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What's Going On? Digitization and Global Music Trade Patterns since 2006

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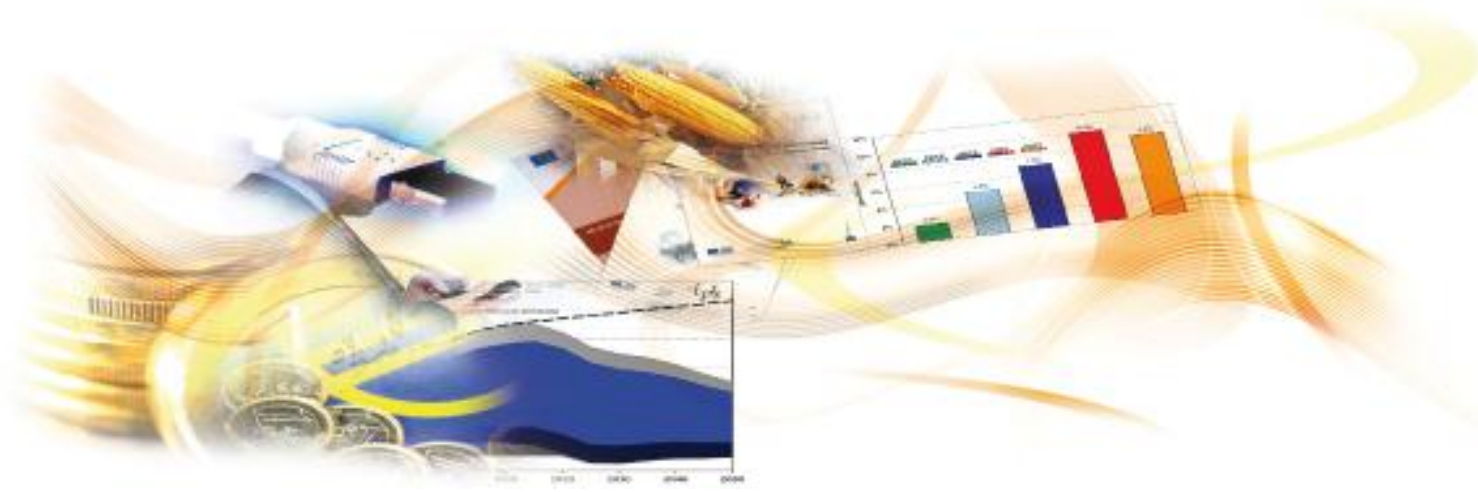

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Non-technical summary

The objective of this paper is to document the evolution of cross-border music trade patterns in this transition period and to explain what drives digital music trade patterns. The shift from analogue to digital music distribution has substantially reduced trade costs and has enlarged the choice sets of music consumers around the world. Using comprehensive data on digital track sales in the US, Canada, and 16 European countries, 2006-2011, we document patterns of music trade in the digital era and contrast it with what's known from elsewhere about trade in popular music for the past half century.

While home bias in music consumption among the top 100 songs had grown in the pre-digital distribution period prior to 2006, home bias has declined since then. We find that the share of imported songs in music consumption has grown in all countries except in the US. Moreover, although the number of European songs available has risen faster than the number of US songs, the market share of the US in digital music sales has increased while the market shares of European repertoires have fallen. US repertoire holds the largest market share in almost every country. Home bias is lower in the long tail than at the top end of the distribution.

We consider four candidate explanations for the shift away from domestic music: a) that growth in availability of particular repertoires explains their growth in total sales and market shares, b) that changes in the effect of distance-related trade costs on trade made possible by digitization explain changed patterns of trade, c) that changed preferences toward particular origin repertoires explains changed patterns, and d) that recent vintages of particular repertoires have grown more appealing to world consumers. We conclude that a combination of c) and d) offers the most credible explanation for the observed patterns.

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1. Introduction

Over the past half century – and especially since the diffusion of the Internet – consumers around the world have had better access to cultural products, and information about them, from elsewhere in the world. The growth of the Internet as an unregulated zone for music promotion may undermine policies promoting local music. Digital retailing threatens to exacerbate this loss of control: not only can consumers avoid locally regulated promotional outlets; they also can have access to a growing number of tracks from abroad. One might expect the shift from physical to digital music sales to create a global music market as transport costs are reduced to zero on the internet. Yet whether digitization promotes a global marketplace depends on two separate issues: what's available to consumers in different countries; and given what's available, what they choose to purchase. While one cannot download digital music in online stores outside one's country of residence, one can, however, buy physical CDs online in another country. For example, Apple iTunes, the market leader in digitally downloaded music, keeps all its country stores strictly separated by digital walls, and so do all legal digital music stores. Hence, the impact of digitization on international music trade patterns remains an open question. Some factors may have facilitated greater trade; others make it more difficult. The objective of this study is to find out what is happening to consumers' options, their choices, and the ensuing patterns of trade in this market for digital music.

Against the backdrop of the European concerns about the demise of domestic repertoires, it is perhaps surprising that home market shares in music markets rose between the early 1990s and the mid-2000s. Ferreira and Waldfogel (2012) (FW henceforth) document that even as information and communication technologies had improved, consumers bought relatively more domestic music. Home bias increased substantially between 1992 and 2005, allaying some of the concerns about Anglophone cultural hegemony. In their gravity model of music trade, geographical distance continued to matter: the elasticity of trade with respect to distance was -0.3. How has this changed with digital retailing?

Marketing of digital music began in earnest with the launch of the iTunes Music Store in the US in 2003 and in much of Europe beginning in 2004. Since, then digital music distribution has grown rapidly in many countries (see Table 1). While the US had an unusually high digital share in 2008 (38 percent, as opposed to 10 percent for most countries), digital shares have recently converged. In 2012 Norway and Sweden surpassed the US digital share of 63 percent. The UK digital share was 45 percent in 2012, compared with 33 percent in Spain, 26 percent in France, and 20 percent in Germany. Digital distribution is clearly supplanting physical, so understanding its impact on consumption and trade patterns is of growing importance.

Digital distribution has the promise of reducing trade costs rather substantially. Not only is it unnecessary to ship physical goods, it is also unnecessary to ship unsold goods back, nor to maintain costly physical inventories. . Digitization of distribution may thus allow massive expansion of consumers' choice sets, for both domestic and foreign music. If the availability of foreign cultural products were to have large effects on trade patterns, the advent of digital distribution would constitute a large-scale experiment with relevance, for example, to the EU Digital Single Market or an EU-US Trans-Atlantic Free Trade Agreement. And, indeed, this is the episode we propose to examine in this paper. Using comprehensive data on digital track sales in the US, Canada, and 16 European countries, of which 14 EU Member States, for 2006-2011, we document patterns of music trade in the digital era and contrast it with what's known from elsewhere about trade in popular music for the past half century.

We begin, borrowing from Marvin Gaye, by simply asking, "what's going on?" Because this is the first study of music trade with comprehensive data going deep into the long tail and far beyond the top of the charts, we start by simply characterizing the cross-country patterns of trade, asking who trades with whom? And what are the roles of language and distance in these trade patterns? We then turn to recent developments, asking how patterns of trade have evolved with digital retailing

since 2006. How has the availability of domestic and foreign products evolved under digitization? Has trade grown and, by extension, have home shares declined? Which repertoires make up growing or declining shares in various destinations? And which repertoires are gaining market share in the world? After documenting these facts, we channel Lennon and McCartney in a "tell me why" section of the paper that explores several candidate explanations for the changes. First, does the growth in availability of foreign repertoires explain their growth? Second, in line with traditional international trade models, does the digitization of products change the role of geographical distance, reducing the effect of distance on trade volumes; and if so, would that explain the evolving patterns? Third, does changing preference toward origin repertoires explain evolving market shares? Or, fourth, are there changing attitudes toward repertoire that are specific to recent vintages, indicating that new works from particular repertoires are more appealing to world consumers than are older works.

The paper proceeds in five sections. Section 2 describes our data. Section 3 characterizes cross-country trade patterns occurring with digital retailing. Section 4 characterizes recent changes with digitization. We first characterize the evolution of choice sets: does digitization expand the choice sets of domestic and foreign music products around the world? Second, does trade increase (i.e. does the domestic share of the music market decrease)? Third, which country repertoires garner growing and shrinking market shares in various destination markets? And finally, how do the various origin repertoire market shares evolve? Section 5 ("tell me why") explores availability, changing distance effects, and shifting repertoire appeal as possible explanations. A brief conclusion follows.

Our findings are as follows. First, cross country patterns of digital music trade resemble cross country patterns of trade generally: distance between origin and destination countries matters, language of the two countries matters, and there is substantial home bias (preference for domestic repertoire), which varies strongly across countries. Second, with the shift to digital retailing cross-border trade makes up a growing share of consumption and, by extension, domestic consumption occupies a shrinking share. The US is an exception: the home share is by far the highest of all countries in our sample and remains roughly constant in the digital era. As a result, US repertoire makes up a growing share of the volume of world music consumption in the digital era. However, this does not seem to be an Anglo-Saxon or English language issue: UK home shares also decline. Patterns of availability seem not to explain this shift: while availability of songs for all country repertoires grows in all destinations, the number of US-origin songs actually makes up a declining share of what's available over this period. Falling trade costs seem not to explain the result, for two reasons: 1) falling trade costs would raise imports into the US as well as in European countries; 2) we present gravity model estimates showing, surprisingly, growing negative effects of distance on trade in this period. We instead conclude that growth of US-origin market shares both at home and abroad are best explained by a growth in the appeal of US repertoire over time, especially new repertoire (<3 year old) rather than a general shift in preferences toward old and new US-origin music.

2. Data and Descriptive Patterns

The basic dataset for this project comes from Nielsen Music and covers a large sample of annual digital downloads or sales[1] of songs (tracks), in each of 18 countries, 2006-2011. This includes EU Member States Austria, Belgium, Germany, Denmark, Spain, Finland, France, England, Ireland, Italy, the Netherlands, Poland, Portugal, Sweden; non-EU European countries Norway and Switzerland, and the US and Canada in North America. For a more detailed description of the Nielsen dataset

[1] In this paper we use the terms "sales" and "downloads" as equivalent. The Nielsen dataset contains information on the number of downloads for a song, not the sales revenue from these downloads.

see Tables 9 to 11 in the Technical annex. Section 4 in the Technical annex explains the preparation of the data that was carried out for the purpose of this study.

For each song in the dataset we have song title, artist name, and year and country of production based on the ISRC[2] code. An observation is a song-country-year (each song can appear in multiple countries and can continue to appear in the data as long as it is sold). The data include more than 52 million song-country-year observations and cover 4.4 million distinct songs. The data cover only digital and not physical sales; they only cover legal sales and not pirated downloads.

The last three columns of Table 1 compare the Nielsen digital download sample data with IFPI data on total digital downloads per country for 2011. The IFPI reports 7.5 million digital track sales in Norway for 2011, while the Nielsen data include 6.01 million downloads or a coverage ratio of 80%. While the ratio of Nielsen to IFPI digital downloads varies across countries (from 0.46 in Austria to 1.15 for Portugal), it seems accurate to say that the Nielsen data cover the vast majority of known digital sales.

The ISRC year of production codes turned out to be quite reliable when compared with external sources, so that we can measure the original release year or "vintage" of tracks in the sample.[3] However, the ISRC country codes were often not meaningful and did not provide a robust indication of the country of origin of the artist. We attributed songs to origin countries by matching artists with artist information in the Musicbrainz database (see technical annex). Using this approach, we are able to match artists accounting for 91% of total sales. This gave us the ability to quantify bilateral annual country sales of digital songs, 2006-2011.We observe trade from as many as 206 origin countries to our 18 destination countries. Of the total consumption in our destinations, products from 101 origins with positive flows to each destination in every year make up 99.9% of destination consumption.

3. Trade Patterns

3.1 Who Trades with Whom

While we will ultimately be interested in understanding changes under digitization, it is instructive to first use the comprehensive bilateral digital music trade data to examine cross country patterns of trade. For descriptive purposes, there are a few useful ways to organize the data. We can look at a destination country and examine the origin distribution of its consumption ("where do imports come from?"). Or we can look at an origin country, asking "where do its exports go?" One challenge with the latter question is the differential development of digital markets around the world. Because the US and Nordic digital markets are more developed than markets in larger European countries, it appears in digital trade data that the US and Nordic countries are a larger destination that they would be if all countries' digital markets were similarly developed.

Table 2 uses 2006-2011 data to ask where destination consumption is from, and a few patterns are evident. First, the main diagonal entries are larger than many other entries, indicating "home bias," or that a large share of consumption in each country is domestic music. The US domestic share is an especially large entry, at 76%, indicating that the vast majority of US consumption is domestic. The second-largest home share is for Great Britain (GB), at 37%. Second, countries sharing a language trade more. For example, a large share of music consumed in Belgium and Switzerland is from France; and a large share of Austrian consumption is from Germany. Third, music from the US and GB has large market shares in most destination countries, often larger than the home market share, especially in smaller countries. US repertoire has an average market share

[2] ISRC = International Sound Recordings Classification system.

[3] We compared the vintage implied by their ISRC year with the year of release in the Musicbrainz database, a widely-used open source database on recorded music. Dates matched for 96%.

of roughly 30% in European markets. GB repertoire has an average market share of about 15% in other European markets.

3.2 Language and Patterns of Trade

The data in Table 2 can be depicted graphically to show patterns of trade within and across linguistic groups. The data in Table 2 shows each destination country's consumption of each origin repertoire. Some part of origin repertoires' differing market share simply reflects size: larger origin countries tend to have more music products and therefore a larger share of destination consumption apart from elevated preferences for those repertoires. For example, the music of relatively small Austria makes up a relatively small share of destination consumption; and at home it accounts for 6.5% of consumption. Domestic consumption accounts for 76% of US consumption, by contrast. One way to remove the size bias is to normalize relative to home consumption, asking for example, how large is the Austrian share in Germany relative to its (home) share in Austria? We term this ratio (1.4/6.5) the relative preference for Austrian repertoire in Germany.

Figure 2 depicts trade patterns by language, reporting relative preferences for each repertoire in each destination along each row. We represent relative preference by color, where darker colors reflect higher values (from yellow to orange to red to black). To aid visualization of linguistic trade patterns, we group linguistically similar countries together: the German-speaking Austria and Germany, as well as Switzerland; the French-speaking countries France and Belgium that also share a language with Switzerland; the Netherlands shares a language with Belgium; the English-speaking countries US, GB, CA, and IE, and the Nordic countries are separate groups, just like Spain, Portugal, and Italy. The main diagonal is omitted.

If there were a preference for the same language, we would see this as darker dots in the linguistic blocks along the diagonal. And indeed we see this: the dots in the Francophone, German-speaking, and English-speaking diagonal blocks are black. Off-diagonal blocks show the relative preference of, say, German-speakers for French-language repertoire; and vice versa. Both of these blocks contain relatively dark dots. Relative preference for English-language repertoire is high everywhere, as indicated by dark dots in the Anglophone blocks along the rows for repertoire from the US, Great Britain, Canada, and Ireland. English-speakers, by contrast, have low relative preference for non-Anglophone repertoire (note the light dots above US, GB, CA, and IE along the horizontal axis). Nordic consumers have relatively dark dots for repertoires of all languages.

