

Local Trends in Global Music Streaming

Samuel F. Way,¹ Jean Garcia-Gathright,¹ Henriette Cramer¹

¹Spotify Research
{samfway, jean, henriette}@spotify.com

Abstract

Audio streaming services have made it easier for countries around the world to listen to each other's music. This expansion in listeners' access to global content, however, has raised questions about streaming's impact on the import and export flows of music between countries and their preferences for local or global content. Here, we analyze five and a half years of all streaming data from Spotify, a global music streaming service, and find that preferences for local content have increased from 2014 through 2019, reversing previously noted trends. Perhaps correspondingly, both common official language and geographic proximity between countries increasingly shape listener consumption during this period, particularly for younger audiences. Further, we show that these trends persist across different genres, listener age groups, and early- and late-adopters of streaming, providing new insights into this newest phase in the continued evolution of music and its impact on listeners around the world.

Introduction

The invention of sound recording technology served to partially decouple the art of music from its original performance, allowing it to be distributed to a wider audience and experienced over and over again. More recently, in the early 2000s, the distribution of recorded music began to shift from physical (i.e., vinyl, cassettes, and compact discs) to digital media (digital downloads and streaming), lowering trade costs in the global exchange of music and enabling wider audiences still. This shift, in conjunction with recording technology becoming more advanced and accessible, has made it easier than ever for countries to listen to each other's music.

Technological innovations often have profound effects on what kinds of cultural products are produced and by whom (Appadurai 1996). Much has been written about whether globalization's effects are on the whole beneficial or not and whether they might be inevitable or irreversible (Robertson 1992; Clark 1997; Frankel 2000; Antonio and Bonanno 2000; Spicer and Fleming 2007; Cowen 2009). On one hand, globalization can broaden consumers' choice sets, introduce artists to more fans, and inspire new styles of music forged through the combination of

global sounds and techniques (Cowen 2009; Magu 2015). On the other hand, globalization can advantage wealthier countries to dominate global trade and contribute to the supplanting of local culture with homogeneous global products (Tomlinson 1999). Understanding the balance of these aspects of globalization — as well as how and why that balance changes over time — represents a crucial and evolving issue at the intersection of the social and economic sciences.

As one of the most prevalent and easily traded cultural products, music has been the focus of many studies on globalization (see (Burnett 2002) for an early summary). Recent studies on global music exchange in the digital era have tended to focus on pop music and the extent to which large markets, specifically the U.S. dominate global consumption (Verboord and Brandellero 2018; Gomez-Herrera, Martens, and Waldfogel 2014). Countries' appetites for globally- or locally-sourced content has been operationalized through the lens of *home bias* or the degree to which countries prefer music created in one's home country (Ferreira and Waldfogel 2010; Gomez-Herrera, Martens, and Waldfogel 2014). Home bias and its patterns over time provide useful insight into the evolution of globalization and countries' preferences for local products. Aligning with these studies, we adopt a listener-centered definition of "local", defining it as music whose main performing artist is from the same country as the listener, with "global" referring to music produced in any other country. Using these definitions, recent studies have shown that globalization is on rise (Verboord and Brandellero 2018) and home bias is on the decline (Gomez-Herrera, Martens, and Waldfogel 2014).

Here, we build upon past studies on the globalization of music and make several key contributions. First, we extend this line of inquiry to on-demand music streaming services, which, in recent years, have overtaken physical media and digital downloads as the largest distribution channel of recorded music by revenue (International Federation of the Phonographic Industry 2019). On-demand streaming differs crucially from past distribution channels in that the cost barrier to access global music has been dramatically reduced for many consumers. Specifically, on these platforms, users typically pay no additional amount to stream music produced in other countries, thereby greatly expanding their choice sets

and allowing them to more easily explore global music. By expanding listeners' access to global music, intuition might suggest that streaming services would accelerate globalization and potentially divert listenership of locally-produced content to music imported from other countries. Instead, we find that preferences for local content have increased throughout the streaming era, and that this trend is consistent across different genres, listener age groups, and registration cohorts. Similarly, we note the growing importance of language and geographic proximity in shaping global music trade, each suggesting that although the world of music has become more connected, preferences for local content are growing.

To provide a deeper understanding of the kinds of music being traded internationally and the people trading it, our analyses consider consumption by genre as well as the ages of listeners, drawing connections between past work from the musicology and economics literature. Finally, our investigation considers the evolution of streaming's adoption in markets around the world and how it affects measures like home bias over time. This evolution informs how early- and late-adopters of the technology differ in their consumption of global music, yet shows that these differences alone cannot explain overall trends in home bias.

We begin our study with a preliminary investigation of the data sources leveraged by our analyses. We then investigate trends in global music exchange, first generally and subsequently through the use of gravity modeling, which we introduce in a later section. We conclude with a discussion of our results and their implications for future studies on the globalization of music.

