes, and

the construction of the dispersion index. These analyses collectively evaluate whether the observed decline in within-genre dispersion reflects genuine convergence in musical characteristics or is driven by compositional artifacts or specific measurement choices.

3.1: Fixed-Composition Counterfactual

A primary concern when interpreting aggregate homogeneity trends is that changes may be driven by genre composition rather than convergence within genres. To address this, Figures 8 and 9 present counterfactual homogeneity paths constructed by holding genre shares fixed at their values in selected baseline decades.

Figure 8 compares the observed count-weight homogeneity index to a counterfactual series that applies the 1980s genre mix along decades. While the fixed-composition series differs modestly in level, the overall downward trend closely tracks the observed series, particularly after 1980. This indicates the declining dispersion is not solely attributable to the rising dominance of particular genres, such as Pop.

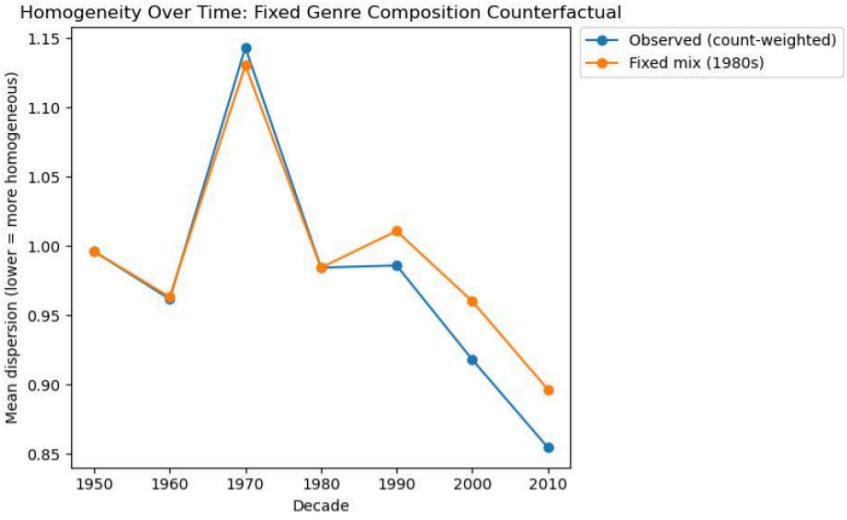

Figure 8.

Figure 9 extends this examination by fixing genre composition at alternative baseline decades (the 1970s, 1980s, and 1990s). Across all counterfactuals, the direction and timing of the decline remain broadly consistent with the observed trend, although the magnitude varies somewhat. Together, these results suggest that aggregate convergence cannot be explained purely by changing genre prevalence and instead reflects within-genre dynamics.

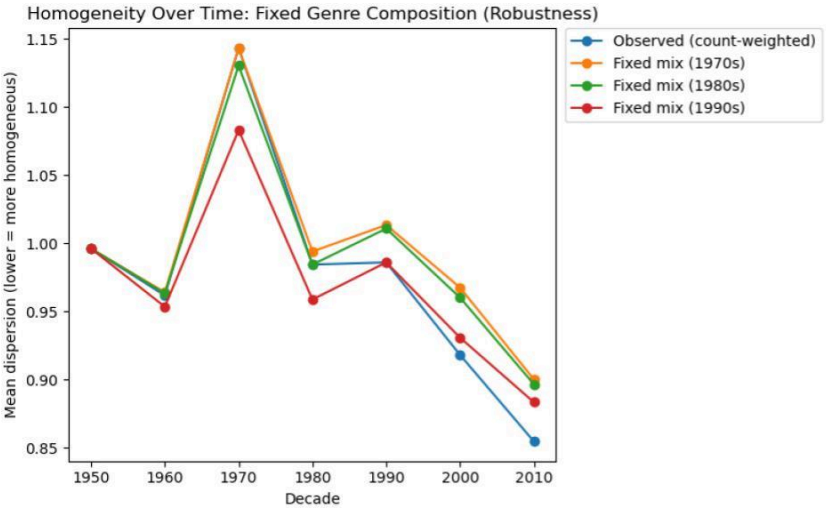

Figure 9.

3.2: Weighting Schemes: Count vs. Equal Weighting

Because genres and decades differ substantially in the number of charting songs, the baseline analysis weights observations by song counts to reflect mainstream exposure. Figure 10 compares this count-weighted homogeneity index to an equal-weighted alternative in which each genre-decade cell receives equal weight.

Although the equal-weighted series exhibits a lower overall level of dispersion, both weighting schemes display similar qualitative patterns over time, including a pronounced peak in the 1970s and a steady decline thereafter. The persistence of these trends across weighting choices suggest that the main findings are not driven by a small number of high-volume genres or decades with unusually dense chart coverage.