In short, every country likes its own repertoire; and speakers of every language like repertoire in their own language. The dislike of other languages is not symmetric. English is universally embraced; and non-English-speaking European consumers are more willing to consume foreign repertoire than are the English-speaking consumers.

3.3 Summarizing Trade Patterns with Gravity Models

While the raw data are interesting, the traditional gravity model of international trade provides a parsimonious way to organize the data, allowing direct quantification of the respective impacts of distance, common language, and home bias on patterns of consumption and trade. The intuition behind the gravity model is that the volume of trade between two countries is a function of their respective size and the distance between them. Larger countries close to each other trade more than smaller countries far away from each other. That intuition has been confirmed many times in empirical trade analysis (Anderson and Van Wincoop, 2003; Anderson, 2011). In an economic context, distance does not only stand for geographical distance and the physical transport costs associated with that. In the trade literature it has been interpreted more widely and become a catch-all proxy variable for all types of trade costs, including taxes, regulatory and linguistic barriers, etc.

We begin with a gravity model relating trade from one country to another to variables measuring geographic distance between them and whether they share a language. Because we observe domestic consumption as well as cross-border trade we also include a variable that measures the

relative preference for consumption of domestic instead of imported products. We begin – in column 1 of Table 3 - by including year dummies, as well as origin and destination fixed effects. The year dummies should pick up the common growth in digital consumption levels. The origin fixed effects reflect the average appeal of origin repertoire, over and above the aspects of the effect operating through distance and language. The destination fixed effects indicate the destination country's appetite for consumption. Finally, the home consumption term indicates the extent to which home repertoire is consumed more than foreign repertoire, conditional on other factors in the model. Subsequent columns of the table present elaborations on the basic specification. Column 2 adds destination-specific time dummies to allow for different rates of growth in different markets. Column 3 adds origin-specific time dummies. Columns 4-6 repeat these exercises for the restricted sample including only country pairs with positive trade flows in all years.[4]

The results confirm what was evident in the descriptive tables. Distance matters: the elasticity of trade with respect to distance is -0.37. Home bias is large: the coefficient of 2.46 on the home repertoire dummy means that domestic repertoire attracts 10.7 times as much consumption as foreign repertoires ($e^{2.46}$-1=10.7), conditional on the other variables (including the appeal of the repertoire abroad). Common language also is associated with more trade: countries sharing a language have 50% more trade than countries that do not, all else equal, a fact that, while true, obscures some of the richness of linguistic trade patterns documented above. In addition to reflecting the raw data, these results also confirm what has been found elsewhere. In a similar specification – also on trade on in popular music – Ferreira and Waldfogel (2012) find a distance coefficient of -0.3, a home coefficient of 2.4, and a common language coefficient of 0.7. Studying use of foreign websites, Blum and Goldfarb (2006) find a distance coefficient of -2.8. Gomez-Herrera et al. (2013) find similar distance effects in e-commerce activity.

3.4 Heads or Tails

Unlike previous research employing data on the top of the charts, we have the full distribution of songs, so we can check whether trade determinants differ between the head and the tail of the distribution. To do this we estimate gravity models separately for songs in the top 500 in each destination and year and the rest. This comparison raises one complication. In a given year a destination's top 500 includes imports from fewer countries than its remaining thousands of song sales. Because we are interested in how trade patterns vary between the head and the tail of the distribution, we restrict attention to observations (country pairs years) with trade in both the destination's top 500 and its remainder. This leaves us with 2,594 observations. As the first two columns of Table 4 show, trade determinants are broadly similar in the head and the tail: the distance and language coefficients are nearly identical, but home bias is substantially smaller in the tail. The coefficient is 2.1 rather than 2.8, indicating that domestic repertoire is about 15 times more common in the top 500 compared with about 7 times more common in the tail.

4. Changing Trade Patterns in the Digital Era

4.1 Does Digitization Increase the Choice Set?

We now turn to the question of whether trade patterns have changed in the digital era. If digitization reduces cross-border trade costs, then at a minimum digitization should manifest itself with an increase in the numbers of both domestic and foreign products available in each country. Unfortunately, we do not observe the full list of available songs in a country; instead, we infer

[4] Zero trade observations are ignored in an OLS regression of the gravity model. Still, they may contain information that would bias the results. Other methods have been developed to overcome this problem, such as the Pseudo-Maximum Likelihood method and the Helpman-Melitz-Rubinstein two stage approach. We do not apply them here.

what's available from what sells at least one copy in a year, and Table 5 describes the data on the numbers of distinct songs sold in each country in each year. The first and second columns of Table 5 show the total number of domestic tracks available in each country in 2006 and 2011.

The territoriality of the copyright regime gives rise to costs of making digital music available across borders. Because online stores are geographically separated, songs available in one country are not necessarily available in another. Still, song track availability by every measure is increasing in every country. In the US in 2006, consumers purchased 1.1 million distinct tracks, compared with 2.4 million distinct tracks in 2011. Other countries have fewer tracks available, but the proportionate growth is similar; for instance, Austria's total tracks more than doubles.

The third and fourth columns show the percentage of available songs from the US in each year. Columns 6 and 7 show the same figure for songs coming from home and columns 9 and 10 replicate these figures for EU-origin tracks.[5] As the number of tracks available grows substantially between 2006 and 2011, the share of US-origin song tracks in country choice sets declines. While the domestic share of available tracks declines by 4.2% in the US, the home share rises in most of Europe. However, the share of tracks from EU13 countries is relatively stable over this period, indicating that the share from the rest of the world (the remainder of Europe, Asia, and South and Central America) is also generally rising. These figures seem to confirm the rise of "world music".

While we lack direct evidence on the number of tracks available to consumers around the world prior to digitization, it seems clear that in the digital era, consumers face large and growing choice sets of both domestic and foreign music. Even the largest bricks and mortar music stores do not hold such a large stock of songs. Hence, the period 2006-2011 appears to be an auspicious context for examining possible impacts of reduced trade costs, and concomitant enlarged international choice sets, on patterns of trade and their determinants. We also note, again, that track availability appears to vary substantially across countries, reflecting copyright-related trade costs at least in part.

4.2. Scaling

That our data cover only digital and not total music sales creates some challenges for the analysis. In the period we observe, digital music sales are growing rapidly but at different rates across our destination countries, so that country shares of digital music sales are not representative of country shares of total sales. For example, according to the IFPI, in 2006 digital music sales made up 16.4% of recorded music sales in the US, compared with 5.2% in Spain. By 2011, digital sales accounted for 56% of the total in the US and 30.3% in Spain.

This is evident in our data as well. Digital track sales per capita grow from 1.8 to 3.6 in the US, and from 0.08 to 0.5 in France (see Table 15). This is not because French per capita music spending is so much lower than US spending, nor is it because French music spending is growing more quickly than the US but rather because the digital shares are catching up to the early start in the US.

Because digital music was adopted earlier in the US, during the period of our data (2006-2011), European destination sales in our data appear to grow as a share of total sales. That is, in our raw sales data, European music sales appear to be a growing share of 18-country sales and, because of home bias, that European origin repertoire is attracting a growing share of sales in the world market. Yet, this is an artifact of the late European digital start.

To avoid drawing misleading inferences about origin market shares from the differentially growing digital shares of music sales, we instead treat digital sales as a detailed glimpse into total music sales in each destination country. Accordingly, we aggregate sales across destination countries by scaling our digital sales in each country (q_{ct}) by country shares of total IFPI sales (i.e. by $q_{ct}^{ifpi}/q_{t}^{ifpi}$). This scaling approach also has an important impact on our calculations of origin repertoire market shares. If q_{cot} is the quantity of origin *o* music sold in destination *c* in year *t*,

[5] We use the words "songs" and "tracks" as equivalent in this paper.

then the raw origin *o* share among sales in the 18 countries is: $\sum_{c=1}^{18} q_{cot}/q_t$, where q_t is the sum of all sample sales in year *t*. This ratio is, of course, skewed by digital penetration: the US made up 47.48% of IFPI total recorded music sales among the 18 countries in 2006 and 45.15% in 2011. Yet, the US destination digital sales in the Nielsen sample are 86.14% of total sales in 2006 and 75.51% in 2011, which could create an appearance of a falling US origin share over time even if it were rising in every destination. To avoid this misleading inference we calculate the origin share with scaling, as the sum of origin share in each destination, weighting the origin shares in each destination by the destination's share of the full 18-country sample. That is, we calculate an origin's share of 18-country consumption as:

$$s_{ot} = \sum_{c=1}^{18} \left(\frac{q_{cot}}{q_{ct}}\right)\left(\frac{q_{ct}^{ifpi}}{q_t^{ifpi}}\right).$$

4.3. Does the Traded Share Expand?

If the growing availability of repertoire from abroad makes it easier to buy foreign music, then we should see a growth in trade. We calculate the scaled share of consumption that is imported in a way analogous to our scaled calculation origin shares outlined above.[6] Succinctly, if $s_{ct}^{imported}$ is the imported share of consumption in destination c in year t, then: $s_t^{imported} = \sum_{c=1}^{18} s_{ct}^{imported}\left(\frac{q_{ct}^{ifpi}}{q_t^{ifpi}}\right)$. This is the scaled share of consumption in the 18 countries that is imported. We also calculate an analogous imported share among the 16 European destinations and a third imported share among North American consumption. The home share is the complement of the imported share: $s_t^{home} = 1 - s_t^{imported}$.

Figure 2a shows the share of domestic music in consumption (in our 18 countries). The home share rises from 49 to 50.5% from 2006 to 2007, then declines steadily to 48% in 2011. To put this another way, imported music rises as a (scaled) share of total music consumption in the 18 countries. Figures 2b and 2c examine home shares separately for Europe and North America. The home share is steady in North America, so that the decline in home share – and the increase in imports - is confined to Europe.

4.4. Who Trades with Whom over Time?

We have 206 origin countries and 18 destinations, too many in each dimension for ready visualization, so we divide the origins and destinations into eight groups of countries/regions: North America (the US and Canada combined), each of five large European countries (France, Germany, Great Britain, Italy, and Spain), the remainder of Europe (the rest of the EU, plus Norway and Switzerland), and the rest of the world.

In Figures 3a-h we show the market share of origin repertoires in destination markets. The market shares fluctuate somewhat from one year to the next. In order to aid visual interpretation, we include "median bands" (lines connecting the median of the x and y axis variables in each of multiple bands) in the scatter plots, which provide a smoothed time trend. Figure 4 shows scaled origin repertoire market shares. For example, Figure 3a shows that French-origin repertoire is falling at home but makes up a growing share of sales in Germany, Spain, Italy, and North America. North American repertoire, in Figure 3b, is growing at home and in all other destinations except Italy. The German repertoire share – in Figure 3c – is declining at home and in all other

[6] We calculate the scaled share of consumption that is imported as the weighted sum: (imported share in the US Nielsen data) (US share of 18 country total IFPI recorded music sales)+(imported share in Austrian Nielsen data)(Austrian share of 18-country IFPI total sales)+…

destinations except "other Europe." Spanish repertoire is falling at home – see Figure 3d – but rising in North America and Great Britain. British repertoire makes up a steady share at home, but its share is declining in all other destinations. Italian repertoire is in decline at home and in all other destinations except North America, where its share is steady.

Figures 3a-h convey a large number of disparate facts, but a few patterns are evident. First, some repertoires are gaining and others are losing in various foreign markets. There is no homogeneous picture across the 18 countries; some repertoire shares rise and others fall in the digital music market. Second, home shares are declining for every repertoire, except for North American music. A closer look at North America indicates that only US repertoire is growing in destination consumption.

Because destination markets vary substantially in size – North America's digital music download market is 127 times larger than Italy's and 30 times larger than Germany's – trends in large destination markets documented in the previous section have bigger implications for world market shares than do trends in smaller markets. When we weight the repertoire market shares in the various destinations by the destination shares of the world music market, we arrive at scaled repertoire shares of the "world" (18 countries) music market. Figure 4 shows these evolving shares, again with median bands to aid visual absorption of the information. World market shares are falling for repertoire from France (from 4.1 to 4%), rising in other Europe (from 5.4 to 6.9) and North America (from 58 to 60%). All others are falling.

4.5. What's Going on in Historical Context

In order to characterize a long time pattern, we need to link our data for 2006-2011 with available data on prior periods, from FW. FW have an opportunistic sample of pop charts from various countries 1960-2009. In order to graft our digital data for 2006-2011 to the FW data, we first need to make the samples directly comparable. To this end we do two things. First, because the FW data include as few as 100 songs per year per destination country, for comparability we include only the top 100 songs by country and year from their data. We then link this with the top 100 songs by country and year in the digital data. Second, we include the 16 of our 18 countries that are included in the FW dataset. Third, because FW do not have sales quantity data we approximate quantities using the reciprocal of sales rank.

Using this approach we obtain trade data for the period 1960-2011 (with three years of overlap across data sources). After verifying that the two data sources produce similar results for overlap years, we estimate models combining them. The models include country- pair fixed effects and all coefficients are measured relative to the base year (2006). Figure 5a-c shows the time patterns of home bias, distance, and language effects interacted with years from these models. We see the rise in home bias documented by FW between 1992 and 2006. Home bias then declines, while we see no changes in distance or language effects. While home bias among the top 100 had grown prior to 2006, it has declined since then. In the era of digital song sales, consumers have grown less interested in domestic music at the head of the distribution. This result provides some context for our finding of declining home shares outside the US. Prior to digital sales, home shares had been rising.

5. Tell Me Why

This section seeks to explain what's happened to patterns of world trade under digitization. We consider four candidate explanations: a) that growth in availability of particular repertoires explains their growth in total sales and market shares, b) that changes in distance-related trade costs made possible by digitization explain changed patterns of trade, c) that changed preferences toward particular origin repertoires explains changed patterns, and d) that recent vintages of particular repertoires have grown more or less appealing to world consumers.

5.1. Availability

As we saw above, the availability of foreign repertoire grows substantially in our destinations. Can the growth in availability explain the evolving market shares? This question in turn has two parts. First, does availability have a causal impact on consumption? And second, if so, do the changes in availability in conjunction with the magnitude of the availability effect explain the changes in market shares?

We would like to know whether greater availability of songs from an origin country raises the consumption of the songs from that origin country in destination countries.[7] This is inherently a difficult question for a few reasons. First, causality can run from availability to consumption or vice versa. If French consumers like US music, then we will see more US songs available in France than if French consumers did not like American music. A second reason is measurement error. Our measure of availability, which we would like to interpret as whether a song is on a country choice set, is actually whether a song is *purchased* this year in a destination country. It is likely that some available songs are never purchased.

The solution to both of these problems is an instrumental variable that provides a source of variation in the number of US songs available in France that is driven by the supply of US songs rather than demand. We have two such candidate instruments. The first is the number of US songs observed to be sold this year at home in the US. That is, we propose to instrument the number of origin songs available in each *destination* this year with the number of origin songs observed in the *origin* each year. While origin country entry into recorded music is driven by the overall size of the world market, it is not driven by destination-specific appetites for the origin. So this instrument should give rise to exogenous variation in destination availability.