Data

The primary source of data for our study is derived from five and a half years of music streaming logs on Spotify, an on-demand audio streaming platform that at the time of writing is the largest such platform in the world, operating in 79 countries with over 248 million monthly active users (henceforth "listeners") (Spotify Technology S.A. 2019). We analyzed music consumption in 90-day windows leading up to the first day of the month in January, April, July, and October, from April 2014 to October 2019 (i.e., spanning the period of January 2014 through October 2019). For each 90-day window, we considered the number of all streaming occurrences lasting at least 30 seconds, which henceforth will simply be called "streams." Each stream was characterized by its origin, based on the country of origin of the main performing artist, and its destination as the country where the listener registered their Spotify account. Streams were further aggregated according to listeners' self-reported ages and the genre of the music being streamed. Self-reported listener ages were combined into age buckets (i.e., one of 18-24, 25-29, 30-34, 35-44, or 45-54). Older age brackets were sparse in some markets and therefore excluded from analysis. After exclusions, our data comprise over three trillion unique streams.

Genre was inferred from each performing artist's most common Gracenote genre label, which partitioned streams into 18 high-level categories including Pop, R&B, and Rock,

among others. Previous studies have tended to focus on the exchange of Pop music specifically (Ferreira and Wald-fogel 2010; Verboord and Brandellero 2018), as it is the largest genre by global market share and one of the best studied and documented. Here, we extend these analyses to other genres in order to provide a more holistic understanding of global music exchange and, in particular, any differences between Pop and other genres. Country of origin for exchanged music was also determined at the artist level by selecting the first available country affiliation from a prioritized list of Spotify's sources. This process prioritizes artists' self-reported origins, followed by manually-curated data sets, International Standard Recording Code metadata from the artists' tracks, and, lastly, the country in which the artist is highest ranked, based on stream counts.

Our analyses of global music trade model the effects of countries' economic masses, as well as the impact of shared official language and geographic separation. We measured the mass of a country in two ways. First, as is common in trade flow studies (Kepaptsoglou, Karlaftis, and Tsamboulas 2010), we used yearly Gross Domestic Product (GDP) estimates, sourced from the International Monetary Fund's World Economic Outlook database (International Monetary Fund 2019). Second, for comparison, we approximated the mass of each country using the number of artists from that country streamed during each 90-day time period. For language and geography variables, we combined the data sets outlined above with auxiliary data from the Centre d'Études Prospectives et d'Informations Internationales (CEPII) (Head, Mayer, and Ries 2010; Head and Mayer 2013). CEPII's dataset compiles common covariates in trade flow studies, which we integrated by matching countries and territories according to their two-letter abbreviations/codes (i.e., their International Organization for Standardization 3166-1 alpha-2 codes). Though separate in the streaming logs, CEPII groups Monaco with France (i.e., MC to FR), Liechtenstein with Switzerland (LI to CH), and Luxembourg with Belgium (LU to BE). Accordingly, we pooled the streaming data set to match these groupings.

After joining the two data sets, we leveraged CEPII's annotations for whether countries share a common official language (`comlang_off`). As described in (Melitz and Toubal 2012), this covariate considers countries' (at most) two most important languages in world trade, and assigns a binary label for whether or not each pair of countries shares a common language. CEPII's Geographic distance (`dist`) covariate uses the great circle formula to calculate geodesic distances between key cities/agglomerations, based on population and measured in kilometers (Mayer and Zignago 2011).

Our analyses investigate trends in the global exchange of and preferences for music over time. However, during the five-and-a-half-year period spanned by our data, much has changed beyond just listener preferences. In particular, during this period, Spotify expanded from 51 to 79 countries by October 2019. Additionally, within each of these countries, the underlying composition of listeners has also evolved over time, and early adopters of the platform may exhibit different preferences than individuals who joined later. We

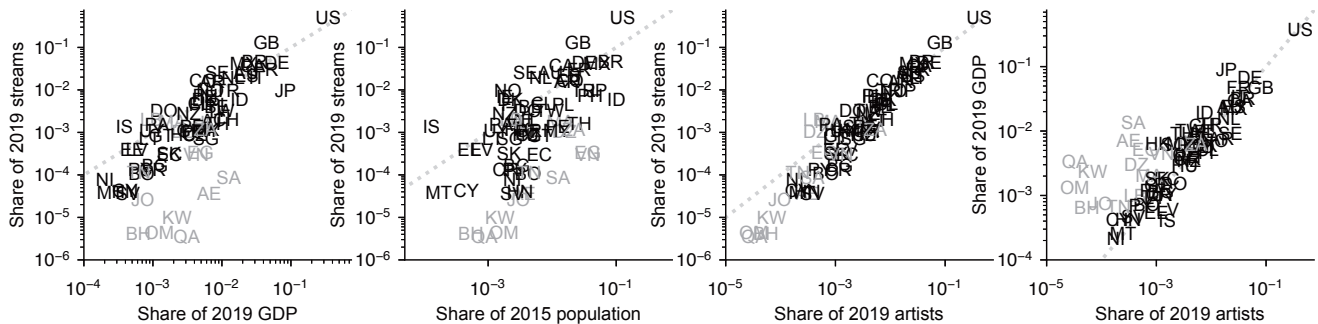


Figure 1: Countries’ individual shares of all artists and streams scale with GDP. Shown on log-log axes, the subplots illustrate the relationships between countries’ individual shares of total GDP and their corresponding shares of all streams and artists on Spotify. Notable outliers in the plots include recent market expansions for the service, namely countries added within the last year (shown in lighter text).

investigate this possibility directly and, where appropriate, we restrict certain analyses to particular markets and registration cohorts, noting these restrictions in the text. These choices help mitigate but cannot fully erase all possible confounds of our analyses, which we consider in more detail in our discussion.

