

And the Bands Played On: Digital Disintermediation and the Quality of New Recorded Music

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Abstract

Although revenue for recorded music has collapsed since the explosion of file sharing, results elsewhere suggest that the quality of new music has not suffered. One possible explanation is that digitization has allowed a wider range of firms to bring far more music to market using lower-cost methods of production, distribution, and promotion. Record labels have traditionally found it difficult to predict which albums will find commercial success, so many released albums fail while many nascent but unpromoted albums might have been successful. Forces raising the number of products released may allow consumers to discover more appealing choices if they can sift through the offerings. Digitization has promoted both Internet radio and a growing cadre of online music reviewers, providing alternatives to radio airplay as means for new product discovery. To explore this, I assemble data on new works of recorded music released between 1980 and 2010, along with data on particular albums' sales, airplay on both traditional and Internet radio, and album reviews at Metacritic since 2000. First, I document that despite a substantial drop in major-label album releases, the total quantity of new albums released annually has increased sharply since 2000, driven by independent labels and purely digital products. Second, increased product availability has been accompanied by a reduction in the concentration of sales in the top albums. Third, new information channels – Internet radio and online criticism – change the number and kinds of products about which consumers have information. Fourth, in the past dozen years, increasing numbers of albums find commercial success without substantial traditional airplay. Finally, albums from independent labels – which previously might not have made it to market – account for a growing share of commercially successful albums.

Recent technological changes – in particular the development of file-sharing – have substantially weakened the excludability of recorded music products and have therefore reduced the ability of sellers to appropriate the value of their products. In the past dozen years, recording industry revenue has fallen by about a third.¹ Because much of the recorded music industry has traditionally been investment-intensive – spending roughly a sixth of its revenue on artist development (including advances) and another sixth on music promotion – vitiated intellectual property rights have prompted serious concern that consumers would see a diminished flow of new recorded music products.² It is perhaps surprising, then, that a growing body of evidence shows that consumers have experienced no reduction in the volume of high-quality recorded music products and may indeed have experienced an increase in the service flow from new work. In related work I document a) that based on critics' retrospective best lists, the volume of high quality music did not decline following Napster; and b) that based on sales and airplay data by music vintage, the apparent quality of music vintages rose substantially following 2000.³

Continued development of new products in the face of weakened copyright protection is on its face a puzzle, particularly in an industry with high investment: with less revenue available, record labels have less ability to invest in new products and new artists. Tervio (2009) presents a theoretical framework that is useful for thinking about the product selection problem in the recorded music industry. The marketability of an artist is only known after consumers have been exposed to the product which, in turn, only happens after a label's traditionally large investment in production, promotion, and distribution activities. It is difficult to predict which

¹ A large literature explores the impact of file sharing on recorded music revenue. See Oberholzer-Gee and Strumpf (2007), Blackburn (2004), Rob and Waldfogel (2006), Liebowitz (2006), and Zentner (2006), to name a few. Most observers conclude that file sharing is largely responsible for the reduction in recorded music sales.

² See IFPI (2010) for a discussion of the magnitude of investment by the major record labels.

³ See Waldfogel (2011, forthcoming).

artists will succeed, and only a small minority of artists whose albums are released – perhaps 10 percent – are profitable. Unpredictability means both that many released albums turn out unsuccessful and that many unreleased albums would be successful if released. The key to discovering more marketable artists to market is more “experimentation,” that is, exposing more products to consumers.

This model, along with some institutional features of the recording industry may explain the puzzle of increased music quality following Napster. The major record labels that dominate the recorded music industry each have access to all aspects of the traditional processes for bringing music to market: recording, production, promotion, and distribution. These firms employ a high-cost strategy for experimentation, involving substantial expenditures for artist cash advances, professional recording, tours, and costly promotion of music on traditional radio stations. Alongside the majors is a large fringe of “independent” record labels, employing lower-cost methods for bringing music to market. Notably, they do not typically incur the costs needed to get their artists’ songs on the radio. Because of their limited resources in undertaking promotional activities, independent labels (and artists releasing their own music) have traditionally faced difficulty in achieving substantial sales for their albums.

In the past few decades, changes in communication technology have made it possible for recording firms to undertake broader experimentation with less investment. Digitization has had obvious effects on the costs of producing and distributing recorded music. Low-cost equipment and software have reduced recording costs, and the Internet enables low-cost digital distribution; but success also requires the promotion of new products. Perhaps less obvious are digitization’s impacts on promotion. Consumers can now be made aware of a wider range of new music more

easily and through channels besides the traditional bottleneck of radio. Notable new avenues of promotion include online listening opportunities (Internet radio) as well as a growing cadre of online music reviewers.

Effective reduction in the cost of bringing new work to market raises the possibility that despite piracy's depressing impact on revenue, more music may be finding its way to market, allowing consumers to discover better music. This paper seeks to systematically explore this possibility. To this end I assemble data on all album releases 1980-2010 (including label type), along with airplay information that I am able to assemble on album sales and airplay on both traditional radio (since 1990) and Internet radio (2006-2011), as well as the availability of reviews for albums at Metacritic since 2001. Using these data I address the following questions. First, how have the number of releases from major and independent labels, as well as self-released album, evolved over time? Second, have sales become concentrated in fewer, or in more, albums over time? Third, has promotion via airplay and album reviews changed over time? Fourth, how have the apparent pathways to commercial success changed over time? In particular, *how* are they achieving success – using radio airplay vs other means of reaching consumers? And finally, *who* is achieving success over time (majors or indies)?

The experience of Arcade Fire's album *The Suburbs* illustrates the mechanisms the paper seeks to explore. The 2011 winner of the Grammy award for best album, *The Suburbs* provides a prominent example of promotion – and both commercial and critical success – without much traditional airplay. The album was released by the independent label Merge Records on August 3, 2010⁴ and received a Metascore of 87 at Metacritic, putting its rating in the top 5 percent of

⁴ According to Amazon.com: <http://www.amazon.com/The-Suburbs-Arcade-Fire/dp/B003O85W3A/> .

album scores. Despite critical acclaim for this and their previous albums (Metascores of 90 and 87, respectively, for 2004's *Funeral* and 2007's *Neon Bible*), their new album received little or no airplay. Neither it nor its predecessors ever appeared among the top 75 weekly songs on Billboard's airplay chart. Yet, its exposure on Internet radio was substantial. In its third week after release, the song "Ready to Start" had over 40,000 weekly listeners at last.fm, and its listening remained at roughly 20,000 per week through February, 2010. The album won the Grammy for best album, and the album was certified Gold by the RIAA, indicating sales of 0.5 million, on October 19, 2011.

Systematic analysis of the data paints the following picture, which provides a plausible explanation for the apparent increase in music quality of the past decade. First, there has been a substantial growth in independent releases and self-released works of music relative to major label releases. Despite an absolute decline in major-label releases, the overall number of new works brought annually to market has increased by 50 percent since 2000. Second, there has been substantial growth in information channels by which consumers can learn about new music. Where traditional radio used to be the main institution for learning about new music, the past decade has seen the emergence and growth in alternative institutions, including Internet radio (with highly customized playlists able to air a wider variety of music) and online music criticism. New information channels are changing the pathways to commercial success. While 60 percent of the artists appearing among the weekly top 25 albums on the Billboard 200 during 1991 received substantial airplay during the year, the share has fallen steadily since. In 2010, only 30 percent of the Billboard top 25 artists had received substantial airplay during the year. Other modes of acquainting consumers with new music besides radio airplay are playing a larger role. A large share of the Billboard 200 artists not receiving airplay had instead been covered in the

growing web media: by 2010, 38 percent had recently been reviewed by at least three critical outlets covered in Metacritic.

This disintermediation of the traditional roles of the major record labels has given rise to a rather substantial change in the types of record companies achieving commercial success as well as the channels by which consumers learn about the music that they ultimately purchase. Independent labels accounted for 13 percent of the artists appearing in the Billboard 200 in 2001, and this has risen steadily to 35 in 2010.

The paper proceeds in six sections. Section 1 provides some institutional background on the recorded music industry, as well as a simple model in the spirit of Tervio (2009) for organizing ideas about the possible impact of digitization on the quality of music that markets provide to consumers. Section 2 describes the various data sources used in the study. Section 3 discusses our method for estimating sales from a combination of Billboard album sales ranks and Recording Industry Association of America (RIAA) sales certification data. Section 4 describes the changed information environment by contrasting the role of traditional airplay with the new environment of Internet radio and online music criticism. Section 5 then turns to results. First, I document the evolution of the number of album releases over time, overall and by type of music label. Second, I document that the growth in the number of available new products has brought about a fragmentation of demand, particularly since 2000. While roughly 500 artists appeared on the Billboard 200 rankings during 2000, over 1000 separate artists appeared on the Billboard 200 weekly rankings during 2010. This evidence is interesting in itself; it also provides an instructive contrast with other media markets that remain concentrated even as markets expand in relation to entry costs, as in Sutton (1991). Third, I present evidence on the changing composition of

promotional channels for commercially successful artists. I document that a declining share of successful artists have traditional airplay, while a growing share are covered by online radio and critics. Fourth, I ask whether the formerly suppressed products now brought to market have substantial ex post value, in particular whether a growing share of commercially successful albums are released by independent labels. The conclusion provides some discussion of the results, in particular a discussion of factors that would lead an increase in the number of available products to bring about fragmentation.