The population of the destination market provides a second candidate instrument. The motivation to trade with a destination is greater if the destination is larger. If there is a fixed cost of trading, for example the cost of clearing copyright in a new destination country, then the revenue from trading with a destination is more likely to exceed the cost if the destination is a larger market. Hence, the number of songs available in the destination should be related to the population of the destination country.

Table 6 provides estimates. The first two columns report regressions of the log of consumption of an origin's repertoire in a destination on year dummies, destination fixed effects, and the log of the un-instrumented number of origin songs available in the destination. Column 2 adds destination-specific year effects. The coefficients on available songs are small but significant (0.04- 0.06), indicating that consumption of a country of origin repertoire is higher as the number of available songs from that country is larger.

Columns 3 and 4 explore our instruments for the number of origin songs available in a destination. Column 3 uses origin availability alone, and its coefficient is 0.7. Column 4 adds population. Both instruments are very significant. The F-test on their joint significance is 144.36, indicating that we do not have weak instruments.

Columns 5 and 6 revisit the basic regression from column 1 using instruments for availability of origin repertoires in destination countries. The resulting coefficient of interest is in the range of 0.4-0.5, indicating that a 1% increase in the number of available songs from an origin repertoire raises the consumption of that repertoire by about a half a percent in the destination. The fact that instrumented coefficients are much larger than the un-instrumented coefficient has a few possible interpretations, including that the un-instrumented measure is contaminated with measurement error. In the last columns we also revisit these regressions using the sub-sample of country pairs

[7] As explained before, cross-border availability is not automatic in the digital era. The territoriality of the copyright regime implies that sellers incur trade costs to clear copyrights and make their songs available in another country.

that trade in every year. The instrumented coefficient on available origin repertoire songs is 0.4-0.5, again indicating a positive impact of availability on consumption.

Availability appears to matter, and the elasticity of consumption with respect to availability is roughly 0.5. But availability has grown more for European repertoire relative to North American, while North American repertoire has gained in market share, indicating that changed patterns of availability does not explain the changing patterns of repertoire trade in the digital era.

5.2. Weakened Gravity?

In traditional international trade models, distance is a proxy variable for all kinds of trade costs, including transport costs, customs duties and overcoming regulatory barriers. Digital products are weightless and travel at the speed of electrons, so one of the major traditional explanations of a geographical effect of distance on trade is absent in this context. Still, distance related trade costs are not zero in digital trade. Other trade barriers emerge, for instance the cost of clearing copyright across the border and costs related to "cultural distance". Language barriers may be a good proxy for cultural distance. Unlike other cultural products like film and books, music is usually not translated. So in this section we explore whether distance is still a relevant concept for trade in digital music. We ask two questions. First, has the effect of distance on music trade declined on the digital era? And, second, if so, would that explain changed patterns?

Table 7 reports gravity regressions of using the Nielsen data for 2006-2011, with country-pair fixed effects and interactions of bilateral trade determinants with time. To deal with destination-specific time patterns of digital adoption, we also include destination-specific year fixed effects. We summarize possible changes in distance, language, and home bias by interacting them with time trends, in effect asking whether there is a time trend in the distance coefficient, etc, 2006-2011. The distance coefficient falls by 0.025 per year, and home bias falls by 0.12 per year. These regressions include 16,416 observations on a total of 3,079 country pairs. Yet, the particular country pairs included in each year varies because of the zero trade problem.[8]

Column 2 of Table 7 revisits the regressions of the first two columns using only the 101 origin countries trading with all of our destination countries in each year. These regressions include 10,217 observations on 1,744 country pairs; and these observations account for 99.9% of total destination consumption. These regressions have the advantage of avoiding the zero problem and the drawback of being conditional on the origins and destinations included. But having said that, the results in columns 1 and 2 are similar. The distance effects grow more negative, by 0.039 per year, and the home bias falls by 0.12 per year. Common language again has no trend.

We also estimated related models with interactions of the trade determinants with time dummies. The resulting coefficients are presented in Figure 5b, confirming that with a flexible specification, the distance effect grows more negative, home bias declines, and the language effect has less of a clear trend.

The important finding in this exercise is that, rather surprisingly, the effect of distance has grown more negative over this period. In other words, geographic distance seems to have become more important in the digital era.

Standing back, might the changed distance coefficient explain times patterns of trade? Interpreted as either a literal trade cost or a preference differential, larger distance effects give rise to depressed consumption of more distant products. Suppose distance effects declined to zero. Then, in effect, European repertoire would be either effectively less expensive or more appealing to North American consumers; and vice versa. All else constant, imported shares would increase in both

[8] Zero trade observations are ignored in an OLS regression of the gravity model. Still, they may contain information that would bias the results. Other methods have been developed to overcome this problem, such as the Pseudo-Maximum Likelihood method and the Helpman-Melitz-Rubinstein two stage approach. We do not apply them here.

places. Conversely, if distance effects rose in magnitude, then the Atlantic would effectively grow wider, and imported shares would decline in both places.

Clearly, neither of these explanations is consistent with the facts. While Europe appears farther from North America based on the behavior of North American consumers, North America appears to have grown closer to Europe based on its consumers' choices. When we econometrically allow the change in distance to vary between North America and Europe, we find distance effects growing stronger (more negative) for Europeans and remaining constant for North America. This also cannot explain trade patterns as North America's consumption of European repertoire declines while Europe's consumption of North American repertoire increases. So this explanation is wrong both in theory and in fact. Changing effects of distance do not explain the changing trade patterns under digitization.

5.3. Changing Appeal of Origin Repertoires

Given that neither changing availability nor changing impacts of distance on trade appear to explain time patterns, we are drawn to the conclusion that the appeal of repertoires is changing over time. One version of this explanation is that consumers in destinations develop more positive attitudes toward music from an origin as, for example, if consumers became more interested in US-origin music. A second and related, but distinct, possibility is that consumers' growing interest in origin repertoires is specific to new work or, in effect, that the appeal of particular origin repertoire is changing not only over time but across vintages.

We can explore these distinct versions of the "changing appeal" explanations by calculating origin-by-destination consumption patterns over time separately for new and old music from each repertoire. We also calculate the overall origin market share separately for old and new repertoire from each origin region.

Figure xx shows the evolution of North American repertoire's share of the world market, dividing the North American sales by vintage. "Old" is over 3 years old. The new music share increases from 0.32 to 0.35, while the older music's share falls from 0.27 to about 0.25. This indicates that the growth in North American share stems from the newer music and that the changed preference for US music is specific to the newer vintages. To put this succinctly, the growing US-origin share of world sales arises from new music that consumers find appealing rather than a general shift in preferences toward US music.

6. Conclusions

Music trade has transitioned rapidly from physical to weightless digital media in the past decade and especially since 2004 in Europe. The availability of titles has grown substantially. Proportionally, European titles have become a larger share of what's available in most countries including those in North America as well as Europe. Yet, most European countries' repertoire market shares among the 18 destination countries are falling, as is the European-origin share as a whole. Hence, growth in availability does not account for the trends in trade. Nor do changing effects of distance account for the changing trade patterns. Instead, the changing patterns appear to arise from growing appeal of some repertoires over time (US, France, other Europe). Moreover the changed appeal appears specific to recent vintages and therefore reflects changed attitudes towards new music rather than towards US repertoire generally.

7. Technical annexes

7.1. References

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7.2. Description of the Nielsen Music Data Set

Nielsen Music has been compiling data on legal digital music downloads at song level since 2006 in 18 countries of which 14 EU Member States: Austria, Belgium, Germany, Denmark, Finland, France, Ireland, Italy, Netherlands, Poland, Portugal, Spain, Sweden, United Kingdom. Two non-EU European countries: Switzerland and Norway, and two countries in North America: Canada and the United States. The Nielsen Music database is compiled from download statistics from the major players in the music industry: iTunes, Amazon and a few other online music sales services.

The last three columns of Table 1 provide some indications of the representativeness of the sample of Nielsen Music digital download data per country. Table 12 shows the total number of music downloads in the Nielsen dataset (2006-2011) per country of origin and destination. Tables 13 and 14 present the number of unique artists and unique songs per country in the dataset. The Nielsen Music dataset could not be used in its primary form for the purpose of this study. Problems with respect to the identification of the country of origin of the artist had to be resolved.

7.2.1. Identification of songs

The original Nielsen Music database covers 18 countries and contains annual digital download statistics for the period 2006-2011, by song title. There are approximately 7.8 billion downloads of 15 million titles produced by 1.5 million artists in this database. The total number of country/year/title observations is around 113 million (see Table 11 for more details).

All songs in the Nielsen Music database are identified with a unique identification code, the ISRC code. The ISRC is the international identification system for sound recordings and music video recordings. Each ISRC is supposed to be a unique and permanent identifier for a specific recording which can be permanently encoded into a product. The 12-character ISRC code consists of 4 segments:

- The country code: two characters allocated by the ISRC agency to which the registrant applies. In the US until late 2010 this was "US" but after this date, it became "QM" for new registrant code allocations.
- A registrant code: three characters allocated to the registrant by a national ISRC Agency
- Year of reference: 2-digit year in which the ISRC was assigned to the recording, regardless of when the recording was made or when the Registrant Code was allocated.
- Designation code: 5 digits assigned to the sound recording by the registrant. This code may not be repeated within the same calendar year.

As a first step in the cleaning procedure, some relatively minor problems in the ISRC codes had to be addressed. More importantly, spelling errors in artist names had to be corrected. The spelling errors artificially inflate the number of songs, artists and observations in the dataset. However the main focus of the cleaning process has been on correcting spelling mistakes in artist names, not on errors in song titles. For two similar-looking artist names, the procedure consists in running an algorithm that first takes into account if they both have a song title in common. If yes, then the algorithm checks if the two artists' names are sufficiently similar to be considered as the same artist. The precise spelling of the artist name is not very important; it is more important to ensure that there is only one spelling of the name for a single artist. Besides this focus on artist names,

the algorithm is also run to correct song titles for a given artist and keep the number of duplicates of song titles – mostly due to spelling errors - to a minimum.

Since the Nielsen dataset is very large, "manual" cleaning procedures were not feasible and computer algorithms had to be applied. Designing and fine tuning algorithms is a combination of art and science. In particular, algorithms that match similar looking artist names or song titles use matching criteria that can be defined more strictly or more widely. Very strict matching criteria may overlook artist names that would actually constitute a match and thereby fail to correct some errors; very wide matching criteria may produce matches for names that actually belong to different artists and thereby introduce new errors. No algorithm will produce a 100% error free outcome; finding an optimal balance is important. The current state of the dataset represents our best endeavour to clean mistakes in the original data. It has not resolved all errors however and may have introduced some new errors.

7.2.2. Identification of the country of origin (CoO) of the artists

For the purpose of this "music crossing borders" research project, the most important variable in the database is the CoO of the artist. A cross-border trade is defined as a download of a song in another country than the CoO of the artist. Once the CoO of the artist has been identified we assume that all songs of the artist belong to the CoO of the artist.

There are several ways to define and identify the CoO of the artist. Artists' origin is often defined in demographic terms as their country of birth or their (original) nationality (Legrand, 2012). However, artists may have changed nationality, moved to another country, or may have located their economic and financial operations in another country. This creates a discrepancy between the demographic and the economic CoO of the artist. From the point of view of cross-border trade flows, the economic origin may be more relevant. From a cultural point of view, demographic origins may be more relevant.

We tried a combination of these approaches:

1. ISRC country code as CoO: The original plan was to use the ISRC country code for each song in the Nielsen dataset to identify the CoO of the song. An immediate problem with this approach is that about half of all artists have more than one ISRC country code in their song catalogue, and sometimes more than one ISRC country code for the same song. We tried using the ISRC country code for the oldest song of the artist in the dataset, assuming that the oldest song refers to the country where the artist started his or her career. This method produces too many countries of origin that are patently wrong. Songs are often registered in countries that have nothing to do with the nationality or origin of the artist.

2. The artist's main market as an indicator of his CoO: An economic criterion to define the CoO is to identify the artist's main market: where does his music sell best, not just in absolute but in relative market size terms? The Nielsen dataset enables us to identify the largest relative market for the artist's digital sales. For artists from outside the 18-country dataset, there are no observations on their most important market if that is outside this group of 18 countries. However, this method also produces many results that do not make sense.

3. Country of birth as CoO: Since none of the variables in the Nielsen dataset produced a reliable indication of the CoO of the artist we had to look for an external information source to fill

that gap. We decided to use MusicBrainz, an open music encyclopaedia that collects music metadata and makes it available to the public (see www.musicbrainz.org). That database includes the CoO of the artist, as well as some other interesting variables such as year of release of each album/song, song language, label, etc. Given that there is no unique identifier that would allow us to link the MusicBrainz (MB) and the Nielsen databases, the matching had to be done using artist names. This is a challenging task given that artists' names formats and/or spelling mistakes are likely to occur in both datasets.

For each artist in the Nielsen dataset, several matching cases with MusicBrainz can occur:

i. The artist is uniquely identified in MB and has a CoO in MB.

ii. The artist is uniquely identified in MB but doesn't have a CoO in MB.

iii. The artist is not uniquely identified in MB: several artists may have the same / a similar name. We are not able to assign a single CoO to the artist.

iv. The artist is not identified in MB and can therefore not be assigned a CoO.

Once this matching is done, several further steps are required for the final data to be usable:

1) Most of the artists that could not be matched in MB (case iv. above) were actually not real individual artists, but rather karaokes, tributes, movie soundtracks, best-of's or even ringtones. However, there were also some real artists with spelling mistakes in the artist name that could not be matched with MB For instance, "KARVITZ,LENNY" was not recognized as an artist but still had a substantial number of total downloads. In order to reduce the long tail and make manual cleaning feasible we focused only on artists with more than 300 downloads that could not be matched in MB. We checked for spelling mistakes in these artist names and manually corrected them.

2) For artists that were matched with MB, some had several origin countries assigned. Using the information provided on MusicBrainz and the Internet, we manually checked and assigned the correct country for these specific cases. Some observations had the same name for an artist although they were actually different artists; some others had too generic names (e.g. "james") to be able to identify them. We did not assign any CoO to these artists.

3) In the matched data, we have a total of 123,896 artists that appear with a country available in MB (case i. above). However, some of these artist names may still have spelling errors and result in false unique artist names. We manually corrected spelling-related duplicate artist names for all artists with more than 300 total downloads over the period 2006-2011 in all 18 countries combined. That grouping covers more or less the Top-75.000 of all artists with a CoO in MB and 91.28% of all downloads in Nielsen. Correcting about 47,000 artist names with less than 300 downloads was too costly for the gains that could be obtained because they account for less than 0.04% of all downloads in the Nielsen database.

4) Finally, we try to increase download coverage by trying to identify a CoO for artists that were not available in MB. We focus on the top-3000 of artists that have so far been left without a CoO and search for their CoO in Wikipedia. In this way we were able to recover a CoO for 992 out of these 3000 artists.