Methods

To quantify changes in global music exchange over time, we adopt gravity models, a technique borrowed from the economics literature and most often used to model trade flow between countries (Kepaptsoglou, Karlaftis, and Tsimboulas 2010). In their simplest form, gravity models assert that, given two countries i and j with economic masses M_i and M_j – frequently approximated using GDP – and separated by a physical distance $\text{distance}_{i,j}$, the trade flow between the countries $\text{trade}_{i,j}$ follows the gravity equation,

$$\text{trade}_{i,j} = G \cdot \frac{M_i M_j}{\text{distance}_{i,j}}. \quad (1)$$

Here, G denotes a fixed gravitational constant. This simple model provides a useful baseline for the amount of trade flow that one might reasonably expect to observe between countries based solely on their economic sizes and geographic proximity. Naturally, other factors contribute to trade partnerships, including, but not limited to, shared spoken language, colonial histories, or home bias (i.e., when i and j are the same country). Such factors can be incorporated directly into this regression framework by adding dummy variables to Equation 1.

To align our results with those from the literature, namely (Ferreira and Waldfogel 2010) and (Gomez-Herrera, Martens, and Waldfogel 2014), we fit gravity models of log consumption using ordinary least squares regression.

$$\log(\text{trade}_{ij}) = \beta_0 + \beta_1 \log(M_i) + \beta_2 \log(M_j) + \beta_3 \log(\text{distance}_{ij}) + \mu_i + \mu_j + \gamma_{ij} \quad (2)$$

Under this formulation, β_3 absorbs the negation incurred by the log-transform operation, μ_i and μ_j denote fixed effects for individual countries, and γ_{ij} denotes an error term.

This formulation differs slightly from other studies in that it incorporates economic mass terms and fixed effects for the countries. Here, the incorporation of fixed effects help to capture the impacts of listener adoption and catalog expansion over time. Extending Equation 2 to capture the effects of home bias and common official language produces the following model.

$$\log(\text{trade}_{ij}) = \beta_0 + \beta_1 \log(M_i) + \beta_2 \log(M_j) + \beta_3 \log(\text{distance}_{ij}) + \beta_4 \text{home_bias}_{ij} + \beta_5 \text{comlang_off}_{ij} + \mu_i + \mu_j + \gamma_{ij} \quad (3)$$

Here, “home_bias” represents an indicator variable for signaling when i equals j (i.e., when a country “imports” its own music). Common official language (comlang_off) and distance terms are incorporated leveraging the CEPII data described previously. This formulation serves as the basis for our analyses below, where we add interaction terms with time (i.e., to model trade flow over the 90-day windows defined in the Data section) and listener age where noted. Fitting gravity models using ordinary least squares regression has known shortcomings (Silva and Tenreyro 2006), particularly when trade_{ij} equals zero. For this reason, we replicated our analyses using Poisson regression, which produced qualitatively similar results. To align our work with past studies, we present our findings from ordinary least squares, adding a small constant (i.e., 1) to all trade totals to address any instances of zero trade.

Results

Past studies have found that the amount of music traded between two countries is strongly affected not only by their sizes but also by whether they speak the same language and the geographic distance that separates them (Ferreira and Waldfogel 2010; Gomez-Herrera, Martens, and Waldfogel 2014). Before applying any sort of modeling approach to quantify how the effects of these characteristics have potentially changed over time, we begin with a preliminary investigation of the most recent year of data in order to determine the extent to which global trade appears to be shaped by

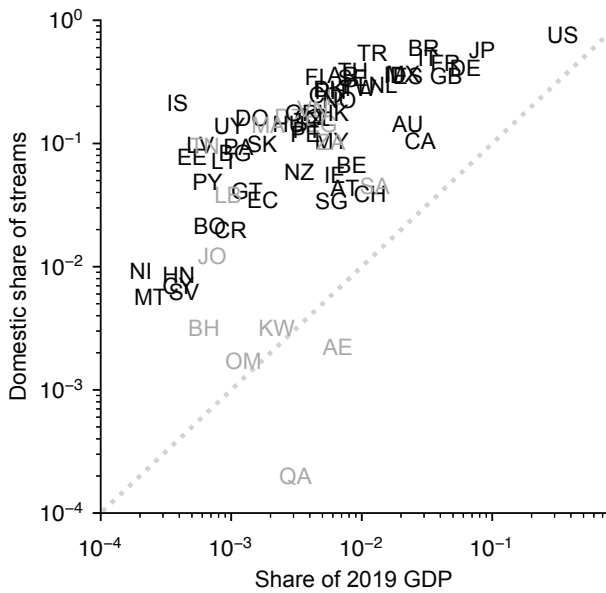


Figure 2: Most markets exhibit a strong preference for local content, with the exception of newer markets. Nearly all countries show significant preference for their own music. New markets in 2019 (lighter gray) constitute the earliest adopters of Spotify in the respective countries.

these three attributes more generally. This inspection serves as both an exploratory analysis of our data and highlights complications that will need to be addressed by later analyses.