I. Background: Digitization and Bringing Music to Market

1. Industry Background

Bringing new music to market relies broadly on four activities. First, a label must discover talent. Second, the label can invest in artists, both in the form of cash advances and the creation of professional-quality recordings of music that embody the quality they have discovered and nurtured. Third, they promote the music that they have recorded through both advertising and campaigns to get music on the radio. Finally, they produce and distribute physical recordings to consumers, via retailers. The major record labels have traditionally maintained all of these capabilities, and these activities are costly.

Major labels give artists cash advances. While these advances are recoupable from an artist's sales, they are "not recouped if sales do not reach certain levels. Thus it is the record company that bears the risk of the investment."⁵ The International Federation of the

⁵ See IFPI (2010), p. 10.

Phonographic Industry (IPFI ,2010) cites \$200,000 as a typical advance for a new pop act and \$1,500,000 as a typical advance for a superstar.

Recording itself has also been expensive. Recording an album has traditionally required an investment in studio time. Labels undertook this investment by lending artists money against future revenue from the resulting albums. Vogel (2007, p.243) reports that, “[p]roduction costs for popular albums are generally budgeted for at least \$200,000, and, if much studio time is used, costs can soar well past \$350,000.” IFPI (2010) cites \$200,000 as the recording cost for a “typical” new pop act and \$400,000 for a superstar.

Marketing and promotion campaigns – involving concert tours, cooperative advertisers with local retailers, and radio and television ads – are also expensive. According to Vogel (2007, p. 244): “[m]arketing costs can often reach \$100,000 for a fairly standard release and in excess of \$500,000 for one by a major artist.” IFPI (2010) cites \$300,000 as a typical cost of promotion and marketing for a new pop act and \$2,300,000 for a superstar. Music videos and tour support add separate costs, totaling \$300,000 for a typical new pop act and \$450,000 for a typical superstar.

A major goal of these promotional campaigns is to get new music played on the radio. Space on radio station playlists has traditionally been scarce. As Vogel (2007) puts it, “With popular-music stations able to add at most three or four new cuts per week to their lists, competition for airplay is intense: Every year an estimated 11,000 (nonclassical) major-label albums averaging some ten cuts per album is released, but it is now unusual for more than around 120 of these to sell more than 500,000 units in the physical (i.e. CD) format.” It is perhaps not surprising, given the incentives to get music aired in conjunction with playlist

scarcity, that the cost of promoting a hit single record was “about \$150,000” in the 1980s (Caves, 2000).

Distribution is also costly and is subject to scale economies. Because most successful records are in demand only briefly, “it is essential that retailers located over a wide geographic swath have their inventories quickly replenished.”⁶ As a result, “[m]ost records are thus distributed by large organizations with sufficient capital to stock and ship hundreds of thousands of units on a moment’s notice.”⁷

Incurring the costs associated with production, promotion, and distribution is by no means a guarantee of success. Vogel (2007, p. 244) reports that “perhaps as little as 10 percent of new material must make a profit large enough to offset losses on the majority of releases... Labels will encourage the production of more material than can possibly succeed, in essence diversifying their portfolio of bets on new releases.” Caves (2000, p.61) makes a similar point: “The payout is highly uncertain, however. *Nobody knows*: casual estimates suggest that roughly 80 percent of albums and 85 percent of single records fail to cover their costs.”

New technologies have enabled disintermediation of the majors’ traditional functions, that is, less expensive alternatives to the major labels’ traditional method. Production is now far less expensive. An artist can create a recording with a few hundred dollars worth of software, rather than hundreds of thousands of dollars of studio time. It is also possible to promote new music with neither expensive advertising nor traditional radio airplay. Instead, an artist can post music to YouTube. Or an independent label can make an artist known through Internet radio. Major outlets include Pandora, Last.fm, rdio, and a multitude of others.

⁶ Vogel (2007), p. 245.

⁷ Ibid.

At an extreme, some highly successful artists have been discovered entirely without labels. Perhaps the best known example is Justin Bieber, who was discovered on YouTube.

“Bieber was discovered in 2008 by Scooter Braun, who happened to come across Bieber's videos on YouTube and later became his manager. Braun arranged for him to meet with Usher in Atlanta, Georgia, and Bieber was soon signed to Raymond Braun Media Group (RBMG), a joint venture between Braun and Usher, and then to a recording contract with Island Records offered by L.A. Reid. His debut single, “One Time”, released worldwide in 2009, peaked in the top ten in Canada and charted in the top thirty in several international markets. His debut release, *My World*, followed on November 17, 2009, and was eventually certified platinum in the United States. He became the first artist to have seven songs from a debut album chart on the *Billboard* Hot 100.”⁸

Bieber’s story, while perhaps atypical, is not unique. Elliott (2011) provides accounts of 15 artists discovered on YouTube.⁹

Short of this extreme example are other possible new routes to success without the major label’s high investment. While there is a great deal of variation among “independent” labels, it is surely accurate to say that they employ lower-cost strategies. According to Agenda Magazine, “If there is an advance offered, it will not be as large as one from a major label.” And: “an Indie label cannot usually allot quite as much money for marketing and tour support as a major, so it might take longer to gain as much exposure as with a major label.”¹⁰ According to one source, “independents typically spend much less on marketing and promotion than major labels.”¹¹

Internet, rather than traditional terrestrial radio is part of the strategy. “For indie record labels, internet broadcasting as well as podcasting, represent a way to get (independent) music heard.” According to the CEO of Magnatune (an independent music company), “Ever since Big

⁸ See http://en.wikipedia.org/wiki/Justin_Bieber .accessed August 3, 2010. See also Desriee Adib, “Pop Star Justin Bieber Is on the Brink of Superstardom.” Nov 14, 2009. Good Morning America (<http://abcnews.go.com/GMA/Weekend/teen-pop-star-justin-bieber-discovered-youtube/story?id=9068403>) , accessed August 3, 2011.

⁹ See Amy-Mae Elliott, “15 Aspiring Musicians Who Found Fame Through YouTube,” Mashable.com, January 23, 2011 (<http://mashable.com/2011/01/23/found-fame-youtube/#Jk5L0-SIeg>, accessed August 3, 2011).

¹⁰ See <http://www.agendamag.com/sept09/majors-vs-indie.html> .

¹¹ See http://en.wikipedia.org/wiki/Independent_music , accessed August 24, 2011.

Radio began being a pay-to-play (aka payola) system, indie labels have not had a way to reach their fans over the airwaves. And of course, fans of non-mass-media music would like diversity and quality in the radio offerings they can access. Indie labels want internet radio to survive and prosper: that is how we reach and build a fan base.”¹²

Leeds (2005) provides additional evidence on the importance of the Internet for artists on independent labels: “...no factor is more significant than the Internet, which has shaken up industry sales patterns and, perhaps more important, upended the traditional hierarchy of outlets that can promote music. Buzz about an underground act can spread like a virus, allowing a band to capture national acclaim before it even has a recording contract, as was the case this year with Clap Your Hands Say Yeah, an indie rock band.”

Because independent record labels incur lower costs making each album, they can break even with far lower sales than a major label requires. “Unlike the majors, independent labels typically do not allocate money to producing slick videos or marketing songs to radio stations. An established independent like Matador Records - home to acts including Pretty Girls Make Graves and Belle and Sebastian - can turn a profit after selling roughly 25,000 copies of an album; success on a major label release sometimes doesn't kick in until sales of half a million” (Leeds 2005). And: “No one's trying to sell six million records; we're trying to sell as many as we can,” said Chris Lombardi, Matador's founder. ‘We're working with realistic success.’ ”

Summarizing the potentially transformative effects of new technologies and new communication channels, Knopper (2009, p. 246) describes artists’ “newfound independence from major record labels” as

¹² See Vern Seward, “Internet Radio and the CRB: A View from Indie Labels.” The Mac Observer. June 13, 2007. http://www.macobserver.com/tmo/article/Internet_Radio_And_The_CRB_A_View_From_Indie_Labels/

“a shocking, liberating new world. They began their careers when labels had just about every bit of leverage possible in the star-making process. An artist who wanted to make a record needed studio time – and that cost money, which meant a sizable loan from the label. An artist who wanted to get a single onto a radio playlist needed connections – and that usually meant a label executive who had the money to hire an independent promoter. An artist who wanted to sell millions of copies of a record needed a big-time distributor with the clout to push CDs into big stores like Best Buy or Target – and that meant one of the major labels’ own subsidiaries, like WEA or CEMA. Today, it’s not necessary to hook up with a label to do all these things. An artist can make a record cheaply, and professionally, using software like Pro Tools. An artist can forgo the radio, building buzz and exposure online via do-it-yourself websites like MySpace, viral videos on YouTube, or any number of social networking services from Facebook to Garageband.com. As for distribution, who needs crates, trucks, warehouses, stores, or even the discs themselves? Artists can follow Radiohead’s example and simply distribute the music essentially free online.”

Many artists express enthusiasm for the new situation. Moby, a US artist with an album that has sold over million copies, argues, “There was a time when the music business was incredibly monolithic and there were only two ways to get your music heard: sign to a major label, get your music played on MTV and get it played by big radio stations.” James Mercer (of the Shins, who have produced two albums that have each sold over half a million copies in the US, quoted in Knopper): “You see these articles about the disaster in the music business...
...It’s now more likely I’ll be able to start my own label, release my work, profit from it, and have a more lucrative career. For a band at our level, it’s all a bowl of cherries.”