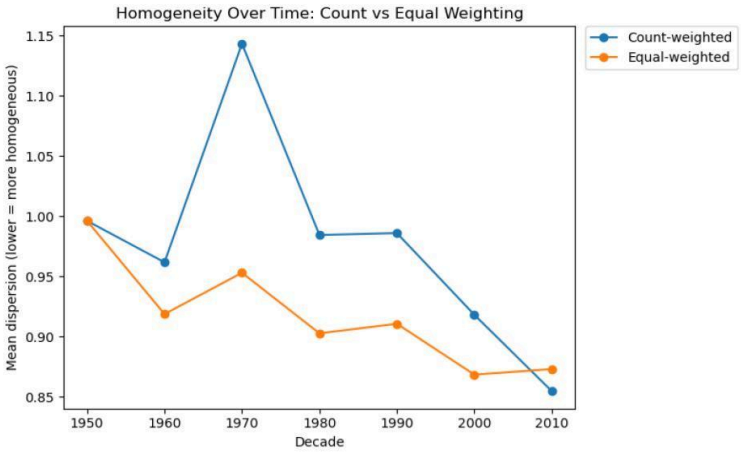

Figure 10.

3.3: Regression-Based Robustness

Appendix table A1 reports alternative regression specifications that vary weighting schemes and standard error assumptions. Across models, including equal-weight OLS, count-weight WLS, clustered standard errors, and square-root weighting, the estimated time trend remains negative. However, its magnitude and statistical significance vary across specifications, with p-values typically falling between conventional 5% and 10% thresholds.

This sensitivity indicates that while there is consistent direct evidence of declining within-genre dispersion over time, the estimated effect is modest and should be interpreted cautiously. Importantly, the attenuation of the time coefficient after controlling for genre fixed effects reinforces the conclusion that aggregate homogenization is not driven by uniform convergence across all musical styles.

3.4: Excluding Song Duration from the Dispersion Index

The feature-level decomposition in Section 2.6 shows that dispersion in song duration closely mirrors the aggregate homogeneity index, raising the possibility that trends in song length may disproportionately influence the overall measure. To assess this concern, I re-estimate the main

homogeneity measures excluding duration and constructing dispersion using only tempo, energy, and danceability (Figure 11).

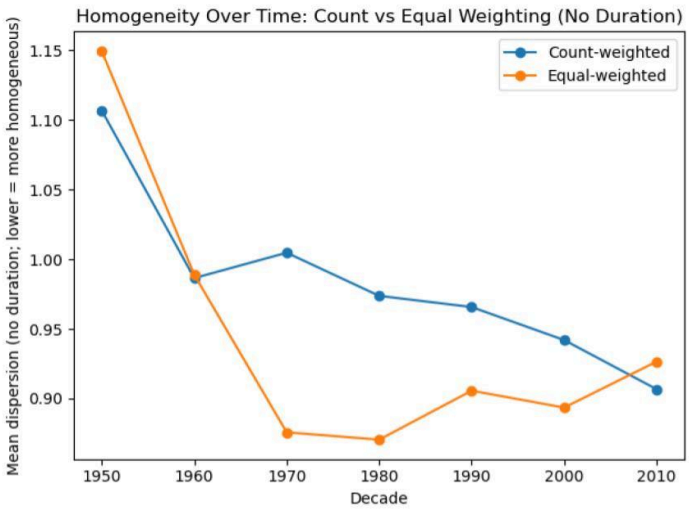

Figure 11.

Under count-weighting, the no-duration homogeneity index continues to decline across decades, indicating increased similarity on these musical dimensions when aggregation reflects mainstream chart exposure. However, the equal-weight no-duration exhibits a different pattern: dispersion declines sharply from 1950 to 1970, then gradually increases after 1990. This divergence suggests that when genre-decade cells are treated symmetrically and song length is excluded, evidence of sustained convergence weakens and partially reverses in later decades.

Regression results reinforce this interpretation. As demonstrated in the no-duration regression results reported in Table 2, once broad-genre fixed effects are included, the estimated linear trend in no-duration dispersion is small and statistically insignificant ($\beta = -0.0008$, $p = 0.348$). Together, these results indicate that earlier evidence of within-genre convergence is not robust to excluding duration and depends in part on how genres are weighted. Rather than reflecting uniform convergence across all musical dimensions, aggregate homogeneity trends appear to be driven largely by changes in song length and by shifts in genre prominence over time.