Corroborating past studies, we confirm that countries' in-

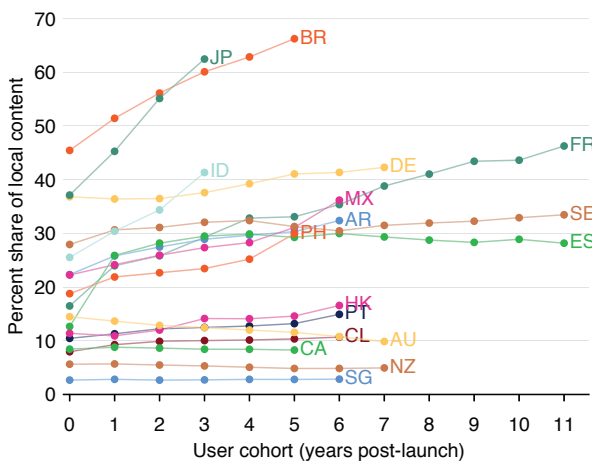


Figure 3: Late adopters (as registration year cohorts) of Spotify tend to prefer more local content. Late 2019 consumption patterns reveal that listeners who were late adopters of Spotify tend to stream more local content than listeners who joined the platform earlier.

dividual shares of total GDP for in-sample countries scale approximately with their individual shares of global music exports, as measured by total streams and artists (Figure 1). This scaling holds, as well, for individual shares of the total population of included countries. Given the relatedness of these measures, we focus our later modeling efforts and their presentation on GDP figures but note that replicating our analyses using these other measures yielded qualitatively similar results.

Comparing the various measures of country sizes reveals two noteworthy patterns. First, the United States (US) accounts for the largest fraction of each output measure, but its share of these outputs does not appear deviate far from what might be expected given its size, both in terms of population and economy. A second pattern suggests a disparity in the shares of certain markets relative to their population and economic mass. These countries (shown in lighter gray text in Figure 1) comprise recent expansions for Spotify's service and point to a source of complexity that complicates our downstream analyses: as markets mature, the composition of their users and thus overall preferences changes. In particular, the observation that new markets exhibit weaker preferences for local content (Figure 2) could suggest that as markets mature, their preferences in aggregate might shift to prefer more locally-produced music. This potential shift in the underlying distribution of a country's listeners could imply a change in home bias without any change to individual-level preferences, a complication that would need to be addressed by our analysis.

To investigate this possibility directly, we analyzed listeners' consumption in the most recent time period by registration cohort (i.e., the year they joined Spotify) in each market, noting the fraction of all consumption devoted to local artists. While the size of the effect varies, late adopters

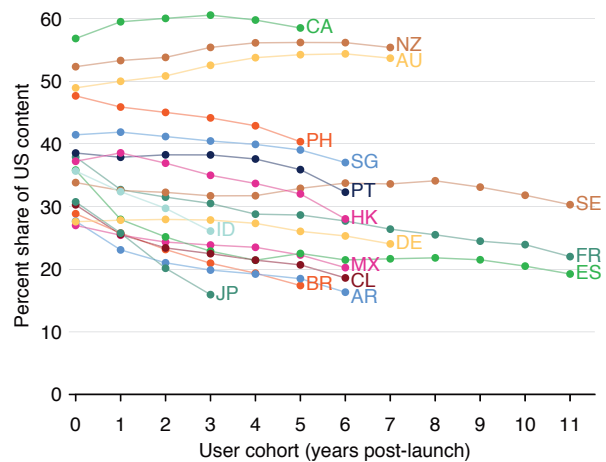


Figure 4: Late adopters of Spotify in global markets stream less US-based content than earlier adopters in the same market. As in Figure 3, binning listeners by registration cohort reveals that late adopters tend to stream less US-based content than early adopters.

indeed often exhibit higher preferences for local content (Figure 3). Similarly and perhaps correspondingly, early adopters generally show larger preferences for US-based content (Figure 4). Together, these findings highlight an important consideration for our analyses and, more generally, for any study into trends in technology. The consideration reminds us that early adopters of any technology frequently differ significantly from those who adopt it later (Rogers 2010). For this reason, we restrict our gravity modeling analyses to countries in which Spotify launched prior to 2014. Further, we replicate our results for individual registration cohorts to rule out market maturation as the driver of any observed trends.

Following our initial investigation of country sizes, we now turn briefly to the effects of language and geographic proximity. Here, we are less concerned with the volume of music being exchanged but, rather, to where countries are exporting their music and the similarity of these export distributions across countries. Comparing Spearman’s rank correlation coefficients between countries’ normalized export distributions for all 2019 time periods (Figure 5), clear structure emerges, aligning with geographic and language similarity. To highlight this structure, we applied unsupervised hierarchical clustering (UPGMC (Müllner 2011)) to specify the order of the rows and columns and form a dendrogram to illustrate similar groupings of countries.