These accounts stand in contrast to the trends in recorded music revenue, raising the question of whether they withstand more systematic inquiry.

2. Model

This section presents a simple model in the spirit of Tervio (2009) to illustrate the possible effects of technological change on the realized quality of music that consumers experience.¹³ The model is meant to embody the idea that music is an experience good whose

¹³ Tervio’s model predicts a bias toward mediocrity: Labels could finance the adequate experimentation only if they could strike long-term contracts with artists, allowing them to finance the failed experiments with the proceeds from

quality and marketability are difficult to predict at the time of the investment decision. Instead, true quality is revealed only by the expensive process of bringing the product to market. In the model music labels act as gatekeepers that finance recorded music products based on their ex ante promise. If the product is brought to market, firms and consumers discover and realize the ex post value of the product. Because of endemic unpredictability, ex ante promise is a poor predictor of ex post success.

Define q_i as an index of the quality of product i . Quality here should be interpreted as an index related to both marketability and consumer welfare. Financiers and consumers cannot learn the true quality of the product prior to release. Instead, they form an estimate of ex ante promise of marketability: $q'_i = q_i + \varepsilon_i$, where ε is a mean-zero error.

Bringing a product to market has the substantial costs described above, and the product must be brought to market in order for buyers and sellers to learn the true quality of the product. Producers are risk-neutral, and they bring a new product to market if expected revenues cover costs, or if $q'_i > T_0$, where T_0 is a quality/marketability threshold such that products brought to market are expected to cover costs.

Technological change then brings two shocks to the market. First, piracy makes it more difficult to generate revenue, which raises the entry threshold T . But concurrent technological changes make it possible to record music and make it available to the public (and to learn its true quality) at lower cost. This allows firms to operate with a reduced T , which we refer to as T_I when they use the lower-cost mode of production, promotion and distribution.

rare successes; but long-term contracts are not feasible. Hence, there is insufficient experimentation and an over-reliance on predictably profitable but mediocre artists.

If artist marketability were perfectly predictable at the time of investment, then all artists with true (realized) quality above the threshold ($q > T$) would be brought to market. If technological change fell from T_0 to T_1 , then additional products with less ex ante promise would be brought to market. This would perform benefit consumers; but the benefit would be relatively small, since all of the newly available products would have quality between T_0 and T_1 . But as noted above, artist marketability is very unpredictable, so a relaxation of the entry threshold can raise the number of products that are highly marketable ex post, not just the number of products with ex post value between T_0 and T_1 . Under the lower threshold, a product is launched when ex ante promise exceeds T_1 , which occurs when $q_i > T_1 - \varepsilon_i$. Provided that ex post success is sufficiently unpredictable – $\text{var}(\varepsilon)$ is sufficiently large – the lower-cost entry condition will give rise to additional entry of products with ex post marketability in excess of T_0 . In short, provided that $T_1 < T_0$ and artist marketability is unpredictable, we can expect an increase in the quantity of high-quality products brought to market when T declines.

This framework, while simple, puts some structure on our inquiry. The first question is whether, in light of both piracy and potential cost reductions, the effective threshold has risen or fallen (and, by extension, whether more or fewer products come to market). Given an affirmative answer to the first question, a second question is whether the new products with less ex ante promise – and which previously would have been less likely to be launched – add substantially to the welfare delivered by available products. This is a difficult question, but we can certainly ask whether products launched by independent labels – and using low-cost methods of production, promotion, and distribution – grow more likely to become commercially

successful. These questions, along with evidence about mechanism, occupy most of the rest of the study.

II. Data

I develop two basic datasets for this study using data using nine underlying sources. The first dataset is a list of albums released in the US 1980-2010 where for each album I attempt to classify its label (major, independent, self-released) and its format (physical vs digital). The second basic dataset is a list of commercially successful albums based on their inclusion on weekly top-selling album lists, along with my estimates of the albums' actual sales. These albums are then linked with measures of traditional radio airplay, promotion on Internet radio, coverage by music critics, and a designation of whether the album is on an independent record label.

The nine underlying data sources for this study may be grouped into six components. First, I have weekly rankings of US album sales, from three separate weekly Billboard charts. First among these charts is the Billboard 200 (from 1990-2011), which lists the top 200-selling albums of the week, based on Soundscan data.¹⁴ Second, I observe the Heatseekers chart (2000-2011), which shows the weekly top 50 albums among artists who have never appeared in the top 100 of the Billboard 200, nor have they ever appeared in the top 10 of the more specialized Billboard charts.¹⁵ Heatseeker artists can be viewed as artists emerging as commercially successful. Finally, I also observe the Billboard Independent chart, which shows the week's top-

¹⁴ The underlying data include 272,000 entries from weekly top-200 album sales charts, 1990-2011.

¹⁵ The underlying data include 31,775 entries from weekly top-50 album charts, 2000-2011.

selling albums from independent music labels. I observe this for 2001-2011.¹⁶ All of the Billboard charts are obtained from Billboard.biz.

Second, I observe two measures of traditional US airplay, from the Billboard Hot 100 airplay chart which, ironically, lists the 75 most aired songs of the week in the US and from USA Top 200, which lists “the top 200 songs on US radio” each week. The Billboard chart lists “the week’s most popular songs across all genres, ranked by radio airplay audience impressions measured from Nielsen BDS.” Spins are weighted by numbers of apparent listeners.¹⁷ I observe this for 1990-2011, again from Billboard.biz. Because I observe the top 75 songs of each week and not the entire universe of songs aired on the radio, I refer to the songs on the airplay charts as songs with” “substantial airplay.” I have a separate measure of airplay, the USA Airplay Top 200 (“The most played tracks on USA radio stations”) between February 2009 and the end of 2011.¹⁸ The latter source has the advantage of covering nearly three times as many songs per week. Because airplay data cover songs while my sales data described albums, I aggregate both to the artist-year for linking and analysis.

Third, I observe critical assessments of new albums from Metacritic. Metacritic reports an assessment of each album on a 100-point scale. They report a review of at least three of over-100 underlying critical sites reports a review on an album. Metacritic appeared in 2000, so these reviews cover the period 2000-2011, and the coverage grows over the decade. There are 485 reviews in 2000, 867 in 2005, and 1037 in 2010. According to Metacritic,

¹⁶ The underlying data include 28,775 entries from weekly top-50 independent album charts, 2001-2011.

¹⁷ <http://www.billboard.com/charts/radio-songs#/charts/radio-songs>

¹⁸ See <http://www.charly1300.com/usaairplay.htm>, accessed June 15, 2012.

“We try to include as many new releases as possible, in a variety of genres. Generally, major pop, rock, rap and alternative releases will be included. We also try to include many indie and electronic artists, as well as major releases in other categories (country, etc.). Occasionally, we will also include import-only items (generally, UK releases) if it appears that they will not be released in the United States in the foreseeable future (otherwise, we will typically wait for the U.S. release). Remember, if an album does not show up in at least 3 of the publications we use, it probably will not be included on the site.”¹⁹

Fourth, I have data on the weekly rankings of songs aired at Internet radio site last.fm from April 3, 2005- May 29, 2011. While Pandora is the largest and most prominent Internet radio site (Edison/Arbitron, 2011, 2012), I lack Pandora listening data. However, listening data on last.fm are more readily available. According to Alexa.com, Pandora was the 308th ranked global site – and the 55th US site – on June 11, 2012. Last.fm is lower-ranked: 766 globally and 549 in the US. Last.fm reports the top 420 songs, according to the number of listeners, for each week.

Fifth, I observe RIAA data on total album shipments by year (1989-2011) as well as gold (0.5 million), platinum (1.0 million), and multi-platinum album certifications, 1958-2011. As I detail in Section 3 below, I use the certification data in conjunction with Billboard sales rankings to construct weekly estimates of album sales, by album.

Sixth, I have a list of works of new recorded music, from Discogs.com. Discogs is a user-generated dataset that bills itself as “the largest and most accurate music database... ...containing information on artists, labels, and their recordings.” Using Discogs, I created a

¹⁹ From “How do you determine what albums to include on the site?”, at https://metacritic.custhelp.com/app/answers/detail/a_id/1518/session/L3Nuby8wL3NpZC9DOFVxQkczaw==, published June 10, 2010.

dataset consisting of every US album released 1980-2010. This is a total of 203,258 separate releases. (I aggregate versions on different media – e.g. CD, vinyl, file – into a single release). My focus is albums, so I exclude singles.

There are 38,634 distinct labels among my Discogs data; and classifying labels as major vs independents turns out to be challenging. Major labels are generally understood to be those labels owned by three underlying firms: Universal, Sony/BMG, Warner, and until recently EMI. Unfortunately – for the purpose of identifying them in the data – labels operate with many imprints, as the tallies above suggest. While published sources document the histories of some the major imprints (e.g. Southall, 2003), such published sources cover only a small fraction of the labels in these data.

Fortunately, I can rely on a few other approaches to identify many labels that are either definitely major or definitely independent. First, a recent study by Thomson (2010) attempts to calculate the share of music on the radio released by independent record labels. For this purpose she needed to classify thousands of underlying albums' labels as major or independent. She enlisted the help of the American Association of Independent Music (A2IM) to create a list of major and record labels. Her list includes 6358 labels, of which all but 688 could be coded as major or independent.²⁰ I begin with her classification. I also classify as major a label whose name includes the name of a major label (e.g. Warner, EMI, etc.). Finally, I classify as independent any label that Discogs refers to as “underground,” “independent,” “experimental,” “minor,” or “not a real label.”