Table 2: Weighted Least Squares Regression of Within-Genre Musical Dispersion (Excluding Duration)

	Dependent variable: Dispersion (no duration)	
(lr)2-3	Coefficient	Std. Error
Intercept	0.9423***	0.025
Rock	0.0545*	0.031
Hip-Hop	−0.0985	0.081
R&B / Soul	0.0529***	0.020
Electronic	−0.2373***	0.035
Country	0.0679***	0.026
Oldies / Standards	0.0116	0.102
Other	0.0717***	0.025
Decade (centered at 1980)	−0.0008	0.001
Observations	48	
R^2	0.821	
Adjusted R^2	0.785	

Notes: Each observation corresponds to a decade × broad-genre cell. The dependent variable is the within-genre dispersion index constructed from standardized audio features excluding song duration (danceability, energy, and tempo). Models are estimated using weighted least squares with weights equal to the number of charting songs in each cell. Robust standard errors (HC3) are reported. The reference genre is Pop. Decade is centered at 1980. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

4: Conclusion

This paper set out to evaluate the widely held claim that popular music has become increasingly homogeneous over time. Using within-decade dispersion of standardized Spotify audio features as a measure of musical similarity, I find this narrative is only partially supported and depends critically on how homogeneity is defined, which musical dimensions are considered, and whether genre composition is explicitly accounted for.

At the aggregate level, charting music does not display a smooth or monotonic increase in homogeneity across the post-1950 period. Instead, overall dispersion follows a pronounced non-monotonic pattern, rising sharply during the late 1960s and 1970s before declining steadily from the 1980s onward. While the 2010s exhibit the closest measured dispersion in the sample, the observation must be interpreted cautiously given changes in chart coverage and data availability in the most recent decade.

Crucially, aggregate trends mask substantial heterogeneity across genres. When homogeneity is computed within broad musical categories, no uniform pattern of convergence emerges. Some genres, particularly Pop and Electronic music, exhibit modest declines in within-genre dispersion in later decades, consistent with narratives of increasing standardization. Other genres, such as Rock and R&B/Soul display earlier periods of diversification followed by partial reconvergence, while Hip-Hop and Country show relatively stable dispersion once they emerge. These heterogeneous trajectories indicate that musical homogenization is not a universal industry-wide process but instead operates unevenly across styles.

Regression evidence reinforces this interpretation. Once broad-genre fixed effects are included, the estimated time trend in within-genre dispersion becomes small and at most marginally significant. This suggests that a substantial portion of the apparent aggregate convergence reflects shifts in genre composition rather than systematic within-genre narrowing. In other words, popular music has not become uniformly more similar within all genres; rather, changes in which genres dominate the charts play a central role in shaping aggregate perceptions of similarity.

Decomposing the dispersion index by musical feature further clarifies these dynamics. Tempo and energy exhibit relatively stable or early-period convergence, while danceability shows only modest long-run change. While changes in song length themselves are a meaningful structural feature of popular music, song duration stands out as the feature with the most pronounced non-monotonic trajectory, closely mirroring the aggregate homogeneity index.

Robustness analyses confirm both the strengths and limits of these findings. Fixed-composition counterfactuals show that holding genre shares constant yields trends that closely track the observed decline in dispersion, indicating that convergence is not purely a mechanical artifact of changing genre prevalence. However, when song duration is excluded from the dispersion index, the genre-adjusted time trend becomes small and statistically insignificant. This result implies that evidence of within-genre convergence is not robust across all musical dimensions and is driven in part by changes in song length rather than uniform convergence.

Overall, these results complicate claims that popular music has become steadily more homogenous. While certain genres and musical attributes exhibit increased similarity in recent decades, there is little evidence of broad universal convergence across all styles and dimensions. Instead, observed homogenization reflects a combination of genre-specific dynamics, feature-specific trends, and shifting patterns of mainstream exposure.

4.1: Limitations

Several limitations of this analysis should be acknowledged.

First, the dataset includes only charting songs, capturing mainstream commercial success rather than the full universe of musical production. Songs are included based on appearance on Billboard or ARIA charts, which reflect commercial success and industry visibility. As a result, the findings speak to trends in highly visible, commercially dominant music and may not generalize to underground, independent, or non-Western musical traditions. Homogenization within the charts does not necessarily imply declining diversity in musical production overall.

Second, chart coverage and data density vary substantially over time, particularly across early and late decades. Earlier periods contain relatively few charting songs while the number of observations increased sharply in the 1990s and 2000s due to changes in chart reporting and musical distribution. Although the analysis addresses this concern by focusing on within-decade dispersion, using count-based weights, and employing heteroskedasticity-robust standard errors, estimates for early decades and less prevalent genres are necessarily noisier due to changes in chart reporting, music distribution, and consumption technologies. In addition, the decline in dispersion observed in the 2010s should be interpreted cautiously, as it may partly reflect selective inclusion rather than true contraction in stylistic variety.

Third, genre classification relies on broad genre categories, which necessarily aggregate over substantial internal heterogeneity. While this aggregation is required to ensure stable decade x genre cells, particularly in earlier decades, it may mask important within-genre stylistic shifts. For example, Pop and Electronic music encompass a wide range of subgenres that may exhibit divergence trends in homogeneity. Future work could examine finer genre distinctions or artist-level clusters to better capture these internal dynamics.