Most prominently, Spanish-speaking countries exhibit strong similarities in the recipients of their exported music. Within this group, Spain and bordering Andorra exhibit similar trade patterns as other nations with large Spanish-speaking populations but are distinguished by a higher degree of similarity with other European countries. The broad appeal of music from the United States manifests in the country exporting to similar partners as most other countries included in the analysis. Europe contributes the largest number of countries to the analysis and is, by comparison, more heterogeneous. At least some of this heterogeneity can be attributed to European countries’ commitment to learning multiple languages (Hufeisen and Jessner 2009). One exceptional example, Switzerland (CH), has four official languages – German, French, Italian, and Romansh – of which the most common is German. The notion that countries might exchange music in (potentially many) languages besides their official one has important implications for the interpretation of our later analyses on language. In particular, our reliance on common official languages serves as only a crude proxy for whether two countries might understand or value the lyrical content of each other’s music.

Rounding out our preliminary analyses of the data, we now turn to gravity models and a longitudinal analysis of home bias in global music streaming. These initial findings suggest important considerations for the construction and interpretation of these models, particularly the evolving nature of recently-launched markets.

Gravity Modeling

Past studies applying gravity models to global music exchange have monitored the evolution of three key components: the effects of home bias, common official languages,

and geographic distance. In particular, (Gomez-Herrera, Martens, and Waldfogel 2014) conducted a comprehensive analysis of Nielsen data on digital download consumption and found negative trends for all three quantities.

To fit gravity models over time to the streaming data set, we applied the model framework of Equation 3, adding date index interaction terms between between home bias, common language, and geographic distance covariates respectively. Each model incorporated fixed effects for each origin and destination country by date. In light of the findings from our preliminary analyses, we restricted modeling here to only include the 51 countries in which Spotify was operating for the entirety of the 2014 to 2019 period spanned by our data.¹

	(1)	(2)	(3)
home_bias	2.619*** (0.045)	2.78*** (0.059)	2.435*** (0.043)
home_bias:trend	0.014*** (0.003)	0.009** (0.004)	0.016*** (0.003)
comlang_off	1.646*** (0.021)	2.053*** (0.028)	1.293*** (0.02)
comlang_off:trend	0.011*** (0.002)	0.006*** (0.002)	0.013*** (0.001)
log(distance)	-0.497*** (0.007)	-0.59*** (0.009)	-0.414*** (0.007)
log(distance):trend	-0.004*** (0.001)	-0.004*** (0.001)	-0.004*** (0.0)
Observations	59823.0	59823.0	59823.0
R2	0.968	0.95	0.971
Note:	*p<0.1; **p<0.05; ***p<0.01		

Table 1: Gravity modeling shows growing roles for home bias, common language, and geographic distance. Three models are shown: (1) includes all streaming activity between countries; (2) includes just consumption of the Pop genre; and (3) spans consumption of all genres except for Pop. Each model includes fixed effects by date for each origin and destination, GDP of origin and destination, fixed trend effects, and an intercept term.

Table 1 summarizes the three covariates of interest, along with their interactions with time, for three different subsets of the data. The first model (1) was applied to consumption of all genres combined, whereas (2) was restricted to just the Pop genre, and (3) considered consumption of all genres *except* Pop. As indicated by the interaction terms, in the years spanned by our analysis, home bias is rising, marking a reversal of the trend observed in (Gomez-Herrera, Martens,

¹For completeness, the following countries were included in our gravity model analyses: {AR, AT, AU, BE, BG, BO, CH, CL, CO, CR, CY, CZ, DE, DK, DO, EC, EE, ES, FI, FR, GB, GR, GT, HK, HN, HU, IE, IS, IT, LT, LV, MT, MX, MY, NI, NL, NO, NZ, PA, PE, PL, PT, PY, SE, SG, SK, SV, TR, TW, US, UY}.