²⁰ A small number of additional labels have the classifications Disney and legacy, respectively.

Despite all of these efforts, matching is incomplete. Of the works in Discogs, 26 percent can be identified as being on major labels. Another 20 percent of works can be identified as independent-label releases, and 3 percent are self-released. This leaves the label types for 51 percent of the albums in the database unidentified. That said, there is reason to believe that the releases on unknown labels are not from major record labels. Of the releases on unknown labels, 40 percent are on labels that release albums by no more than 5 artists. In some calculations below, I treat the unclassified labels as non-major labels.

III. Inferring Sales Quantities from Sales Ranks and Album Certifications

We would like to have data on the quantities sold for all albums, by album, but such data are unfortunately expensive to obtain. Fortunately, we can use the data at hand to construct reasonable estimates of sales for almost all albums. We have data on the weekly sales ranks of the top 200 selling albums, as well as sales milestones (0.5 million and multiples of 1 million) for high-selling albums. In addition, we have data on the total sales of all albums by year.

It is usual to assume that sales distributions follow power laws (see Chevalier and Goolsbee, 2003; and Brynjolfsson, Smith, and Hu, 2003). That is, sales quantities are believed to bear simple relationships with sales ranks. To be specific, $s_{it} = \alpha r_{it}^\beta$, where s_{it} is sales of album i in week t , r_{it} is the sales rank of album i in week t , and α and β are parameters. Because we observe when sales pass various thresholds, say, 0.5 million at gold certification, we can econometrically estimate α and β . Define the cumulative sales for album i in period τ as $S_{i\tau}$. Thus, $S_{i\tau} = \sum_{t=0}^{\tau} \alpha r_{it}^\beta$. If we include an additive error, we can estimate the parameters via

nonlinear least squares. The coefficients have the following interpretation: α provides an estimate of the weekly sales of a number-one ranked album. The parameter β describes how quickly sales fall in ranks.

A few adjustments are needed for realism. Because the size of the market is changing over time, the parameters are not necessarily constant. We have data on thousands of album certifications across many years, so we can be flexible about the parameters. Given estimates of the parameters, we can construct estimated sales of each album in each week (or each year). We can use these data to calculate, say, the share of sales attributable to independent-label albums. We can also calculate the extent to which sales are concentrated in each year.

Data on certification-based sales provide some guidance on parameter stability. We can calculate the sales for the top-selling albums of the 1970s, 1980s, 1990s and the 2000s. We can then compare the log sales-log rank relationships across decades. (To be clear, these are not the Billboard weekly sales ranks referred to as r_{it} above; rather, these are ranks based on total sales ever from RIAA certification data). Table 2 presents a regression of log sales on log ranks, where the constant and slope coefficients are allowed to vary across releases from the different decades, 1970-2010. Not surprisingly, the constant term varies substantially across decades, reflecting the differing sales levels in the different decades. The constant term rises from the 1970s to the 1990s, then falls substantially in the 2000 decade. (The exponentiated constants provide estimates of the sales of the top-ranked album of each decade). The slope coefficient varies less across decades. In particular, it rises in absolute value from 0.65 in 1970s to 0.75 during the 1980s and 1990s. The coefficient then falls in the 2000s back to its level in the 1970s. A lower slope coefficient indicates that sales fall off less in ranks. The recent decline in the

slope coefficient indicates that recent sales are less concentrated among the highest-ranked albums. These results indicate that we will want to allow the constant term to vary over time.

We implement the nonlinear least squares estimation with 3,272 albums receiving certification, released between 1986 and 2010. There is apparent bunching of certifications of particular albums. That is, the gold and platinum certifications sometimes appear on the same date. Hence, I use only the sales associated with the highest certification for each album, and I assume that the sales associated with the accumulated certifications level of sales has occurred by the time of the last certification. Table 3 reports results. The first column reports a restrictive specification which holds both α and β constant over time. The second specification relaxes the constancy of α . Regardless of the method used, the β estimate is roughly 0.6. The α term varies over time with overall album sales. The rise in α in 2010 arises because the certification data end in 2010. Hence, the coefficient reflects the relationship between BB200 weekly ranks and the selected sample of albums that quickly achieve sales certification. Putting the 2010 coefficient aside, the pattern of α coefficients tracks overall sales trends, peaking around 1999 and falling thereafter. Figure 1 plots coefficients against total annual album shipments, both normalized to 1 in 1999, and the correspondence is close.

One shortcoming of the approach above is that it does not incorporate information about annual aggregate album sales. That is, nothing constrains the sum of simulated sales across albums to equal total reported shipments for the year. If we were to assume that the sales of albums that never appear on the Billboard weekly top 200 are negligible – in effect that only about 500-1000 albums per year had nonzero sales – then we would expect the sum of the implied sales across weeks in a year to equal the year’s aggregate sales. That is, if we define σ_y

as the aggregate album sales in year y , then: $\sum_{i=1}^T \sum_{t=0}^{52} \alpha r_{it}^\beta = \sigma_y$. This can be rewritten as $\alpha = \sigma_y / (\sum_{i=1}^T \sum_{t=0}^{52} r_{it}^\beta)$. That is, once we have an estimate of β that we wish to apply to year y , we can infer α for that year as well. The sum of the simulated sales of the albums appearing in the Billboard 200 at some point during the year then equal the actual aggregate sales. I use this approach, which causes the sales tabulations of Billboard 200 albums to equal total shipments.

IV. The Changing Information Environment for Consumers

1. Internet vs Traditional Radio

Traditional radio operates in a relatively small number of pre-defined programming formats (top 40, adult contemporary, and so on), providing venues for the promotion of a relatively small share of new music. Major-label music dominates airplay on traditional radio. Thomson (2010) documents that between 2005 and 2008, music from independent labels accounted for 12-13 percent of US airplay.

Two recent developments hold the possibility of changing the number of new music products of which consumers are cognizant: Internet radio and expanded online criticism. While traditional radio stations have publicized a small number of artists in pre-ordained formats, Internet radio allows listeners to tailor stations narrowly to their tastes. At Pandora, for example, users “seed” their stations with songs or artists that they like. Pandora then presents other songs that are similar. Last.fm operates similarly. While this personalization need not lead to a greater variety of artists receiving airplay – it would be possible for all listeners to seed their stations with the same songs or artists – in practice, personalization provides promotion for artists not receiving substantial traditional airplay.

To explore Internet radio listening patterns I obtained song listening statistics from Last.fm's weekly song chart, Feb 2005 – July 2011. Each week last.fm reports the number of listeners for each of the top 420 songs at last.fm. Figure 2 provides a characterization of listener volumes as a function of song rank on last.fm. In 2010, a top-ranked song (according to volume of listeners) had about 38,000 weekly listeners. The 100th-ranked song had about 13,000, and the 400th song had roughly 8,000. I then compare the artists on last.fm with those on traditional radio airplay charts.

Unfortunately, both of my airplay data sources are incomplete. Thomson (2010) documents that, over the course of a year (between 2005 and 2008), the top 100 songs accounted for about 11 percent of airplay; the top 1000 songs accounted for almost 40 percent; and the top 10,000 accounted for nearly 90 percent. While the Billboard airplay data include 3900 (75 x 52) song listings per year, because songs persist on the charts, the total number of songs making the Billboard airplay charts is about 330 per year. The USA Airplay data go deeper. In 2010, the chart included 10,400 entries and 662 distinct songs. While I am missing more than half of the songs on the radio, I can still document stark differences between radio airplay and Internet radio artist coverage.

Despite the differences in list depth, both the Billboard airplay charts and last.fm's song chart include roughly the same number of artists per year. In 2006 (with the first full year of data on Last.fm), Billboard's weekly top 75 lists included a total of 253 artists across the year. Last.fm's weekly songs lists included a total of 183 artists. Only 33 artists appeared on both lists. The overlap is quite similar in subsequent years. The degree of overlap by listening is somewhat larger than the overlap by artists: of the 2006 listening at last.fm, 26 percent was to

artists also on the Billboard airplay charts. Figures for 2007-2010 are similar. While this leaves open the possibility that the last.fm songs are nevertheless on the radio, the degree of overlap with the longer USA Top 200 Airplay list is similarly low. In 2010, nearly 70 percent of the songs on last.fm are not among those on the USA Top 200 list.

We see other indications that airplay patterns differ between traditional and Internet radio. I can construct crude indices of song listening from rank data as the reciprocal of the weekly rank, summed across weeks in the year. The correlation between this measure of listening across the two traditional airplay datasets is 0.75. The correlation between the airplay index from the Top 200 data and the last.fm listening measure is 0.15. These results indicate that the majority of Last.fm listening appears to be for music not widely played on traditional radio and that Internet radio provides promotion for music that is less heavily promoted on commercial radio.

Among the songs on BB airplay and last.fm lists, the correlation of airplay frequency is low (see Figure 3 for scatter plot). There is other evidence that the two kinds of outlets allow the promotion of different sorts of artists. Tables 4 and 5, respectively, provide lists of the most heavily played artists on last.fm not appearing on the BB list, and vice versa. Comparison of the lists shows clearly that last.fm is comparatively skewed toward independent-label artists. Despite the shortcomings of the available airplay data, it seems clear that traditional and Internet radio provide promotional opportunities for different kinds of artists.