Fourth, the audio features analyzed: tempo, energy, danceability, and duration, only capture certain aspects of musical similarity. Other dimensions such as harmony, melody, lyrical content, and production techniques are not observed. While Spotify's features provide a consistent quantitative framework, they cannot fully represent the depth of musical expression.

Moreover, the results indicate that dimension choice plays a large role in driving aggregate homogeneity patterns. Although changes in song length are themselves meaningful, robustness checks show that evidence of within-genre convergence weakens substantially once duration is excluded from the dispersion index. This suggests that conclusions about musical homogenization depend in part on which dimensions are emphasized, and that convergence in certain structural attributes does not necessarily imply convergence across all musical characteristics.

Finally, this analysis is descriptive rather than causal. While the results document when and where convergence occurs, they do not identify the underlying mechanisms driving these changes. Future research could investigate the role of streaming platforms, algorithmic recommendation systems, industry consolidation, or production technologies in shaping genre-specific homogeneity trends.

Despite these limitations, the analysis provides systematic empirical evidence that complicates simplistic narratives of musical homogenization. By distinguishing between aggregate trends, genre composition effects, and feature-specific dynamics, the paper highlights that perceived convergence in popular music reflects structured and uneven change rather than a uniform decline in stylistic diversity.

5: Appendix

A1: Robustness of Time Trend in Within-Genre Dispersion

This appendix presents supplementary tables that assess the robustness of the main empirical findings to alternative weighting schemes, standard error assumptions, and the construction of the dispersion index. These results support the interpretations in Sections 2.5 and 3, and are intended to provide additional transparency rather than introduce substantive claims.

Table 1: Robustness of the Time Trend in Dispersion (Genre-Adjusted)

Model	Weighting	SE type	$\hat{\beta}$ (Decade)	SE	p	N
OLS (equal-weighted)	None	HC3	-0.00053	0.00095	0.577	44
WLS (count-weighted)	n_{songs}	HC3	-0.00270	0.00156	0.084	44
WLS (count-weighted)	n_{songs}	Clustered by decade	-0.00270	0.00147	0.067	44
WLS (sqrt count-weighted)	$\sqrt{n_{songs}}$	HC3	-0.00170	0.00100	0.091	44

Notes: Each specification estimates $dispersion_{dg} = \alpha + \beta \cdot decade\_centered_d + \gamma_g + \varepsilon_{dg}$, where γ_g are broad-genre fixed effects (i.e., `C(broad_genre)`). The dependent variable is within-genre dispersion (lower values indicate greater homogeneity), constructed at the decade × broad-genre cell level. `decade_centered` is defined as `decade` − 1980, so β is the change in dispersion per one-decade increase in time.

Table 2: Decade-Level Dispersion (Excluding Duration): Count-Weighted vs. Equal-Weighted

Decade	Count-weighted	Equal-weighted	Difference (Count − Equal)
1950	1.15114	1.14960	0.00154
1960	0.98878	0.98889	-0.00011
1970	1.00469	0.87570	0.12899
1980	0.97371	0.87042	0.10329
1990	0.96567	0.90560	0.06007
2000	0.94197	0.89345	0.04852
2010	0.90666	0.92650	-0.01984

Notes: Values report decade-level dispersion indices constructed from standardized audio features excluding song duration. "Count-weighted" aggregates weight decade × genre cells by the number of songs; "equal-weighted" assigns equal weight across cells.

Table 3: Drivers of Aggregate Dispersion Over Time (Feature-Specific Within-Genre Dispersion)

Decade	Danceability (SD)	Energy (SD)	Tempo (SD)	Duration (SD)
1950	0.967071	1.059166	1.424632	0.533618
1960	0.914637	1.010588	1.036492	0.885365
1970	0.975493	1.066682	0.969775	1.560630
1980	0.948850	1.020382	0.950373	1.018055
1990	0.904621	0.991408	0.996391	1.051629
2000	0.922847	0.891619	1.007363	0.851031
2010	0.873276	0.868677	0.974092	0.703337

Notes: Values report decade-level, count-weighted within-genre standard deviations of standardized (z-scored) audio features. Each decade value aggregates decade × broad-genre cells, weighting by the number of songs in each cell. Higher values indicate greater dispersion (less homogeneity) along a given feature.

Table 4: Change in Feature Dispersion from Peak (1970s) to 2010s

Feature	1970 (SD)	2010 (SD)	Change (2010 − 1970)
Danceability	0.975493	0.873276	-0.102217
Energy	1.066682	0.868677	-0.198005
Tempo	0.969775	0.974092	0.004317
Duration	1.560630	0.703337	-0.857293

Notes: Based on Table 3. Negative values indicate declining dispersion (increasing homogeneity) from 1970 to 2010.