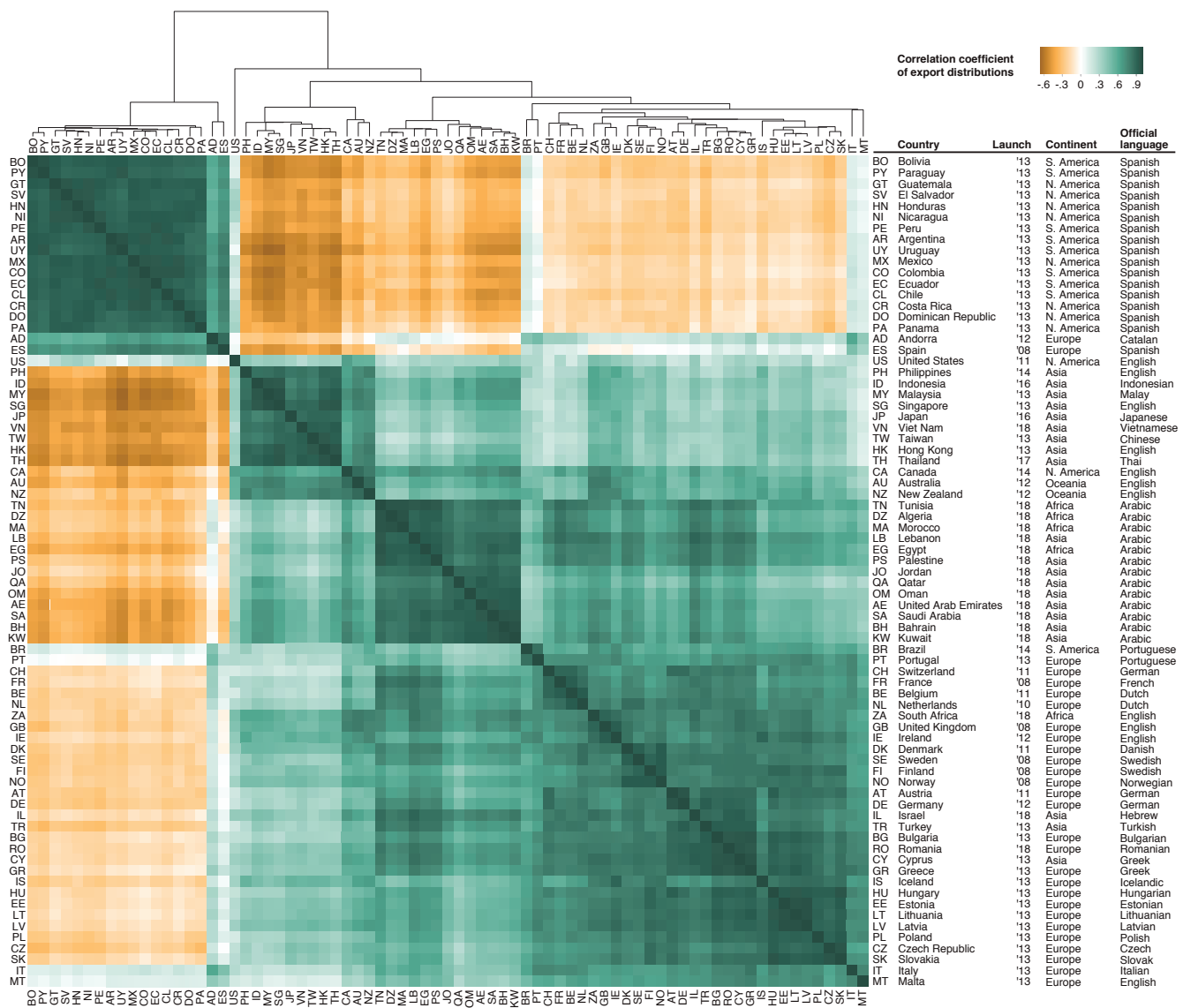


Figure 5: Global music exchange reflects shared language and physical proximity. (Left) Similarity between countries' trade partners is shown as a heatmap of Spearman's rank correlation coefficients between country export distributions. Green cells indicate countries with similar export partner rankings, and orange denoting dissimilar. Hierarchical clustering (UPGMC algorithm) was applied to order the plot and construct the dendrogram. Annotations (Right) include unabbreviated country names, continents, and official languages. Structure in the heatmap and patterns in its annotations point to strong effects of language and geographic distance in shaping where the world shares its music.

and Waldfogel 2014) for digital downloads through 2016. Similarly, common official language has also grown during this period, meaning shared language increasingly contributes to more international streams on Spotify. In contrast, the effects of geographic distance have grown more negative over time, continuing trends identified by past studies, indicating that global music consumption has shifted to become more constrained in the digital and now streaming eras.

Comparing the three models, these general trends are consistent across the different subsets of genres. While Pop music (Model 2) shows larger effects across the covariates, tem-

poral trends suggest that the differences in effects between Pop and other genres have narrowed during this period.

To provide insight into whether these trends might be driven by certain listener ages, we applied a similar model formulation to subsets of the data corresponding to each age group. Specifically, we removed interactions over time and, instead, inferred effects for each date period individually. Consistency in the shape of each covariate's progression over time and across age groups (Figure 6) indicates that no particular age group is alone in contributing to the overall trends noted in Table 1 (i.e., for each age group we

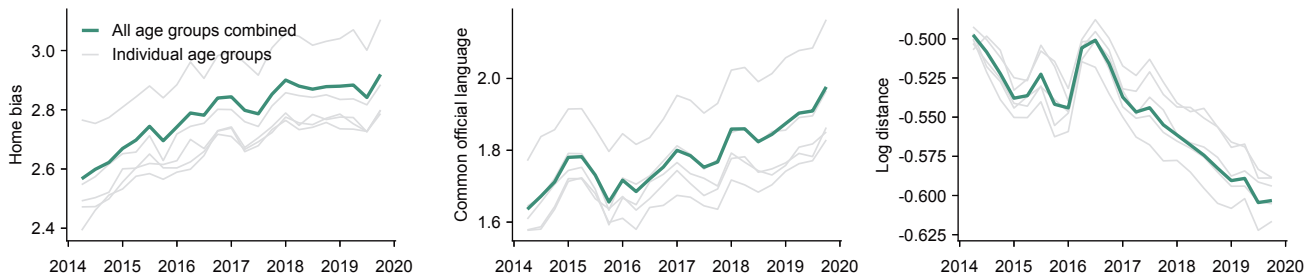


Figure 6: Trends in the effects of home bias, language, and geographic distance are preserved across age groups. Listeners across all age buckets have experienced similar trends in the effects of these three attributes.

observe home bias increasing, language effects increasing, and distance effects decreasing over time).