2. Growing Online Criticism

Critical assessments also substantively expand the set of artists promoted to consumers. Along with many other effects of digitization, the Internet has led to an explosion of outlets providing critical assessment of new music. Since 1995 the number of outlets reviewing new music – and the number of reviews produced per year – has doubled. These reviews are moreover made available freely on the web (through sites like Metacritic and Pitchfork). These information sources hold the possibility of challenging radio's centrality in influencing musical discovery.

Of course, music criticism predates the Internet; but the growth of the Internet has been accompanied by a substantial growth in outlets offering music criticism. Metacritic.com is a website offering distilled numerical ratings of new music. They have operated since 2000, and they draw from over 100 sources of professional music criticism. Metacritic reports a “Metascore” for an album – a translation of reviews into a numerical score between 0 and 100 – if at least three of its underlying sources review an album. Underlying sources include originally-offline magazines such as Rolling Stone, as well as newspapers. But many sources, such as Pitchfork, came into existence with, or since, the Internet. Of the reviews in Metacritic for albums released since 2000, over half are from sources founded since 1995. See Figure 4. If these outlets can inform consumers about music, they may supplant the traditional role of radio. The number of albums reviewed at Metacritic has grown from 222 in 2000 to 835 in 2010, as Table 1 shows. The vast majority of these albums are by artists who do not receive substantial airplay on traditional radio stations.

V. Results

We are now in a position to evaluate the net effect of piracy and cost reduction, in conjunction with the changed information environment, on the volume and quality of new work brought to market. Do we see a greater volume of releases by artists with less ex ante promise? And do these artists' music contribute substantially to the products with ex post success?

1. Volumes of Major and Independent Label Releases

The first question is how the number and mix of new products has evolved. Have the majors reduced the number of new releases? Have the independent labels increased their volume of releases? I have access to two broad measures of the numbers of albums released each year in the US. The first is an aggregate time series of album releases from the Nielsen Soundscan database. To appear among those data, an album must sell at least one copy during the year. According to Neilson, the number of new albums released annually was 36,000 in 2000, grew to 106,000 in 2008, and has since fallen to about 75,000.²¹ It is quite clear, as Oberholzer-Gee and Strumpf (2009) have pointed out, that there has been substantial growth in the number of albums released annually since 2000. Because I lack access to the underlying Nielsen data, I cannot classify those releases by label type.

The Discogs data, while they cover only about a tenth of the total releases in Soundscan, contain album-level info along with label type. It is difficult to know how the Discogs and Soundscan samples relate to one another. Soundscan includes all music genres, while the Discogs figure here include only rock music. Inclusion in Discogs is not mechanically driven by sales; rather, albums are included because users contribute information. It is nevertheless

²¹ Data for 2000, 2008-2010 are reported at <http://www.digitalmusicnews.com/stories/021811albums>. Data for 2011 are reported at <http://www.businesswire.com/news/home/2012010500547/en/Nielsen-Company-Billboard%20%99s-2011-Music-Industry-Report>.

encouraging that the total numbers of albums released according to respective data sources follow similar trends, rising from 2000 to 2009, then falling.

With the caveat about representativeness in mind, we can use the Discogs data to see how releases evolve over time by label type. Figure 5 provides a description based on only the identifiable label observations. Releases from major labels far outnumber independent releases between 1980 and roughly 2001. Since then, major-label releases have declined by more than half. The numbers of identifiable independent-label releases, and self-released albums, show a different pattern. While independent releases were a fraction of major-label releases between 1980 and 1995, they surpassed major-label releases in 2001. In 2010 identifiable independent-label releases outnumber major-label releases by a factor of 2. Self-released recordings have also increased sharply, from a few hundred in the year 2000 to over a thousand in 2010.²² Figure 6 aggregates independent releases, self-releases, and the releases on unknown labels (which we suspect generally to be independent of the majors). While major-label releases are, again, declining, it is clear than overall releases are increasing.

We have argued that the growth in new releases is driven by changed technologies for production and distribution. We see some direct evidence for this in a breakdown of new releases by whether they are physical or digital, in Figure 7. I classify as “digital” the releases available only as digital files. Interestingly, there is a fairly substantial decline on the number of

²² A curious feature of the data is that the number of releases – both independent and major – appears to have fallen recently. Annual major label releases peak in 1999; annual independent label releases peak in 2007. It’s not clear whether the decline is real – it may be an artifact of the user-contributed nature of Discogs. Perhaps it takes a few years for users to fill in recent years. Regardless of these timing issues, the number of major-label releases has fallen relative to the number of independent-label releases. This is a rather significant change relative to earlier periods covered in these data.

releases that include a physical version, but there is a rather substantial growth in digital-only releases, which by their nature have lower distribution costs.²³

While major-label releases have declined sharply over the past decade, releases of independent and self-released albums releases have increased even more, driven in part by growth in purely digital products. The number of new products coming into existence has continued to grow over time despite the collapse in revenue.

While growth in releases – as indicated by both Soundscan and Discogs – is consistent with growth in the number of products that consumers might discover to be appealing, neither the Soundscan nor the Discogs lists provide a direct measure of what we would like to observe. The story I am advancing here depends on digitization allowing more pieces of new music to get tested in the market. More releases may be a piece of this, but more releases do not by themselves indicate more “experimentation.” Determining whether a product has appeal requires some substantial subset of consumers to listen and decide whether they find it appealing. Prior to digitization there was a relatively bright line between releases promoted on the radio and others. In the digital era, releases that are not promoted on the radio nevertheless can get exposure with consumers. Quantifying the extent of experimentation is challenging, if not impossible. At one extreme it is clear that the number of products that consumers can evaluate has risen. But even in the new digital world, it seems implausible to think that consumers all 75,000 (or 100,000) new releases can be vetted to determine whether they are appealing to

²³ I include only multi-song compilations in the data; that is, singles are excluded.

consumers. Still, in the language of the model, more products – including those with less ex ante promise – are now coming to market.²⁴

2. Sales Concentration

A growth in the available number of products tends generally to effect a combination of market expansion and business stealing, as new options draw some people to consumption and others from existing to new products. The spread of music piracy after 1999 (and the attendant reduction in music sales) obscures any market-expanding impacts of appealing new products. What we can study, instead, is whether new kinds of products (e.g. those that would not previously have been released) take market share from traditional types of products. We begin this inquiry in this section by documenting the evolution of sales concentration over the past few decades.

By construction, the number of weekly Billboard 200 listings is 10,400 per year (52×200). The number of distinct artists on the list, by contrast, depends on the number of distinct albums per artist (typically only 1) and the length of time an album remains on the list. If albums remained on the list for only one week – and if each artist had only one album per year – then 10,400 artists would appear on the list during the year. At the other extreme, if albums remained on the list all year, then with one album per artist, 200 artists would appear on the list during a year. Because albums tend to remain on the list for a long time, the actual number of artists appearing on the weekly Billboard 200 in a year is far closer to 200 than 10,000. After fluctuating around 600 between 1986 and 1999, the number of distinct artists has grown steadily from 600 to 1000 at the end of the decade (see Figure 8).

²⁴ The growth in the releases echoes a growth in the number of record labels than Handke (2012) documents operating in Germany.

We can explore sales concentration more directly with our simulated sales data. To this end, we predict weekly sales for each album, then aggregate these sales across weeks and artists to produce annual sales by artist. Figure 9 shows the distributions of log sales across artists for each year, 1990-2010. In the early years, the log sales distributions are single-peaked, with a peak near 0, meaning that the central tendency is for albums to have nearly 1 million in sales. As time goes on, mass in the distribution shifts left as a growing share of artists make shorter appearances on the chart (and a growing share of sales is accounted for by artists making short chart appearances).

This figures make it clear that sales are becoming less concentrated in a handful of artists. To say this another way, the increase in the number of available products seems to be manifested in a growth in the number of products achieving commercial success. This fact is interesting in itself, as it indicates a shift toward consumption of a broader array of music. It is also interesting as an example of a more general phenomenon. Entry – resulting from a reduction in entry costs relative to market size – need not reduce the concentration of consumption. Sutton (1991) describes contexts where quality is produced with fixed costs and consumers agree on quality. Some media, including daily newspapers and motion pictures, products conform to these conditions very well (see Berry and Waldfogel, 2010; Ferreira, Petrin, and Waldfogel, 2012). Music provides a contrast. Here, growth in the number of products reaching consumers draw consumption to a wider array.²⁵ This begs the question of how consumers are becoming aware of the growing number of new products.

²⁵ This suggests that horizontal differentiation is more important in music than in movies or newspapers, a finding reinforced in another study of the effect of market enlargement on music consumption. In Ferreria and Waldfogel (2012), a growth in world music trade promotes greater consumption of local music.

3. Success and Promotional Channels

Airplay has traditionally been an important element of albums' commercial success. Of the artists appearing in the Billboard 200 in 1991, just over 30 percent experienced substantial radio airplay. The top 200 includes both albums selling both large and moderate quantities. If we restrict attention to the top 25 albums on the weekly Billboard 200, we see that 60 percent of BB25 artists also appeared on the BB airplay charts in 1991. While the share of BB25 artists receiving airplay fluctuated somewhat over the decade, it averaged about 50 percent and remained as high as 50 percent in 2001. In the past decade, the share of the BB25 with BB airplay has fallen steadily and now stands at about 28 percent. See Figures 10a and 10b. Because Heatseekers are by definition not yet widely successful artists, we would expect less airplay, and we see this. But we also see a reduction in their airplay between 2000 and 2010. The share of Heatseeker artists with airplay falls from 8 percent to about 1 percent. See Figure 10.