The final dataset with a relatively clean set of artist names (elimination of duplicates and misspellings) with CoO for each artist includes about 122,000 artists and covers 91.32% of all downloads in the original Nielsen data. We consider this dataset to be representative.

The final step 5 data set with artists with more than 300 downloads is not used for the current study; it is only used for a companion study on the impact of copyright and digitization on trade and consumer welfare.

7.2.3. Identification of the vintage of the song

The ISRC code includes two digits for the recording year of each song (which is not necessarily the same as the year of release). Since we were not sure whether the ISRC year codes were reliable we cross-checked these with the year codes in the MusicBrainz database. The correlation between both datasets turned out to be +0.96. In view of this high correlation we decided that the ISRC codes in the Nielsen Music dataset were sufficiently reliable to be used without further corrections.

7.3 Tables

Table 1: Digital Share of Recorded Music Sales, by Country (*Sample countries in bold*)

Country	**2008**	**2009**	**2010**	**2011**	**2012**	**IFPI 2011** Digital sales (million units)	**Nielsen 2011** Digital sales (million units)	**Nielsen coverage ratio**
Norway	9.5%	16.0%	27.6%	51.4%	64.9%	7.5	6.01	0.80
Sweden	8.3%	16.3%	31.2%	49.8%	64.8%	4.3	3.04	0.71
USA	38.8%	44.0%	49.4%	56.0%	62.9%	1270	1142.19	0.90
Denmark	18.7%	22.9%	29.5%	38.3%	54.1%	9	7.33	0.81
Canada	19.2%	22.9%	31.6%	41.0%	47.5%	94.2	83.33	0.88
UK	14.0%	20.3%	27.4%	35.4%	44.8%	176.2	135.1	0.77
Ireland	10.8%	17.5%	22.9%	33.5%	39.8%	6.9	5.02	0.73
Switzerland	7.1%	12.9%	16.6%	23.6%	34.4%	14	13.41	0.96
Spain	10.4%	15.2%	23.1%	30.3%	33.3%	6.3	5.14	0.82
Netherlands	6.3%	7.8%	10.3%	18.3%	32.0%	8.4	5.87	0.70
Italy	9.8%	15.2%	17.0%	22.5%	30.2%	15	12.84	0.86
Bulgaria	0.0%	16.6%	7.8%	13.3%	28.4%	-	-	-
Finland	5.2%	9.1%	18.2%	19.5%	27.0%	1.9	1.28	0.67
France	12.7%	13.5%	16.2%	22.2%	26.6%	43	31.27	0.73
Portugal	8.4%	7.4%	8.1%	15.9%	25.2%	0.8	0.92	1.15
Austria	7.2%	11.6%	15.6%	20.2%	24.2%	9.9	4.58	0.46
Belgium	10.9%	10.2%	10.5%	14.5%	22.0%	9.3	7.26	0.78
Germany	8.5%	10.7%	13.5%	16.4%	20.3%	79	47.92	0.61
Czech Republic	5.3%	4.2%	6.6%	11.1%	20.3%	-	-	-
Slovakia	0.0%	6.5%	4.3%	8.2%	19.1%	-	-	-
Turkey			9.9%	11.9%	13.2%	-	-	-
Hungary	4.5%	5.1%	3.1%	9.7%	13.2%	-	-	-
Poland	4.1%	0.0%	3.5%	5.8%	10.5%	4		
Croatia	0.0%	1.4%	2.1%	3.2%	6.7%			

Source: IFPI (2013) and Nielsen Music.

Table 2: Share of Destination Sales from each Origin Country (2006-2011)

	Destination																	
orig	AT	BE	CA	CH	DE	DK	ES	FI	FR	GB	IE	IT	NL	NO	PL	PT	SE	US
AT	6.5%	0.2%	0.1%	1.0%	1.4%	0.2%	0.1%	0.2%	0.2%	0.1%	0.1%	0.2%	0.3%	0.1%	0.4%	0.2%	0.1%	0.0%
BE	1.2%	10.4%	0.2%	1.1%	1.4%	0.8%	0.6%	0.3%	1.6%	0.2%	0.2%	0.5%	2.7%	0.3%	0.4%	0.5%	0.4%	0.1%
CA	2.6%	2.8%	13.4%	2.7%	2.2%	2.3%	2.0%	2.5%	2.6%	2.6%	2.7%	2.1%	2.2%	3.4%	2.6%	3.4%	2.9%	4.1%
CH	0.4%	0.4%	0.1%	5.4%	0.5%	0.2%	0.6%	0.1%	0.4%	0.0%	0.0%	0.2%	0.1%	0.2%	0.3%	0.1%	0.2%	0.1%
DE	14.8%	2.3%	1.0%	8.8%	21.3%	2.2%	1.9%	2.3%	1.7%	0.9%	1.1%	1.8%	2.6%	2.2%	4.2%	2.7%	2.2%	0.6%
DK	1.3%	1.1%	0.3%	0.8%	1.2%	29.4%	0.2%	0.7%	0.3%	0.2%	0.3%	0.4%	0.6%	1.5%	0.4%	0.4%	1.2%	0.2%
ES	1.2%	1.0%	0.7%	1.1%	0.9%	1.4%	26.2%	1.0%	0.8%	0.6%	0.5%	0.9%	1.4%	1.0%	0.5%	1.9%	0.9%	0.5%
FI	0.2%	0.4%	0.1%	0.3%	0.2%	0.2%	0.1%	28.5%	0.1%	0.1%	0.1%	0.1%	0.1%	0.5%	0.7%	0.2%	0.9%	0.1%
FR	3.3%	11.4%	1.7%	8.3%	3.1%	1.5%	3.2%	1.7%	28.8%	0.9%	1.6%	2.4%	2.7%	1.5%	3.7%	2.6%	1.8%	0.6%
GB	16.7%	19.7%	11.8%	16.4%	17.4%	14.2%	12.8%	14.3%	14.2%	37.1%	30.1%	15.8%	19.5%	16.9%	16.6%	20.7%	15.2%	10.1%
IE	0.9%	0.8%	0.8%	0.8%	0.9%	0.8%	0.8%	0.7%	0.7%	1.4%	7.0%	0.8%	1.0%	0.9%	0.4%	1.3%	1.0%	0.7%
IT	1.7%	1.6%	0.4%	3.6%	1.1%	0.6%	2.0%	0.7%	1.3%	0.5%	0.6%	34.4%	1.2%	0.6%	1.1%	1.2%	0.8%	0.3%
NL	1.3%	3.4%	0.7%	1.2%	1.2%	0.8%	0.5%	0.9%	0.8%	0.9%	1.4%	0.9%	16.4%	0.9%	1.9%	0.9%	0.9%	0.5%
NO	0.5%	0.2%	0.1%	0.5%	0.8%	0.4%	0.2%	0.5%	0.2%	0.1%	0.2%	0.2%	0.4%	13.5%	1.1%	0.3%	0.7%	0.1%
PL	0.1%	0.1%	0.0%	0.1%	0.1%	0.0%	0.1%	0.1%	0.1%	0.0%	0.1%	0.0%	0.1%	0.0%	9.8%	0.1%	0.1%	0.0%
PT	0.0%	0.1%	0.0%	0.1%	0.0%	0.0%	0.1%	0.0%	0.1%	0.0%	0.0%	0.1%	0.1%	0.1%	0.1%	7.0%	0.0%	0.0%
SE	1.6%	2.4%	0.9%	1.8%	1.6%	3.2%	1.1%	3.7%	1.3%	1.1%	1.2%	0.9%	1.5%	5.4%	2.3%	1.5%	24.1%	0.7%
US	36.9%	33.6%	62.1%	36.0%	36.4%	35.0%	30.9%	34.6%	33.6%	46.4%	46.5%	29.0%	37.9%	42.4%	42.9%	41.7%	38.8%	76.0%
row	8.7%	8.2%	5.6%	10.1%	8.2%	6.7%	16.4%	7.1%	11.2%	6.8%	6.3%	9.2%	9.1%	8.6%	10.6%	13.4%	8.0%	5.3%
eu13	50.0%	54.0%	18.5%	45.0%	51.5%	26.4%	49.9%	55.1%	51.8%	43.8%	44.1%	59.0%	49.9%	43.9%	43.2%	41.0%	49.0%	14.3%

Source: Nielsen Music and authors' calculations.

Table 3: Gravity Estimates of Cross-Country Trade Patterns

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
Log distance between countries	-0.3705***	-0.3715***	-0.3744***	-0.3285***	-0.3298***	-0.3271***
	(0.021)	(0.020)	(0.019)	(0.019)	(0.018)	(0.017)
Dummy for home consumption	2.4578***	2.4563***	2.4518***	2.5349***	2.5325***	2.5371***
	(0.104)	(0.103)	(0.094)	(0.081)	(0.080)	(0.073)
Dummy for same language	0.8973***	0.9000***	0.9107***	0.8787***	0.8793***	0.8794***
	(0.027)	(0.027)	(0.025)	(0.027)	(0.026)	(0.024)
Constant	3.3206***	3.2642***	7.0230***	5.9539***	5.9207***	10.7911***
	(0.195)	(0.206)	(0.160)	(0.168)	(0.176)	(0.150)
Observations	16,416	16,416	16,416	10,217	10,217	10,217
R-squared	0.927	0.929	0.802	0.946	0.948	0.888
Time effects	Yes	No	No	Yes	No	No
Origin FE	Yes	Yes	No	Yes	Yes	No
Destination FE	Yes	No	No	Yes	No	No
Origin x year FE	No	No	Yes	No	No	Yes
Destination x year FE	No	Yes	Yes	No	Yes	Yes
Balanced	No	No	No	Yes	Yes	Yes

Notes: Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Dependent variable is the log of the quantity of digital songs traded between an origin and a destination country. Columns (1)-(3) use all country pairs; the remaining columns include only country pairs with positive trade in all years.

Table 4: Determinants of Trade at the Head and Tail of the Sales Distribution

	(1)	(2)	(3)	(4)
VARIABLES	Top 500	remainder	Top 500	remainder
Distance	-0.3014***	-0.3081***		
	(0.045)	(0.020)		
Home bias	2.8878***	2.1616***		
	(0.128)	(0.058)		
Language	0.8172***	0.7583***		
	(0.067)	(0.030)		
Distance x trend			-0.0179*	0.0069***
			(0.010)	(0.003)
Home x trend			-0.0395	0.0141
			(0.055)	(0.014)
Language x trend			-0.0101	0.0081
			(0.031)	(0.008)
Constant	8.7476***	10.4870***	10.0202***	9.9403***
	(0.526)	(0.238)	(0.254)	(0.055)
Observations	2,594	2,594	2,594	2,594
R-squared	0.879	0.974	0.346	0.879
Number of country pairs	680	680	680	680
Origin, destination FE	Yes	Yes	No	No
Country pair FE	No	No	Yes	Yes
Time effects	Yes	Yes	Yes	Yes
Destination by year FE	No	No	Yes	Yes

Note: Dependent variable is the log of the annual quantity of trade between an origin and a destination that appears among the top 500 songs in the destination in the year. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 5: Catalog Size and Composition: Shares from US, Home, and EU13

Destination	Total songs available in 2006	Total songs available in 2011	%from US 2006	%from US 2011	% change in US-origin share	home 2006	home 2011	% change in home share	EU 2006	EU 2011	% change in EU13-origin share
AT	145,498	333,761	38.5%	36.7%	-2.1%	3.8%	3.4%	-3.8%	48.4%	47.4%	-0.9%
BE	225,021	449,576	38.4%	36.0%	-2.8%	2.9%	3.0%	0.5%	47.4%	47.8%	0.4%
CA	375,865	1,082,145	56.0%	48.6%	-6.1%	6.6%	6.9%	2.0%	26.8%	30.5%	5.5%
CH	262,476	663,233	38.6%	35.6%	-3.4%	1.6%	2.0%	11.2%	45.8%	45.1%	-0.7%
DE	419,260	1,007,159	39.9%	37.0%	-3.3%	13.7%	13.5%	-0.5%	45.8%	46.0%	0.2%
DK	157,286	334,708	43.2%	41.7%	-1.5%	6.5%	5.9%	-4.2%	44.0%	42.4%	-1.5%
ES	150,259	370,164	38.4%	35.7%	-3.2%	8.9%	9.8%	4.4%	45.1%	45.4%	0.3%
FI	82,420	200,661	40.0%	37.7%	-2.6%	11.1%	13.7%	9.2%	48.2%	49.1%	0.8%
FR	297,649	853,302	40.1%	36.8%	-3.7%	12.3%	12.6%	0.9%	44.1%	43.9%	-0.2%
GB	566,047	1,373,799	45.6%	42.2%	-3.3%	20.7%	20.6%	-0.1%	38.6%	39.3%	0.8%
IE	121,994	277,376	46.3%	45.1%	-1.1%	3.6%	3.9%	3.4%	41.5%	40.7%	-0.9%
IT	201,294	526,029	40.8%	37.8%	-3.3%	11.8%	12.6%	2.9%	45.2%	46.0%	0.7%
NL	209,841	439,224	43.6%	40.4%	-3.3%	4.3%	5.9%	14.0%	42.5%	42.6%	0.1%
NO	148,037	365,120	45.0%	42.2%	-2.8%	5.1%	4.6%	-4.8%	38.2%	38.7%	0.6%
PL		28,923		38.2%			3.4%			43.5%	
PT	56,702	135,641	38.1%	38.0%	0.0%	2.6%	3.2%	8.8%	45.6%	43.2%	-2.4%
SE	179,794	330,459	44.4%	40.9%	-3.6%	8.0%	8.9%	4.5%	42.3%	43.1%	0.8%
US	1,169,431	2,434,228	53.7%	48.8%	-4.2%	53.7%	48.8%	-4.2%	28.6%	31.4%	4.0%

Source: Nielsen Music and authors' calculations.

Table 6: Availability and consumption

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Log of number of songs from an origin available in the destination	0.0637***	0.0453***			0.5309***	0.4136***	0.5287***	0.3671***
	(0.009)	(0.009)			(0.069)	(0.038)	(0.066)	(0.044)
Log of number of songs from an origin available in the origin			0.6940***	0.7008***				
			(0.042)	(0.042)				
Log population				2.2817***				
				(0.570)				
Constant	1.0263***	1.2063***	-3.2094***	52.8662***	-0.5942	-0.2318	-0.9730	-0.1989
	(0.032)	(0.035)	(0.400)	(14.010)	(0.239)	(0.150)	(0.325)	(0.227)
Observations	17,667	17,667	17,667	17,667	17,667	17,667	10,637	10,637
R-squared	0.072	0.097	0.468	0.468				
Number of ocno	3,362	3,362	3,362	3,362	3,362	3,362	1,816	1,816
Country pair fe	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Destination by time fe	No	Yes	No	No	No	Yes	No	Yes
Time effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Standard errors in parentheses. *** <0.01, ** p<0.05, * p<0.1. Dependent variable is the log of the number of tracks from an origin country sold in a destination country in a year.