Despite showing consistency in their trends over time, age groups might nevertheless exhibit differences in the effects of home bias, common language, and geographic distance. To more directly estimate these differences, we restricted our analysis to age group totals for all 2019 time periods and fit gravity models including interaction terms for age groups. Table 2 summarizes the results of three models trained, once again, on different subsets of genres: (1) all genres, (2) just Pop, and (3) all genres except Pop. In each model, the third age group (30-34) served as the reference in the regression.

With regard home bias, the age groups exhibit similar preferences for locally-produced music in each of the three genre subsets. However, key differences distinguish the age groups with respect to both language and geography. First, the effect of common language on music trade is diminished for the two oldest age groups (35-44 and 45-54), a pattern that holds similarly for both Pop and non-Pop genre subsets. Of note, common language appears to be somewhat less important to the youngest age group for Pop music exclusively, though the same does not apply to non-Pop genres.

Geographic distance revealed similar patterns distinguishing age groups. Here, the youngest age group showed significantly lower effects for geographic distance, indicating a larger preference for music produced near one’s own country in all three genre subsets.

For younger listeners to hold the strongest preferences with respect to the origin and language of music supports past research into the heightened social roles that music plays in the lives of younger listeners (DeNora 1999; Selfhout et al. 2009). Further, it is consistent with the notion that these roles are generally preserved across cultures (Balkwill and Thompson 1999; Boer et al. 2012), which would contribute to greater preferences for music in the same language and from places that are closer and thus whose music is historically more accessible.

Finally, our preliminary analyses suggested that evolving markets and changes to the underlying distribution of listeners on Spotify could give rise to perceived differences in global preferences. To mitigate this possibility, we restricted our gravity modeling analyses to only include countries in which Spotify had launched prior to the start of 2014.

Nevertheless, these markets themselves continued to evolve throughout our sample frame, and early- and late-adopters may exhibit different preferences. To assess how the observed trends in global music exchange potential vary as a function of evolving markets, we fit gravity models to subsets of our data, combining listeners into cohorts according to the year in which they created their Spotify account.

Comparing cohorts of listeners who joined between 2014 and 2017, we find that the general trends for home bias, language, and geographic distance are preserved (Figure 7), albeit with heterogeneity. That the effects of language and distance here would differ somewhat from the overall trends is perhaps unsurprising in light of our results so far. In particular, given that each cohort represents increasingly later adopters of already-launched markets, the dampening of these trends aligns well with the general notion that late adopters of technology tend to be somewhat older, and that older listeners have distinct preferences with regards to language and geographic distance (Table 2). Home bias, in contrast, tracks neatly across registration cohorts.

Discussion

In this study, we analyzed trends in the global exchange of music in the (ongoing) streaming era. Like past studies of the digitization and globalization of music, our work implies that the changes we observe in music consumption over time reflect changes in the underlying preferences of the people and countries included in our analysis. Such assumptions imply a static model for the music countries produce, its uniqueness, quality, and relevance to other countries. However, music, like the technologies used to record and distribute it, along with the people who adopt these new technologies, is constantly evolving. We took precautions to mitigate several sources of complexity in our analyses but cannot address how music itself has changed during this period. Studying how global music’s composition has evolved over time goes well beyond the scope of our current study but represents an interesting direction for future work and an important test on the assumptions made by this and related studies. Recent work examining human song provides a useful framework for how such a study might one day be realized (Mehr et al. 2019), though extending the analysis to all music poses significant challenges.

	(1)	(2)	(3)
home_bias	2.892*** (0.097)	3.118*** (0.125)	2.684*** (0.092)
home_bias:y18-24	-0.022 (0.135)	-0.163 (0.173)	0.048 (0.128)
home_bias:y25-29	-0.021 (0.135)	-0.069 (0.173)	-0.004 (0.128)
home_bias:y35-44	-0.032 (0.135)	-0.071 (0.173)	-0.022 (0.128)
home_bias:y45-54	-0.076 (0.135)	-0.183 (0.173)	-0.133 (0.128)
comlang_off	1.939*** (0.034)	2.365*** (0.043)	1.453*** (0.032)
comlang_off:y18-24	-0.014 (0.046)	-0.101* (0.059)	0.067 (0.043)
comlang_off:y25-29	0.001 (0.046)	-0.035 (0.059)	0.027 (0.043)
comlang_off:y35-44	-0.124*** (0.046)	-0.124** (0.059)	-0.115*** (0.043)
comlang_off:y45-54	-0.157*** (0.046)	-0.16*** (0.059)	-0.181*** (0.043)
log(distance)	-0.613*** (0.012)	-0.726*** (0.015)	-0.495*** (0.011)
log(distance):y18-24	-0.07*** (0.015)	-0.07*** (0.02)	-0.08*** (0.015)
log(distance):y25-29	-0.025 (0.015)	-0.016 (0.02)	-0.034** (0.015)
log(distance):y35-44	0.023 (0.015)	0.008 (0.02)	0.019 (0.015)
log(distance):y45-54	-0.009 (0.015)	-0.027 (0.02)	0.002 (0.015)
Observations	25919.0	25893.0	25917.0
R2	0.954	0.931	0.961