Using our simulated sales data, we can also calculate the share of sales attributable to albums with substantial airplay. Figure 11 shows that the share of sales for artists with concurrent radio airplay fell from about 55 percent of sales in 2000 to about 45 in 2010.

While the share of artists with airplay declines, the share covered in Metacritic instead rises. The share of the Billboard 200 artists with contemporary (same-year) Metacritic coverage rises from 15 to 35 percent between 2000 and 2010 – see Figure 12 – while the share of Heatseeker artists with Metacritic coverage rises from 6 to 30 percent – see Figure 13. We observe Last.fm airplay for the limited period between 2005 and 2011, but during this period one fifth of Billboard 200 artists receive substantial last.fm play.

Thus far, we see a) that there are more products, b) more products achieve success, and c) that a growing share of products achieve success without substantial airplay. An important remaining question is whether a wider variety of new products – including those lacking major-label backing and substantial airplay (i.e. those with less ex ante promise) – can achieve success.

4. Whose Albums Achieve Success? (independent vs major)

We have seen that independent labels account for a large – and growing – share of new music releases. If this wider-scale experimentation is responsible for the sustained flow of high quality music since Napster, then at a minimum, it must be true that these albums with less ex ante promise make up a growing share of the albums that ultimately become successful with consumers. To examine this we ask whether albums from independent labels account for a growing share of top-selling albums.

Before turning to data on this question, we note that there is a substantial amount of controversy in the measurement of the volume of independent record sales. Nielsen reports the volume of independent record sales in its yearend music sales report. These reports are available online for the past decade, and they show that independent record labels have sold a roughly constant 15 percent of overall music sales. However, Nielsen calculates the independent share according to the entity distributing a record rather than the entity producing the recording. The different methodologies produce very different results. While Nielsen reported an independent share of just under 13 percent for the first half of 2011, the American Association of Independent Music (A2IM) advocates a different methodology that produces an independent share of nearly a

third. As they put it, “Ownership of master recordings, not distribution, should be used to calculate market share.... But Billboard reports market share based on distributor and as a result sales from [independent labels] are embedded within the major-label market share totals.”²⁶

We take a conservative approach, calculating the independent share among commercially successful albums by merging the list of artists appearing on the weekly Billboard 200 each year (during any week of the year) with the artists appearing on the Billboard independent ranking during the year. Figure 14 shows results. The upper left panel shows that the independent share among the full Billboard 200 rises from 14 percent in 2001 to 35 percent in 2010. We get a similar increases – albeit at a lower level – in the independent share among albums appearing in the weekly top100, top50, or top 25 among the Billboard 200. The independent share among artists appearing in the Billboard 25 rises from 6 percent in 2001 to 19 percent in 2010. We see a similar pattern in sales terms. As Figure 15 shows, the share of BB200 sales of albums from independent labels rises from 12 to about 24 percent between 2000 and 2011.

The growth in the independent label role among the commercially successful artists confirms that products with less ex ante promise are not only coming to market; they also appear among the products generating commercial success and therefore welfare benefit.

VI. Discussion and Conclusion

²⁶ See Ed Christman, “What Exactly is an Independent Label? Differing Definitions, Differing Market Shares.” Billboard, July 18, 2011; and Rich Bengloff, “A2IM Disputes Billboard/SoundScan’s Label Market-Share Methodology – What Do You Think?” Billboard, March 3, 2011.

The growth in file sharing in the past dozen years has created a tumultuous period for the recorded music industry, presenting a enormous challenge to the business model of traditional major music labels. At the same time, technological change in production and distribution, along with a digitally enabled growth in music criticism, have allowed smaller music labels (and individuals) to both release more music and bring it to consumers' attention.

Much of the music originating in the low-cost sector is succeeding commercially. Music from independent labels now accounts for over a third of the artists appearing on the Billboard 200 each year. In effect, consumers are exposed to much more music each year. In the past consumers would not have been exposed to the independent-label music, and the majors would dominate commercial success. The growing presence of independent-label music in the Billboard 200 means that, when exposed to this broader slate of new music, consumers find much of the independent music to be more appealing than much of the diminished major label fare. While the usual caveat that more research is needed probably applies, these results nevertheless provide a possible resolution of the puzzling increase in music quality documented elsewhere.

Beyond a possible explanation of continued music quality, the findings from this exercise may have some implications for the effects of digitization on product markets generally. Digitization, with its attendant reductions in entry costs relative to market size, was supposed to bring about both frictionless commerce and a proliferation of product varieties to serve niche tastes. In many contexts, the increase in market size along with reductions in fixed costs have not produced this sort of fragmentation. Sutton (1991) outlines circumstances in which an increase in market size need not give rise to fragmentation, in particular that product quality is produced with fixed costs and that consumers largely agree on which products are better (i.e.

competition is vertical). The first of these conditions clearly holds for recorded music. Quality is produced entirely with investments in fixed costs. Whether consumers agree on quality is less clear. Results here suggest that consumers do not agree – that competition has an important horizontal component. Hence, an increase in the number of products available leads to fragmentation of consumption. This feature of music provides a sharp contrast with some other media products – such as daily newspapers and motion pictures – where competition has more important vertical aspects. Music appears to be one product, however, where digitization leads to fragmentation and perhaps the satisfaction of niche tastes. Other contexts where these effects predominate remain to be documented.