Table 7: Changes in Gravity, 2006-2011

VARIABLES	(1) Nielsen all trend	(2) Nielsen all trend balanced	(3) Europe	(4) North America
Log distance between countries*time	-0.0252***	-0.0361***	-0.0266***	0.0072
	(0.004)	(0.003)	(0.004)	(0.022)
Dummy for home consumption*time	-0.1211***	-0.1105***	-0.1223***	-0.0938
	(0.041)	(0.031)	(0.043)	(0.129)
Dummy for same language*time	-0.0209**	-0.0103	-0.0034	-0.0638***
	(0.010)	(0.010)	(0.012)	(0.021)
Constant	7.2383***	7.8203***	4.6016***	6.9600***
	(0.150)	(0.060)	(0.042)	(0.041)
Country pair fe	Yes	Yes	Yes	Yes
Time effects	Yes	Yes	Yes	Yes
Destination by time fe	Yes	Yes	Yes	Yes
Observations	16,416	10,217	14,344	2,072
R-squared	0.438	0.549	0.439	0.434
Number of ocno	3,079	1,744	2,713	366

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 8: Sales per capita, by country and year

country	2006	2007	2008	2009	2010	2011
AT	0.13	0.21	0.31	0.41	0.46	0.54
BE	0.27	0.44	0.43	0.55	0.60	0.66
CA	0.43	0.73	1.13	1.59	1.81	2.42
CH	0.38	0.59	0.76	1.10	1.31	1.70
DE	0.12	0.28	0.40	0.44	0.50	0.59
DK	0.36	0.75	0.97	1.16	1.19	1.31
ES	0.04	0.14	0.13	0.12	0.11	0.11
FI	0.08	0.14	0.17	0.18	0.18	0.24
FR	0.08	0.14	0.29	0.44	0.47	0.48
GB	0.63	1.08	1.57	2.01	2.08	2.16
IE	0.30	0.70	0.90	1.02	1.06	1.12
IT	0.04	0.07	0.10	0.16	0.18	0.21
NL	0.13	0.15	0.17	0.23	0.27	0.35
NO	0.24	0.61	0.87	1.05	1.12	1.22
PL			0.00	0.00	0.00	0.00
PT	0.02	0.03	0.06	0.06	0.08	0.09
SE	0.17	0.29	0.32	0.40	0.39	0.32
US	1.81	2.61	3.27	3.63	3.50	3.67

Source: Authors' own calculation using Nielsen and WDI data.

Table 9: Bilateral trade matrix (2006-2011): number of downloads made in the CoD of songs produced in the CoO

CoD > CoO	AT	BE	DE	DK	ES	FI	FR	GB	IE	IT	NL	PL	PT	SE	CH	NO	CA	US	TOTAL	EU only
AT	1,066,581	81,316	3,204,913	49,300	40,214	9,148	195,864	506,220	18,867	95,552	79,313	1,314	10,144	25,803	477,471	37,919	222,415	3,307,489	**9,429,843**	**5,384,549**
BE	142,905	3,020,052	1,833,050	220,943	275,216	22,258	1,614,065	960,351	40,600	205,206	448,930	3,877	17,299	113,607	409,761	89,283	477,886	4,943,527	**14,838,816**	**8,918,359**
DE	2,864,898	896,729	44,657,298	866,144	541,506	150,054	2,525,629	7,603,099	360,216	846,967	647,503	10,088	96,243	457,617	4,182,526	623,894	3,191,785	42,045,328	**112,567,524**	**62,523,991**
DK	133,938	175,593	1,588,206	8,084,086	52,397	29,291	340,099	1,912,140	70,020	134,099	108,715	953	14,918	197,881	259,545	270,069	608,947	7,853,636	**21,834,533**	**12,842,336**
ES	125,723	273,315	1,167,813	238,502	9,289,080	41,476	1,031,149	2,932,752	109,890	381,876	206,775	1,245	54,713	107,902	420,287	153,724	1,361,613	21,989,955	**39,887,790**	**15,962,211**
FI	66,944	84,522	851,318	82,330	38,545	1,433,769	201,284	794,956	26,143	61,187	36,740	1,375	6,730	174,013	172,912	134,454	324,646	5,826,174	**10,318,042**	**3,859,856**
FR	494,725	4,511,633	5,007,281	640,572	677,270	93,101	39,466,678	8,439,126	404,665	1,152,920	604,473	9,773	114,110	376,983	3,717,056	428,533	4,468,318	37,717,796	**108,325,013**	**61,993,310**
GB	3,007,660	6,483,443	34,291,177	5,035,970	3,549,556	804,052	17,809,519	219,200,000	6,651,247	7,480,442	4,482,563	35,423	772,577	2,770,772	8,058,846	4,228,737	33,795,811	578,000,000	**936,457,795**	**312,374,401**
IE	168,852	360,103	1,701,183	340,988	241,225	45,513	946,446	9,337,884	1,625,280	457,399	269,901	1,481	51,938	200,222	435,196	303,053	2,452,210	40,600,260	**59,539,134**	**15,748,415**
IT	374,884	578,235	2,518,615	217,960	770,211	48,708	1,589,915	3,122,958	165,457	16,511,948	315,018	2,593	57,764	190,040	1,626,674	172,147	1,106,024	17,188,164	**46,557,315**	**26,464,306**
NL	154,306	1,017,353	1,688,648	281,608	123,943	41,437	596,545	5,274,277	243,821	255,435	3,496,401	3,115	26,563	107,237	382,559	168,676	1,352,386	18,649,267	**33,863,577**	**13,310,689**
PL	12,301	32,291	137,383	28,414	26,979	3,636	87,436	338,990	13,816	39,263	15,490	14,561	3,077	10,506	41,313	10,672	100,562	2,283,757	**3,200,447**	**764,143**
PT	4,220	20,287	36,494	4,381	56,191	1,676	84,250	112,469	5,585	27,909	14,379	294	256,817	4,160	31,921	21,568	37,574	413,704	**1,133,879**	**629,112**
SE	291,135	603,180	3,187,143	1,131,449	342,865	198,807	1,677,993	8,272,607	297,907	412,638	354,584	6,267	50,880	4,041,428	796,620	1,251,216	2,301,996	31,382,940	**56,601,655**	**20,868,883**
EU only	**8,909,072**	**18,138,052**	**98,509,502**	**16,058,403**	**15,599,163**	**2,718,807**	**66,317,193**	**260,083,763**	**9,716,206**	**27,583,031**	**10,696,332**	**92,359**	**1,533,773**	**8,778,171**						
																			-	-
CH	79,715	119,516	1,050,471	75,462	98,490	7,507	560,325	374,707	14,423	126,192	39,585	555	5,422	29,920	2,348,218	73,584	226,114	2,478,589	**7,708,795**	**2,582,290**
NO	124,987	117,732	1,912,827	170,270	75,588	31,389	373,141	1,438,415	58,977	117,648	130,666	2,213	17,574	170,260	284,806	3,662,724	304,504	5,820,678	**14,814,399**	**4,741,687**
																			0	**0**
CA	543,423	1,025,490	5,331,056	816,503	629,282	136,346	3,646,076	17,190,448	730,287	1,131,180	592,227	6,091	128,933	513,826	1,486,135	899,233	38,251,640	235,800,000	**308,858,176**	**32,421,168**
US	6,329,410	10,066,595	67,315,576	11,331,853	7,115,362	1,786,127	38,584,301	261,600,000	10,355,189	13,260,937	8,035,405	93,471	1,470,218	6,827,609	16,036,342	10,356,653	167,600,000	4,282,000,000	**4,920,165,048**	**444,172,053**
																			-	-
TOTAL	**15,986,607**	**29,467,385**	**174,119,432**	**28,452,491**	**23,517,885**	**4,680,176**	**109,481,036**	**540,687,333**	**20,875,082**	**42,218,988**	**19,494,215**	**194,689**	**3,155,920**	**16,319,786**	**41,168,188**	**22,886,139**	**258,184,431**	**5,338,301,264**	**6,689,191,047**	**1,028,651,025**

Source: Nielsen Music and calculations by the authors.

Table 10: Bilateral trade matrix (2006-2011): number of unique songs from CoO downloaded in CoD

CoD > CoO	AT	BE	DE	DK	ES	FI	FR	GB	IE	IT	NL	PL	PT	SE	CH	NO	CA	US	TOTAL
AT	19,861	10,043	28,057	6,610	7,752	3,503	15,541	20,150	4,650	12,054	10,936	793	2,607	6,541	17,746	6,738	14,011	32,765	52,537
BE	4,991	21,089	13,125	5,228	5,954	3,000	13,606	14,029	3,521	6,760	11,366	536	2,754	5,650	9,119	4,955	10,125	20,471	33,889
DE	94,618	61,669	207,264	49,757	48,088	24,929	88,192	122,116	29,197	62,273	57,733	4,866	17,941	47,487	113,717	45,475	80,722	184,675	298,332
DK	5,485	7,014	15,604	32,770	5,587	3,869	9,946	17,260	3,568	7,029	6,393	570	2,480	11,388	9,138	12,365	10,573	24,733	48,163
ES	9,701	16,442	27,817	8,917	52,888	5,721	30,116	35,531	6,683	20,012	14,155	757	8,386	10,392	21,656	8,963	21,592	60,067	91,402
FI	5,921	7,559	18,971	7,399	6,172	42,438	11,675	23,694	4,059	7,783	6,805	740	2,237	14,463	11,011	8,695	12,353	28,970	67,718
FR	28,990	84,763	76,975	26,978	39,550	14,870	154,390	89,520	21,189	46,440	40,551	3,161	17,668	28,643	81,591	24,656	77,461	132,859	221,103
GB	119,062	161,792	274,143	136,196	135,733	81,848	225,853	421,190	147,873	170,325	161,621	15,227	67,293	144,828	172,487	136,299	245,453	467,572	601,102
IE	6,060	8,514	13,852	6,923	6,598	3,851	10,467	21,341	17,080	7,795	9,029	477	2,902	6,884	9,298	7,404	14,268	23,675	29,216
IT	26,484	33,675	58,548	17,825	31,297	10,325	53,155	63,875	13,887	95,104	27,426	1,540	10,880	19,111	49,623	17,023	41,443	95,721	155,730
NL	11,717	28,420	29,298	11,654	10,602	6,142	20,575	31,825	8,170	13,186	39,297	1,001	4,737	10,887	18,407	11,279	22,616	46,101	74,795
PL	3,171	4,352	9,833	3,151	3,735	1,645	7,703	12,515	3,442	5,182	4,299	1,814	1,522	3,472	5,171	3,429	7,031	18,510	25,190
PT	1,252	2,718	3,901	1,081	2,811	732	5,561	5,387	794	2,421	2,044	223	6,681	1,391	3,972	1,536	3,831	7,428	11,812
SE	15,342	19,098	39,019	26,451	15,536	18,798	27,072	47,552	10,830	19,090	17,523	2,090	6,683	51,085	24,559	33,642	28,521	60,912	96,289
EU only	**352,655**	**467,148**	**590,000**	**340,940**	**372,303**	**221,671**	**673,852**	**925,985**	**274,943**	**475,454**	**409,178**	**33,795**	**154,771**	**362,222**					
CH	6,171	6,148	14,568	4,107	4,106	2,067	9,906	11,594	2,394	5,883	5,164	371	1,699	4,036	19,110	3,988	7,902	18,687	32,237
NO	6,023	8,385	15,973	10,280	5,622	4,987	10,537	19,122	4,699	7,708	7,642	894	2,748	10,449	9,535	26,202	10,667	26,267	40,521
CA	22,518	31,726	54,644	23,854	23,281	14,306	48,283	70,856	22,319	29,689	28,731	2,416	11,137	26,129	37,617	24,830	100,960	114,077	142,627
US	299,146	387,735	719,517	340,315	329,228	192,572	606,426	991,137	304,728	429,293	403,510	28,131	139,980	377,466	458,231	351,662	851,676	1,520,207	1,722,839
TOTAL	**686,513**	**901,142**	**1,394,702**	**719,496**	**734,540**	**435,603**	**1,349,004**	**2,018,694**	**609,083**	**948,027**	**854,225**	**65,607**	**310,335**	**780,302**	**1,071,988**	**729,141**	**1,561,205**	**2,883,697**	**3,745,502**

Source: Nielsen Music and calculations by the authors.

Table 11: Bilateral trade matrix (2006-2011): number of unique artists from CoO downloaded in CoD

CoD > CoO	AT	BE	DE	DK	ES	FI	FR	GB	IE	IT	NL	PL	PT	SE	CH	NO	CA	US	TOTAL
AT	719	552	805	511	515	385	627	719	424	587	549	108	305	492	672	484	605	795	930
BE	581	851	800	565	582	418	772	829	485	622	742	112	393	581	723	558	729	896	1,025
DE	5,659	4,700	7,398	4,400	4,417	3,094	5,535	6,302	3,530	4,800	4,612	904	2,652	4,263	6,075	4,247	5,292	6,932	8,296
DK	641	750	1,037	1,215	678	533	875	1,054	561	711	743	126	403	919	839	934	843	1,154	1,430
ES	1,198	1,417	1,843	1,165	2,089	872	1,804	2,013	973	1,529	1,334	198	980	1,206	1,627	1,138	1,668	2,447	2,794
FI	901	1,058	1,682	1,064	975	2,135	1,346	1,890	793	1,073	1,055	144	498	1,452	1,277	1,168	1,281	1,737	2,745
FR	3,324	4,814	4,964	3,155	3,729	2,305	6,087	5,152	2,802	3,897	3,732	666	2,515	3,266	4,970	3,130	4,756	5,635	6,912
GB	9,600	10,586	13,104	9,914	9,864	7,696	12,204	15,578	10,650	10,706	10,676	2,548	6,932	10,171	11,205	10,071	12,810	15,852	17,568
IE	485	541	664	496	505	376	613	736	680	526	562	91	317	503	548	513	657	783	828
IT	2,308	2,469	3,204	1,990	2,397	1,497	3,006	3,327	1,750	3,747	2,302	372	1,497	2,035	2,941	1,961	2,714	3,803	4,543
NL	1,389	1,800	1,952	1,378	1,354	989	1,762	2,041	1,218	1,470	2,055	251	859	1,366	1,659	1,372	1,812	2,226	2,575
PL	367	418	616	363	369	247	546	681	351	435	393	231	224	374	471	374	505	775	900
PT	176	228	273	158	231	116	286	300	144	211	206	32	278	204	263	193	248	321	377
SE	1,537	1,673	2,247	1,845	1,571	1,568	1,971	2,450	1,347	1,680	1,659	379	1,003	2,412	1,864	2,025	2,000	2,632	3,121
EU only	**28,885**	**31,857**	**35,920**	**28,219**	**29,276**	**22,231**	**37,434**	**43,072**	**25,708**	**31,994**	**30,620**	**6,162**	**18,856**	**29,244**					
CH	593	574	790	496	505	363	672	736	395	573	523	84	314	489	858	487	649	880	1,023
NO	621	695	981	822	600	555	806	1,066	561	687	725	163	346	839	769	1,181	831	1,171	1,358
CA	1,968	2,226	2,857	1,956	1,975	1,463	2,708	3,166	1,875	2,194	2,158	386	1,291	2,059	2,454	2,008	3,550	3,746	4,027
US	22,982	24,899	31,112	23,764	23,137	18,107	28,967	33,845	22,615	25,502	25,020	4,902	15,477	24,535	26,709	24,169	32,472	39,479	41,224
TOTAL	**55,049**	**60,251**	**71,660**	**55,257**	**55,493**	**42,719**	**70,587**	**81,885**	**51,154**	**60,950**	**59,046**	**11,697**	**36,284**	**57,166**	**65,924**	**56,013**	**73,422**	**91,264**	**101,676**

Source: Nielsen Music and calculations by the authors.