Note: *p<0.1; **p<0.05; ***p<0.01

Table 2: Interactions with age show differences in the effects of language and geographic distance. As in Table 1, three models are shown: (1) includes all streaming activity between countries; (2) includes just consumption of the Pop genre; and (3) spans consumption of all genres except for Pop. Each model includes fixed effects for each origin and destination, GDP of origin and destination, and an intercept term. Coefficients measure age interactions computed for aggregate of consumption across all 2019 time windows.

Despite these challenges, mapping the evolution of music itself represents a potentially essential, missing piece in our understanding of how globalization has impacted music and, more specifically, what underlies the ebb and flow of forces like home bias. Similar processes are reflected in the history of MTV Europe’s focus on “international”, English-language content, which was later replaced by demand for local music television stations serving more local content and in local languages (Roe and De Meyer 2017). Robert-

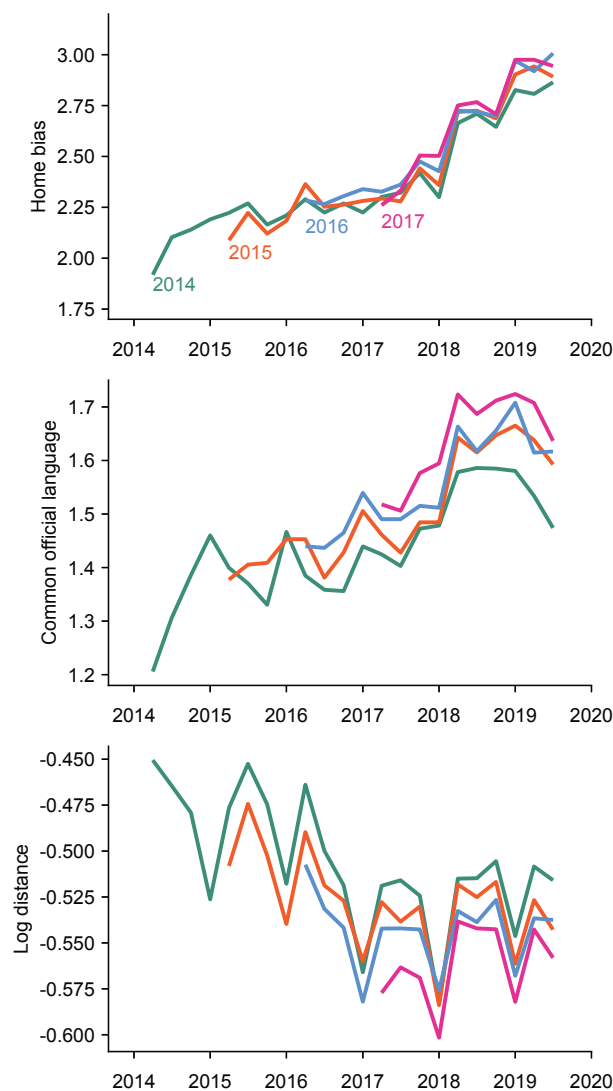


Figure 7: Trends in home bias, language, and geographic distance replicate across registration cohorts. Lines denote home bias trends from gravity models fit on subsets of the data, restricting analyses to registration cohorts by age.

son’s concept of “glocalization” offers one possible explanation for these dynamics, asserting that localization — like the trend we observe here — is not the undoing of prior globalization but rather the next phase of a connected process wherein countries take global cultural forms and products and adapt them for local tastes (Robertson 2018). With this in mind, a greater understanding of how music has changed in the digital era and in different locales would inform how these cultural processes relate to one another and explain whether our findings represent the reversal of past globalization or its continued hybridization (Pieterse 2019).

An important caveat to our study is that Spotify operates in a large but nevertheless limited set of countries, and that

even within these countries, there exist populations of individuals who, for a variety of reasons, cannot access the service. Among these reasons, access to the Internet and Internet-ready devices is far from universal and restricts our analysis to generally wealthier individuals and nations. Similarly, content licensing agreements vary by region and play a role in shaping what global music is accessible to listeners. Such restrictions limit any at-scale analysis of global music exchange and underscore the importance of continued ethnomusicology research to shed light on the communities and cultures not spanned by data sets like the ones studied here.

Our analyses consider how countries consume each others' music by associating each artist and listener with a single country of origin. This association assumes positive affiliation between artists and their countries and, with regard to home bias, that listeners' preferences are influenced by the affiliation. Whether this assumption is valid and the degree to which these affinities hold true or potentially vary by location or the artist's popularity remains untested. Past studies indicate possible issues related to the perceived identity and authenticity of extremely popular artists (Pope 2016) and suggest that listeners themselves may develop split musical identities, corresponding to local and global tastes (Arnett 2002). To this end, we welcome future studies exploring how people's connection to place shapes the musical identities that they develop.

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