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Figure 1

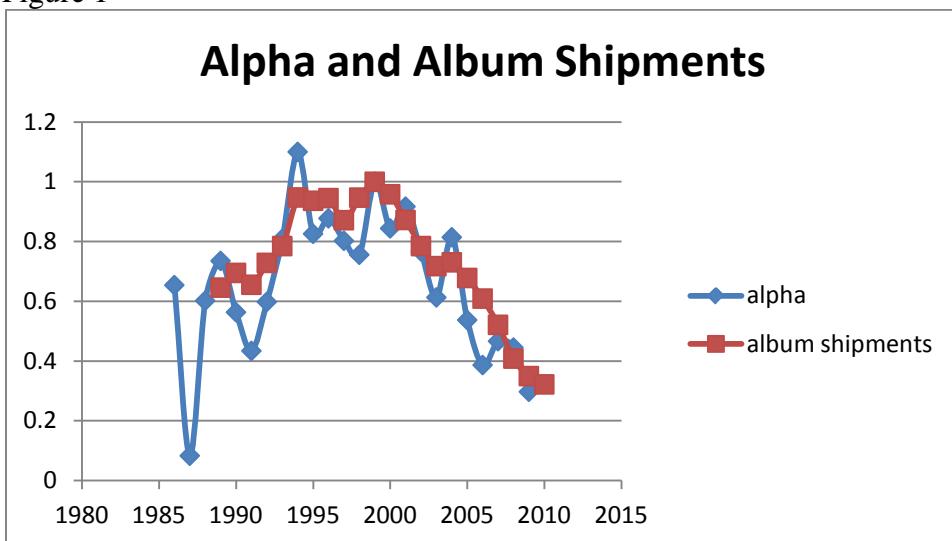


Figure 2

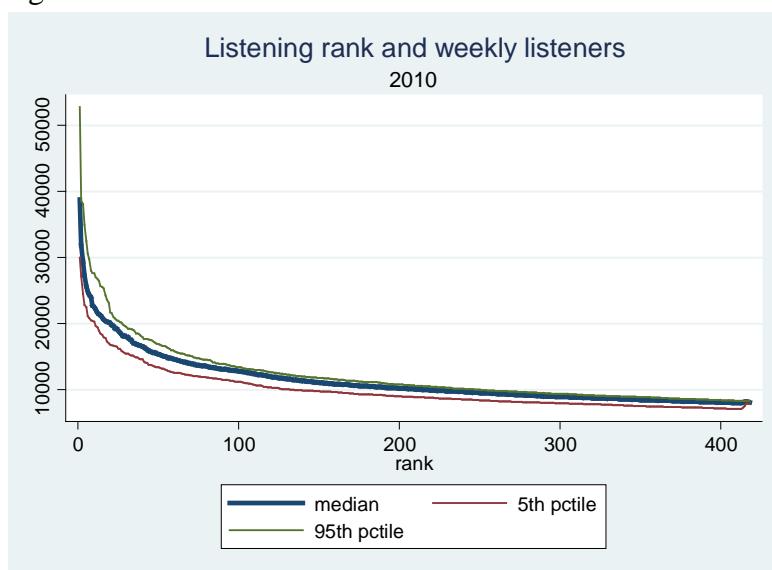


Figure 3

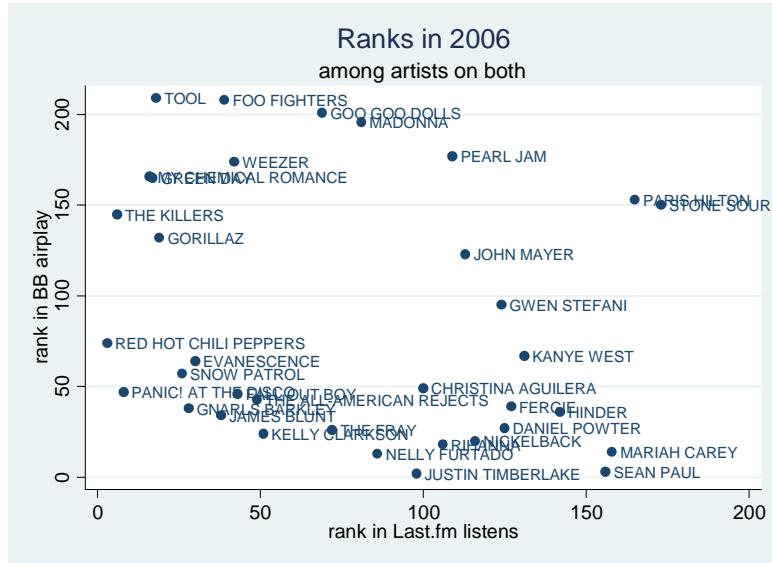


Figure 4

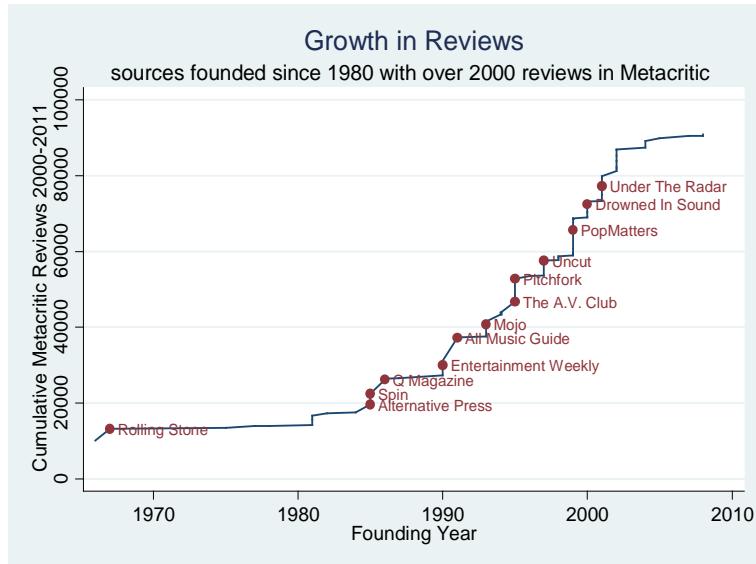


Figure 5

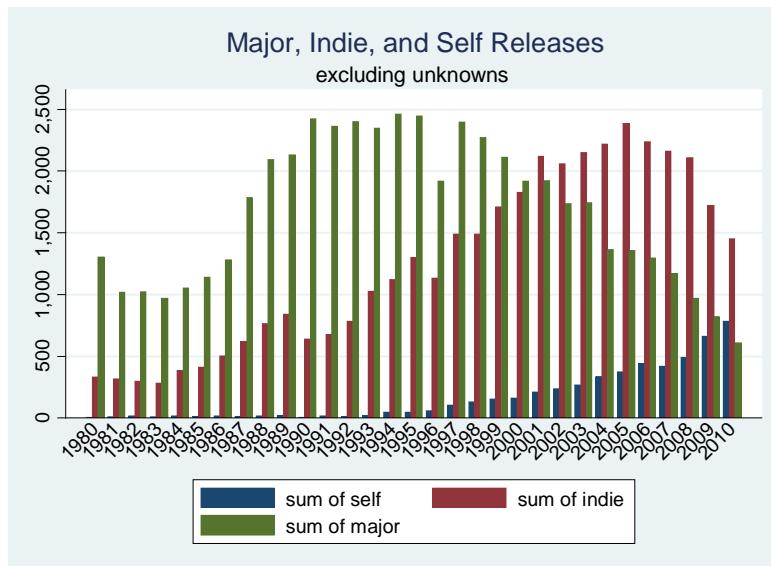


Figure 6

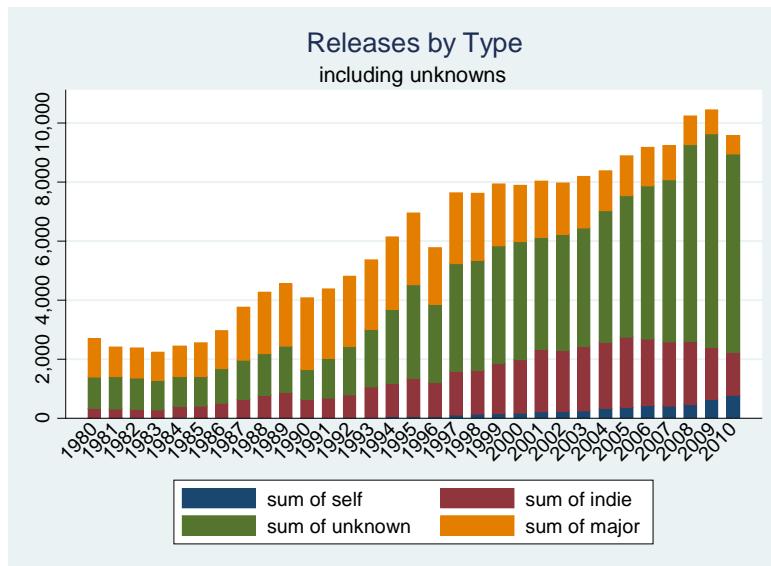


Figure 7

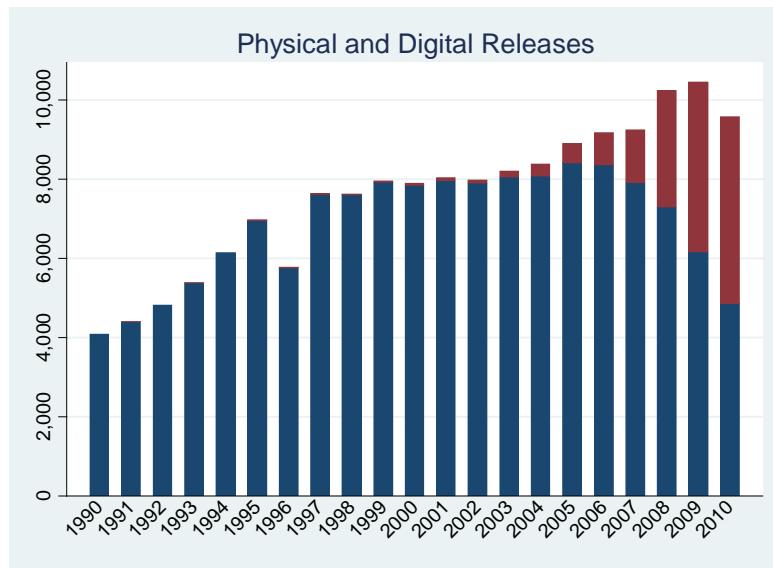