7.4. Figures

Figure 1a

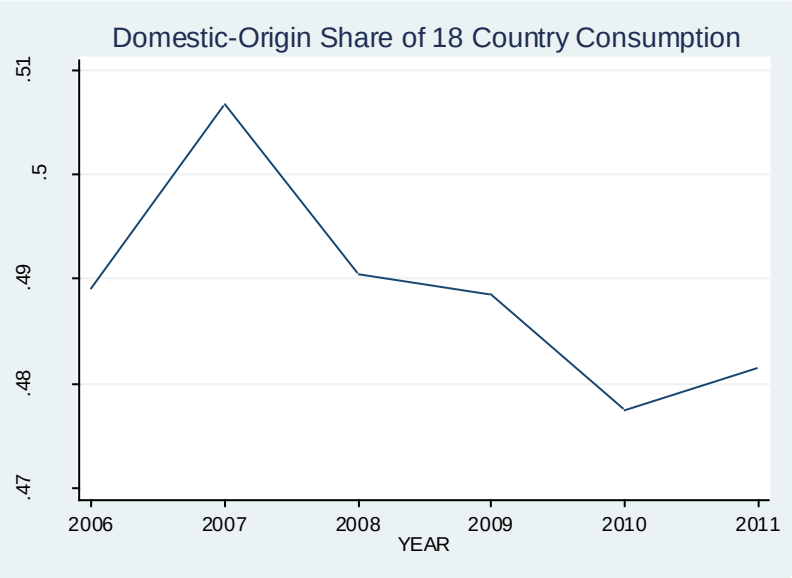


Figure 1b

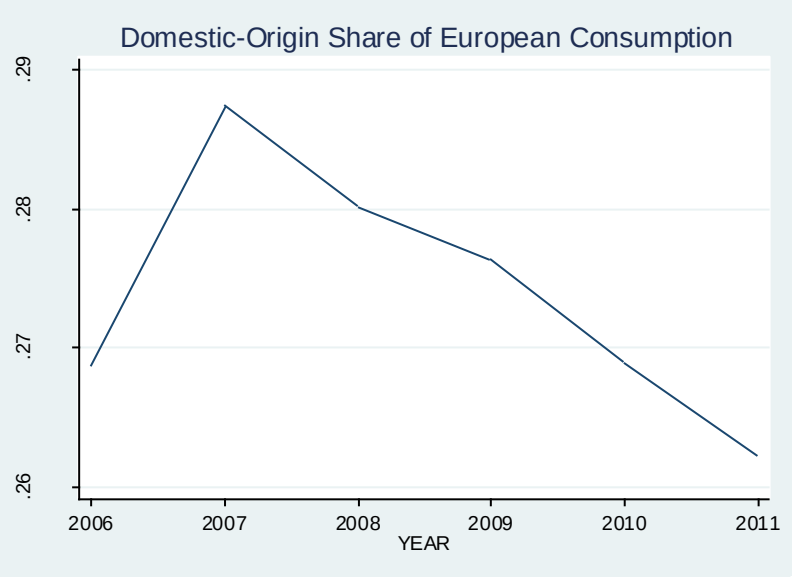


Figure 1c

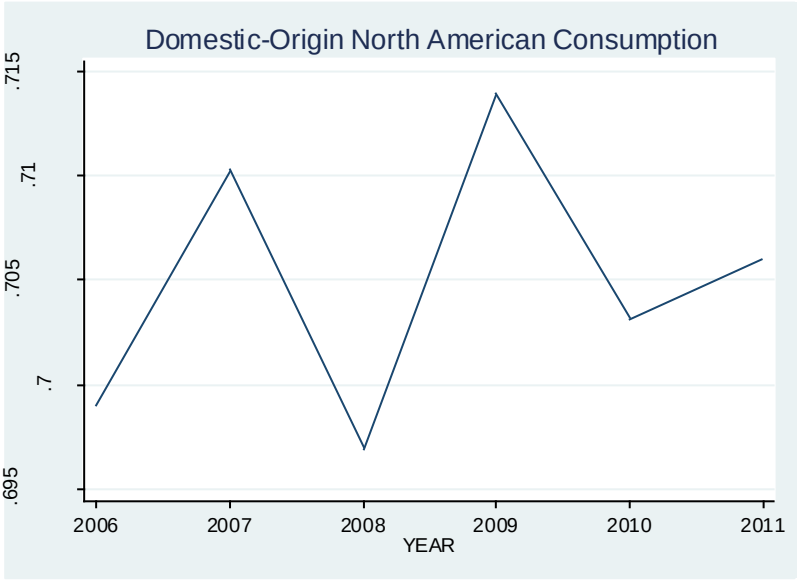


Figure 2

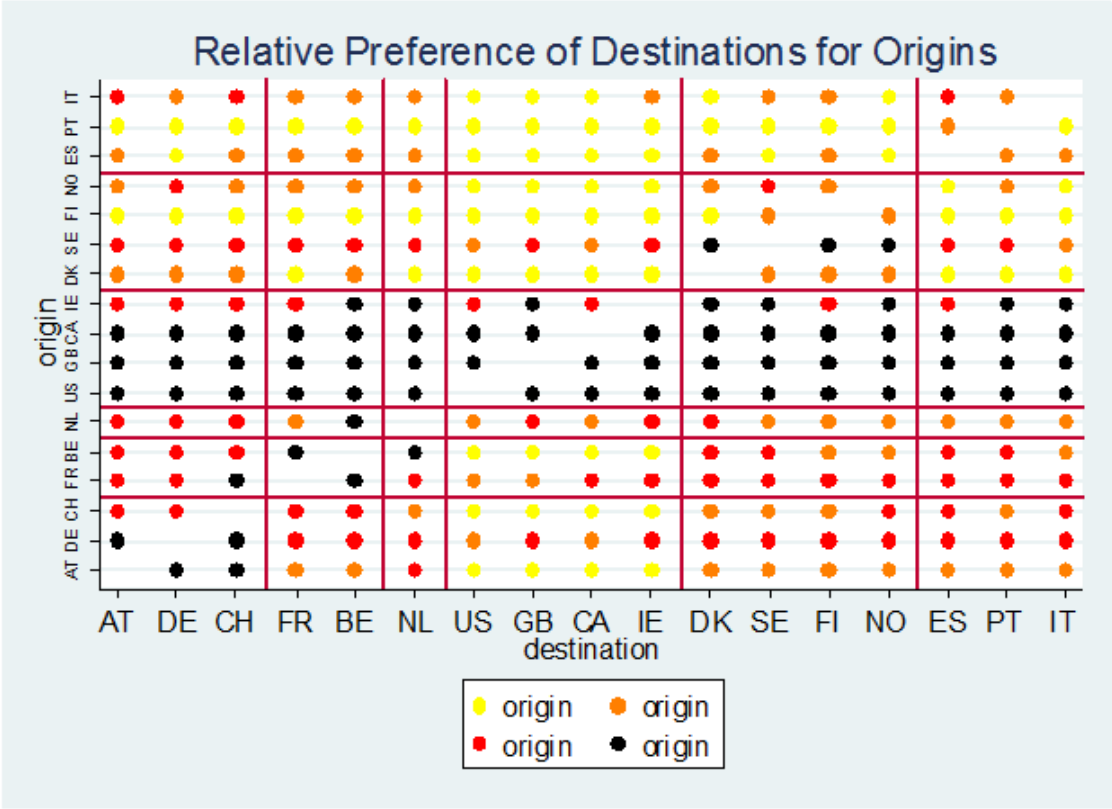


Figure 3a

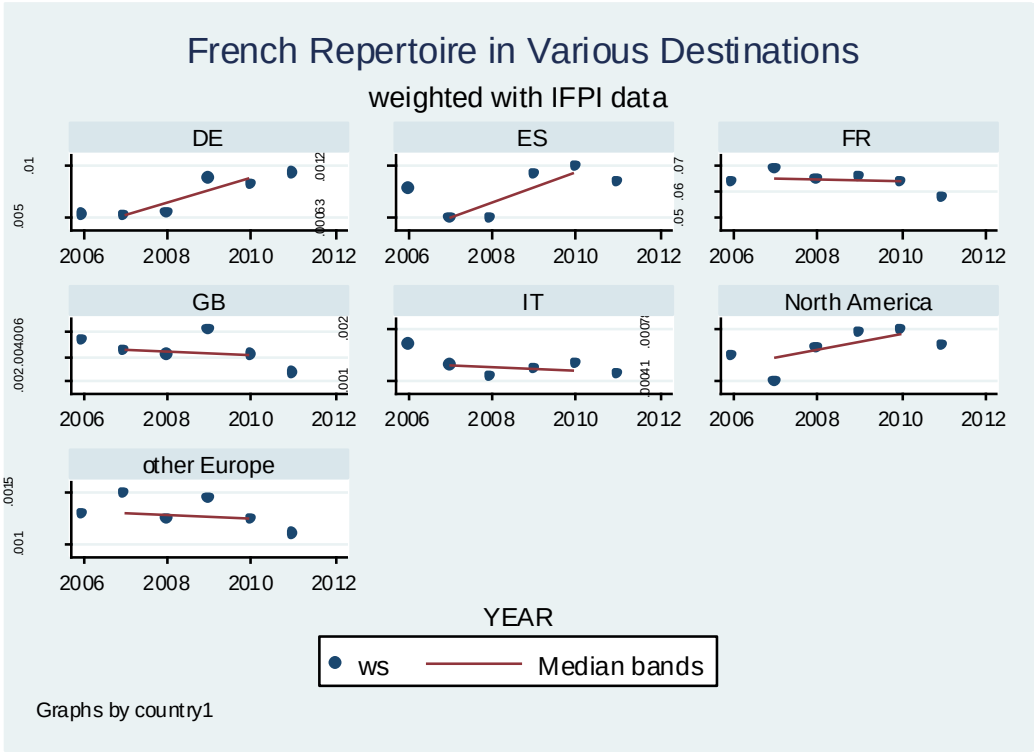


Figure 3b

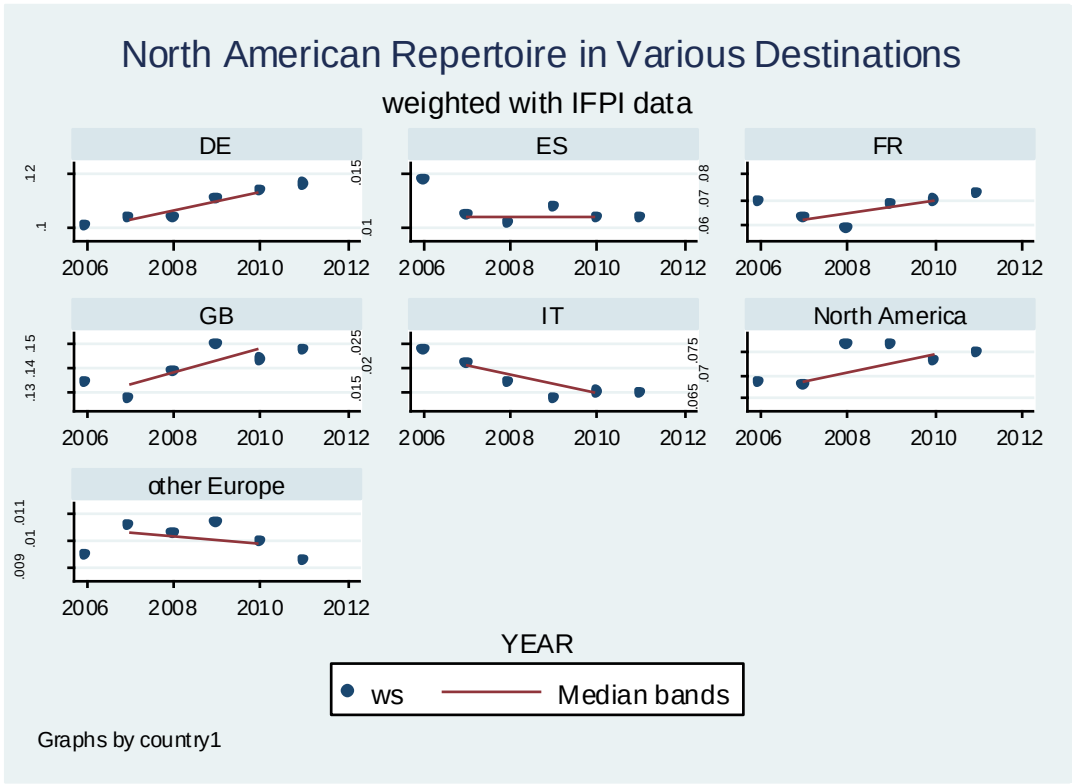


Figure 3c

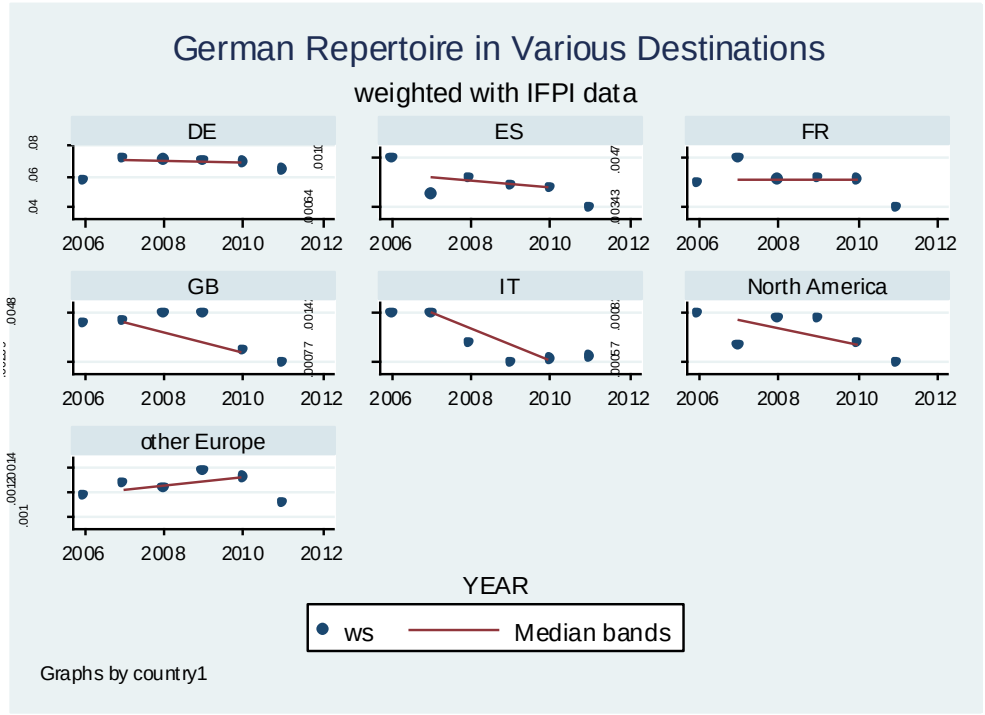


Figure 3d

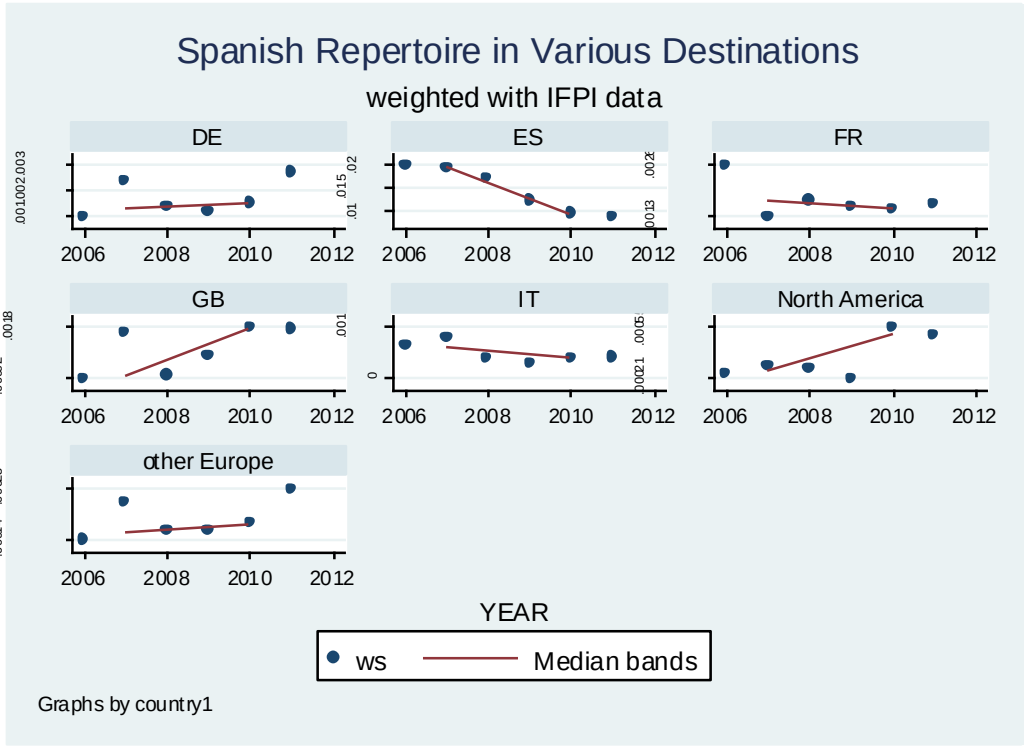


Figure 3e

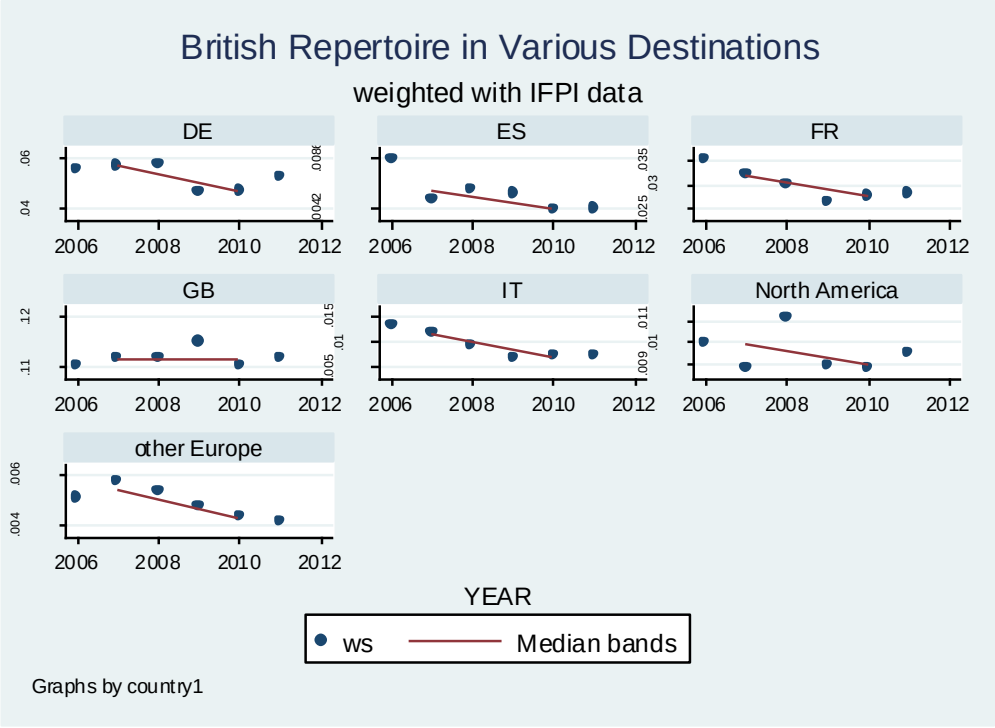


Figure 3f

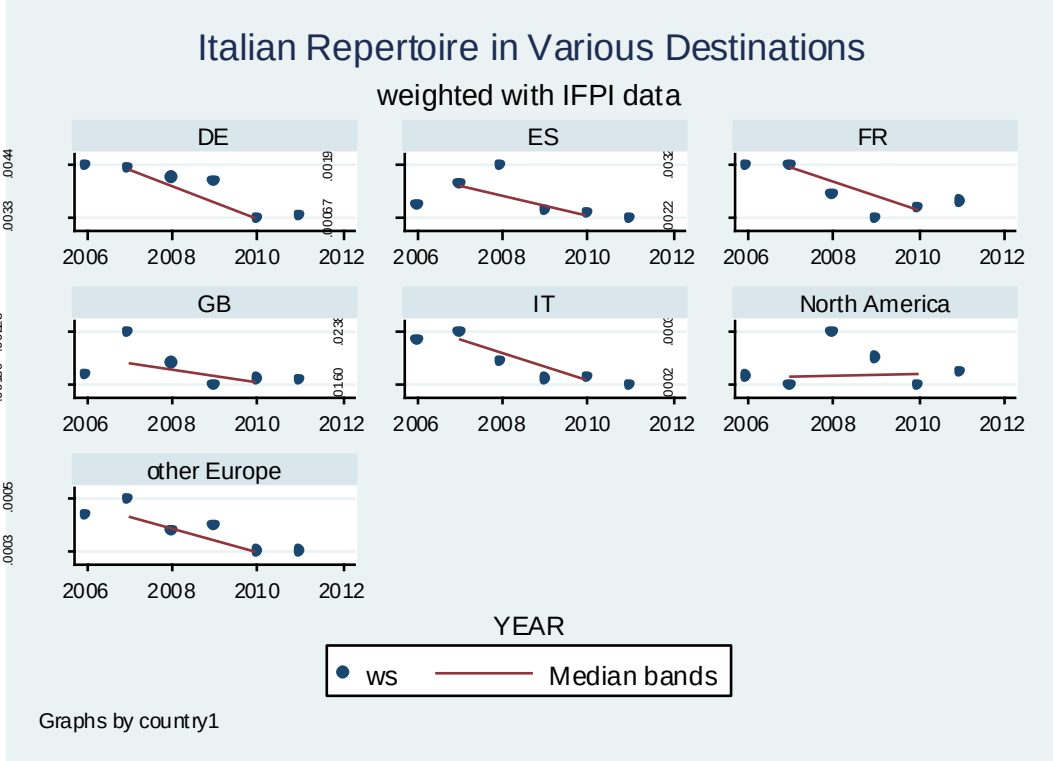


Figure 3g

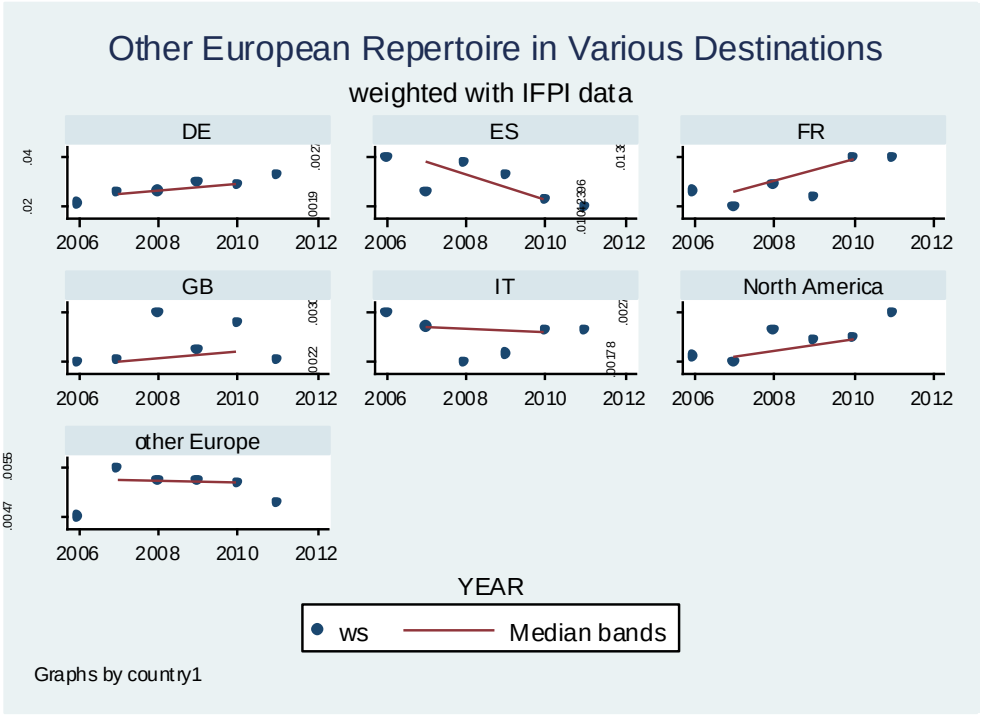


Figure 3h

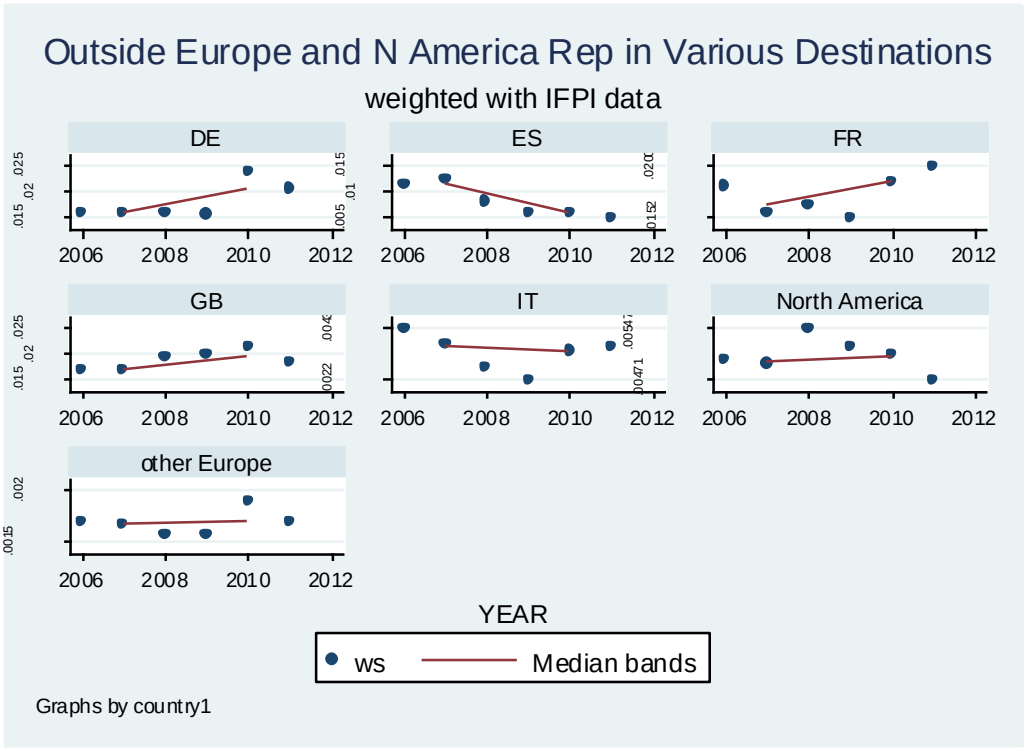


Figure 4

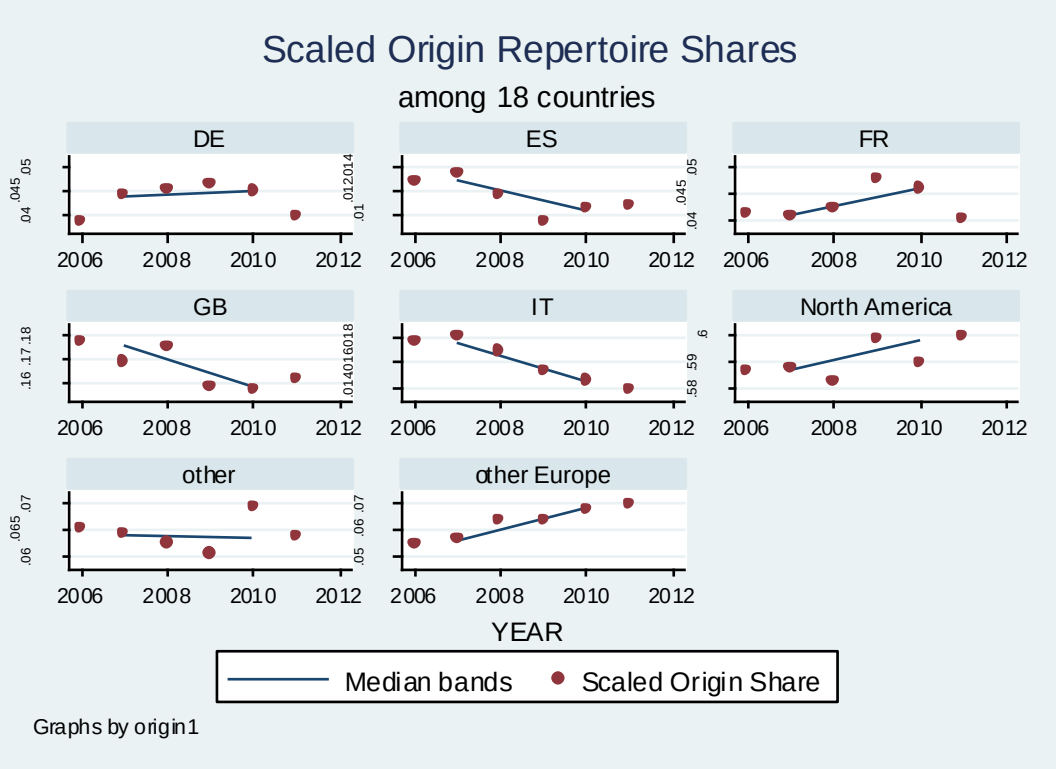
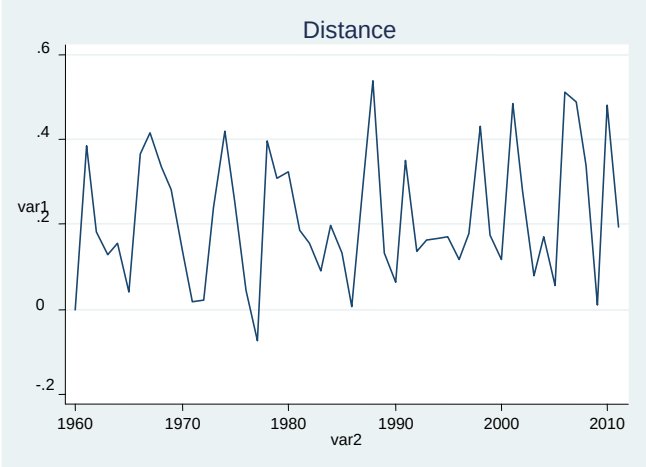
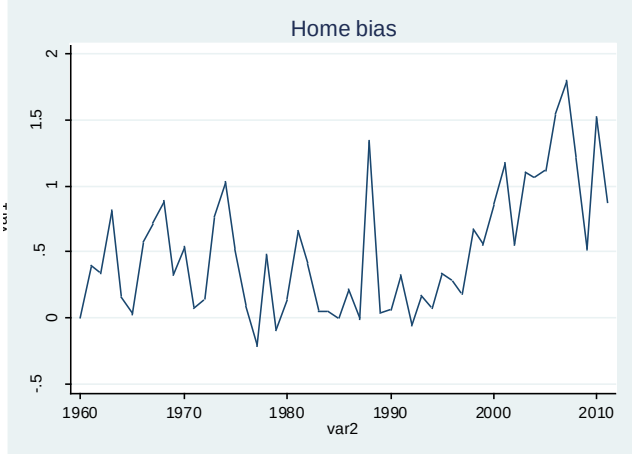

Scaled Origin Repertoire Shares
among 18 countries
DE
ES
FR
GB
IT
North America
other
other Europe
2006
2008
2010
2012
YEAR
Median bands
Scaled Origin Share
Graphs by origin1

Figure 5a: Evolution of the distance coefficients for the Top-100 (1960 to 2011)





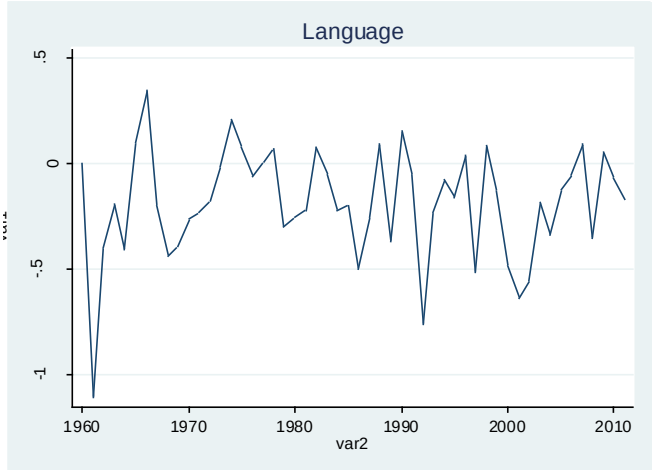
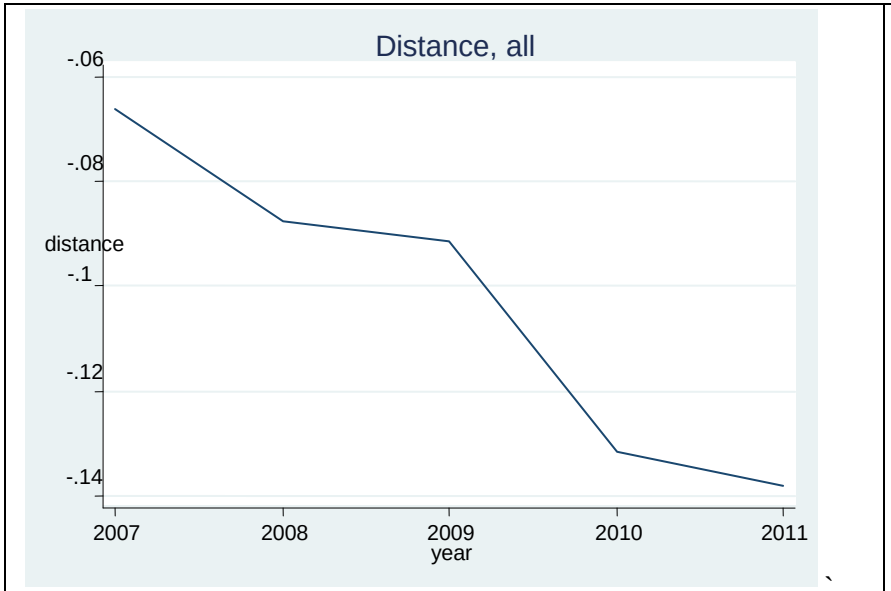
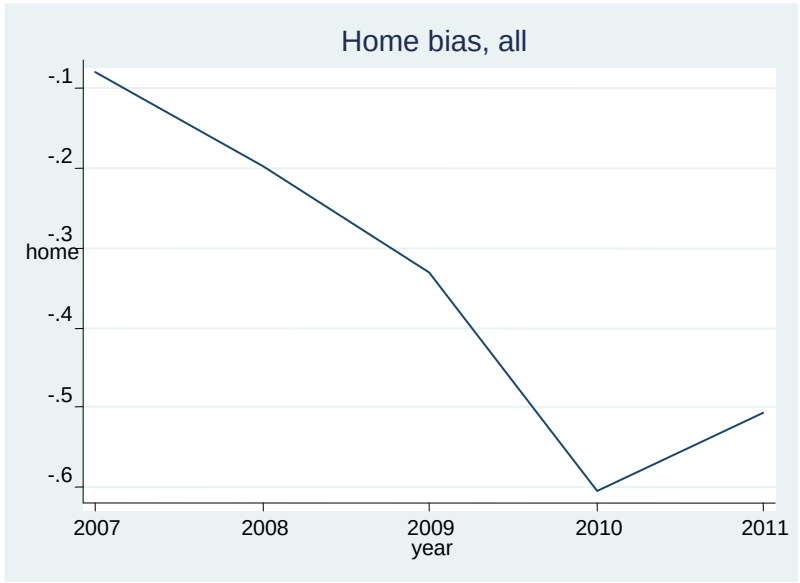


Figure 5b: Evolution of distance coefficients for all songs (2006-2011)





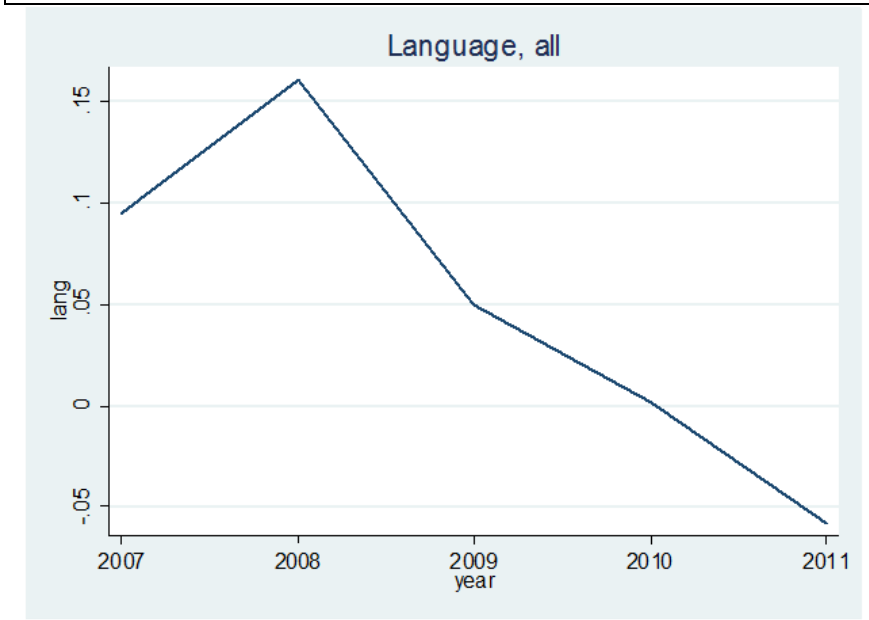


Figure 6a

(Blue lines = age > 3 years, green lines = age =< 3years)

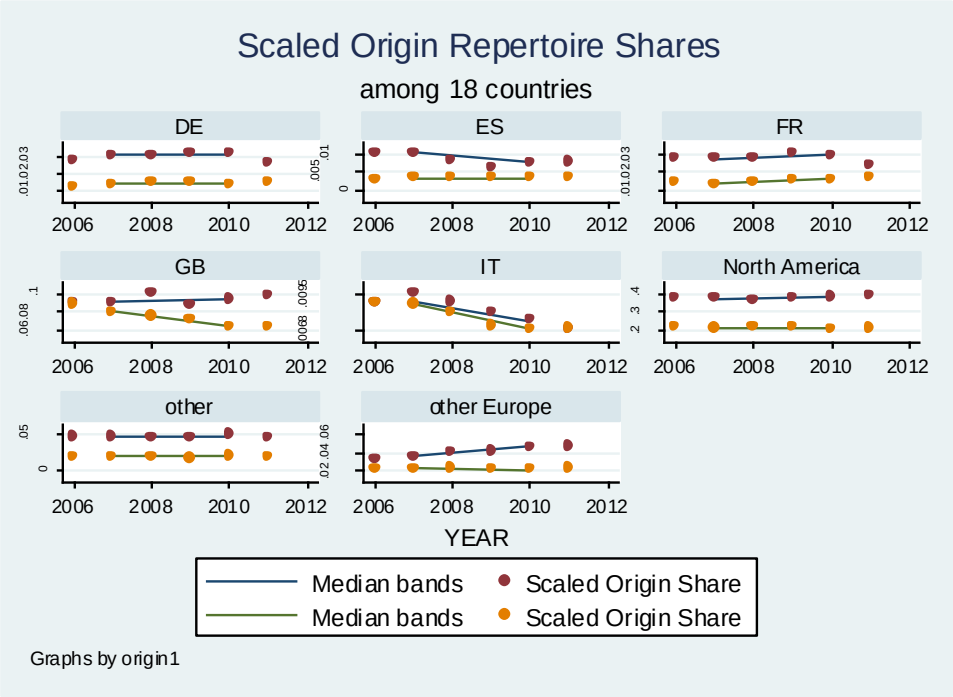
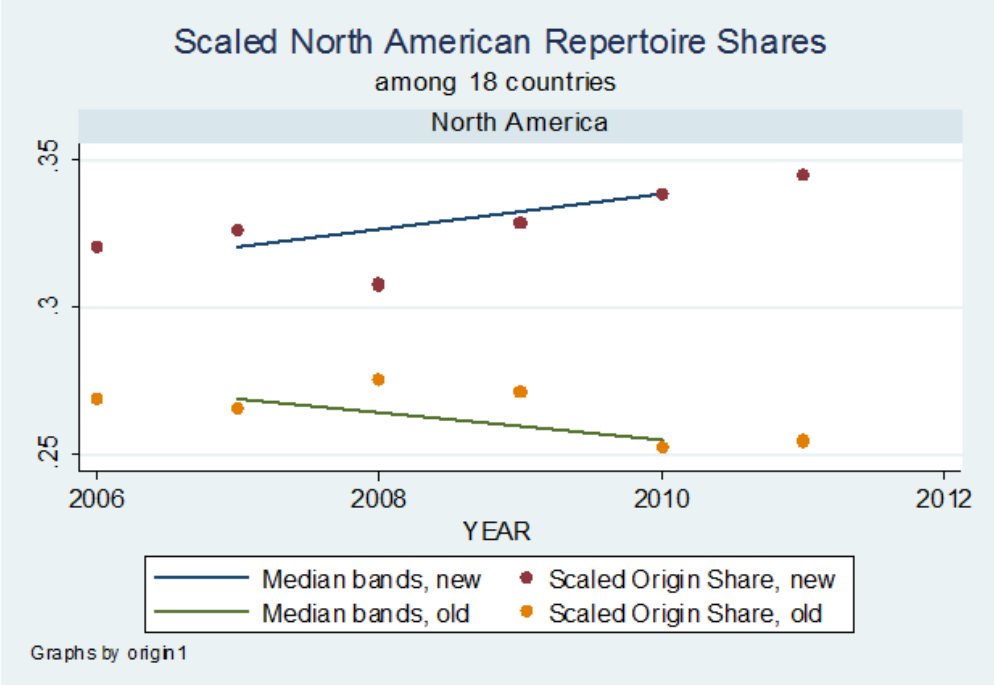


Figure 6b:



European Commission
Joint Research Centre – Institute for Prospective Technological Studies

Title: What's Going On? Digitization and Global Music Trade Patterns since 2006

Authors: Estrella Gomez-Herrera, Bertin Martens, Joel Waldfogel

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Abstract

The objective of this paper is to document the evolution of cross-border music trade patterns in this transition period and to explain what drives digital music trade patterns. The shift from analogue to digital music distribution has substantially reduced trade costs and has enlarged the choice sets of music consumers around the world. Yet, trade costs associated with copyright clearance and language barriers have not disappeared. The objective of this paper is to document the evolution of cross-border music trade patterns in this transition period and to explain what drives digital music trade patterns. Using comprehensive data on digital track sales in the US, Canada, and 16 European countries, 2006-2011, we document patterns of music trade in the digital era and contrast it with what's known from elsewhere about trade in popular music for the past half century.

While home bias in music consumption among the top 100 songs had grown in the pre-digital distribution period prior to 2006, home bias has declined since then. We find that the share of imported songs in music consumption has grown in all countries except in the US. Moreover, although the number of European songs available has risen faster than the number of US songs, the market share of the US in digital music sales has increased while the market shares of European repertoires have fallen. US repertoire holds the largest market share in almost every country. Home bias is lower in the long tail than at the top end of the distribution.

We consider four candidate explanations for the shift away from domestic music: a) that growth in availability of particular repertoires explains their growth in total sales and market shares, b) that changes in the effect of distance-related trade costs on trade made possible by digitization explain changed patterns of trade, c) that changed preferences toward particular origin repertoires explains changed patterns, and d) that recent vintages of particular repertoires have grown more or less appealing to world consumers. We conclude that a combination of c) and d) offers the most credible explanation for the observed patterns.

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