Figure 8

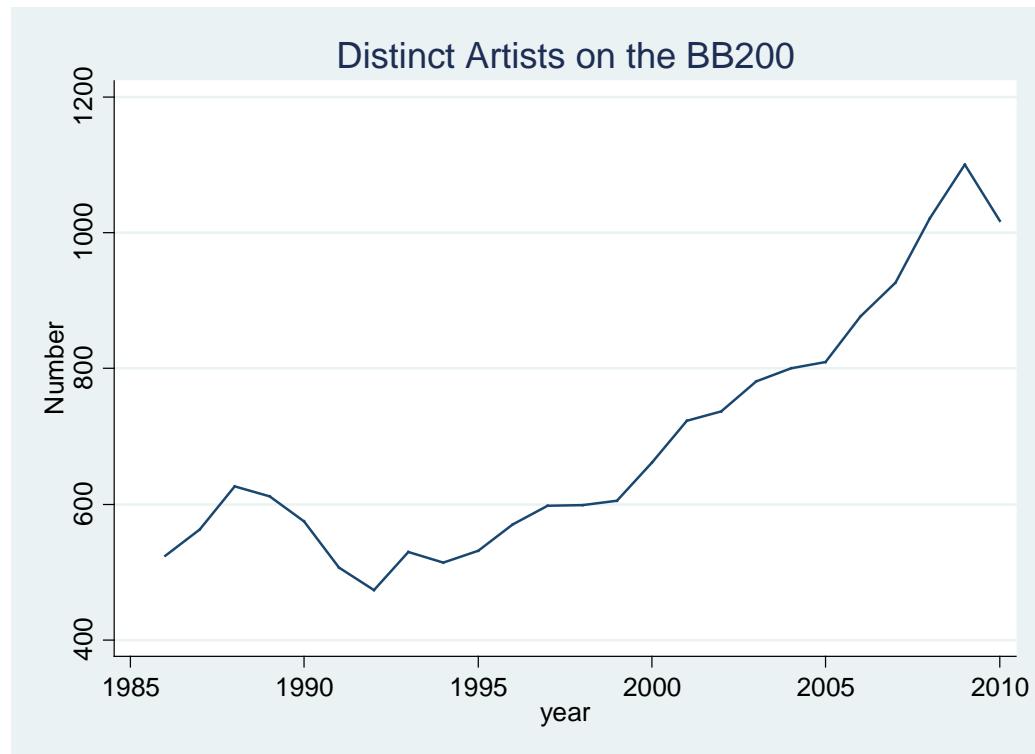


Figure 9

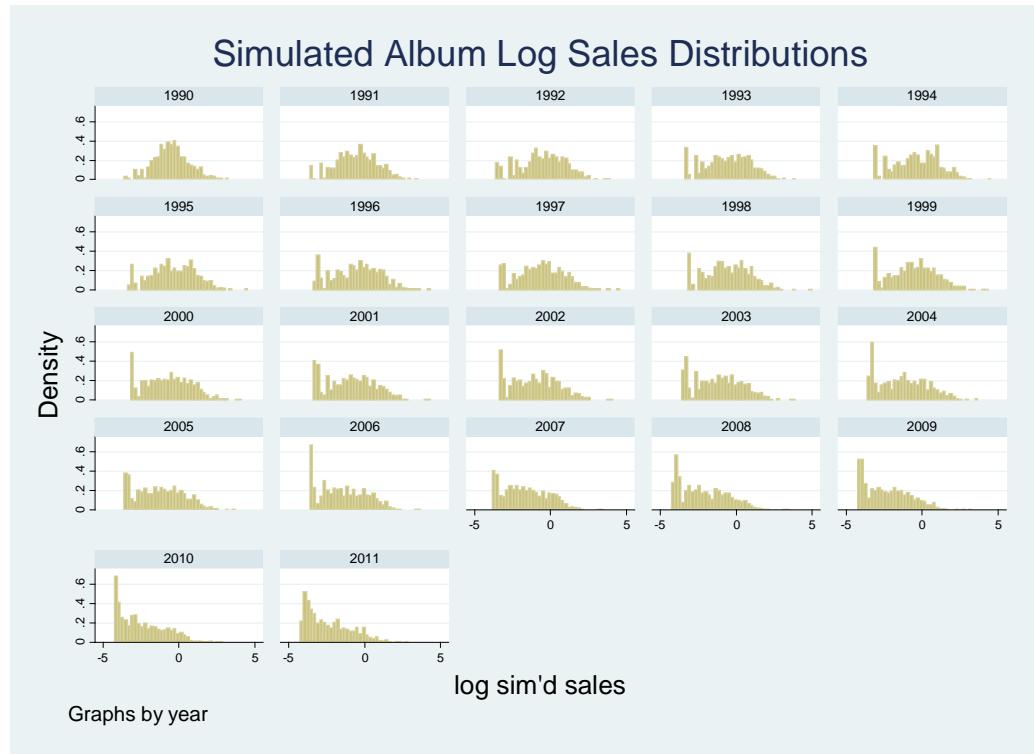


Figure 10a

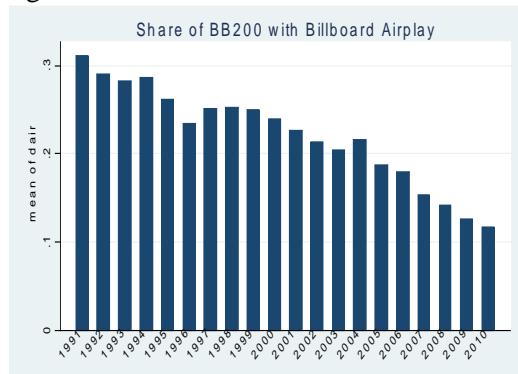


Figure 10b

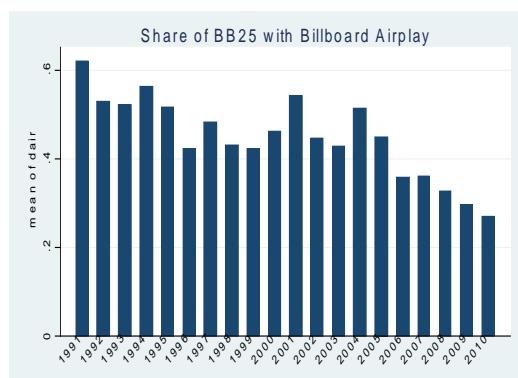


Figure 10

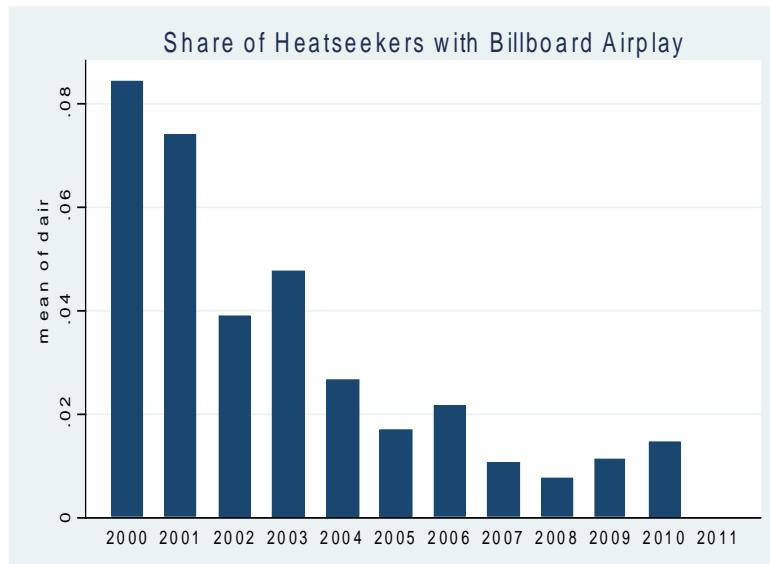


Figure 11

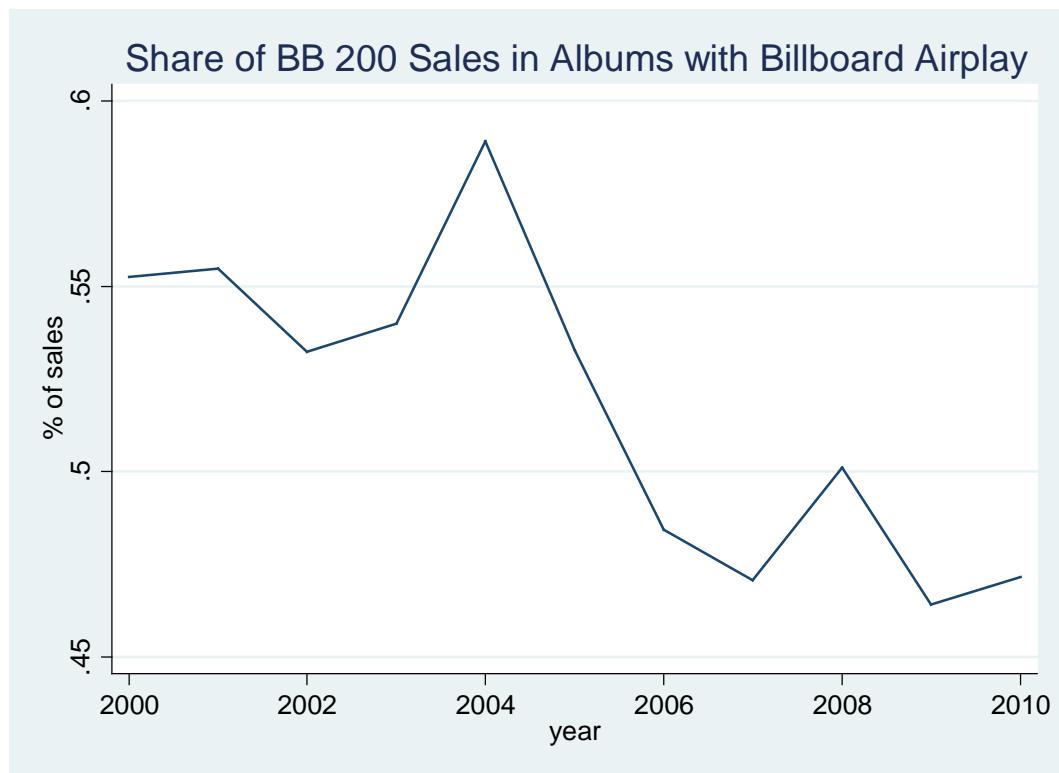


Figure 12

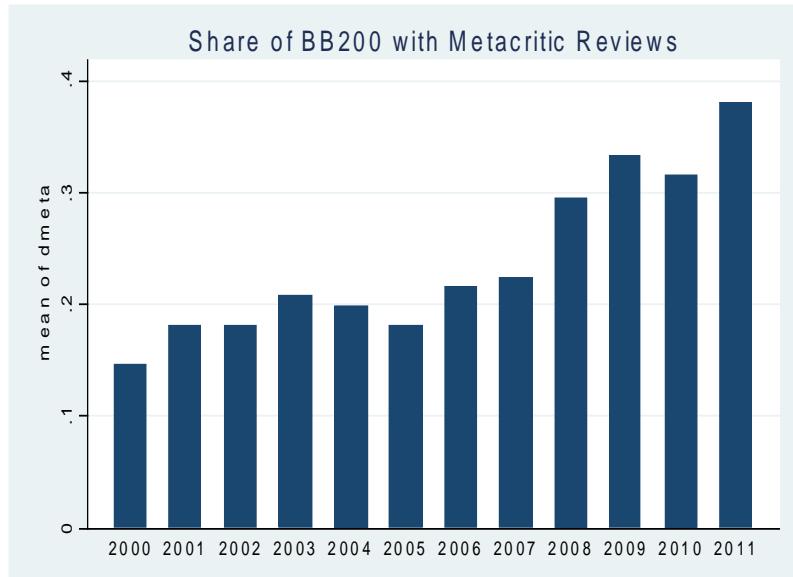


Figure 13

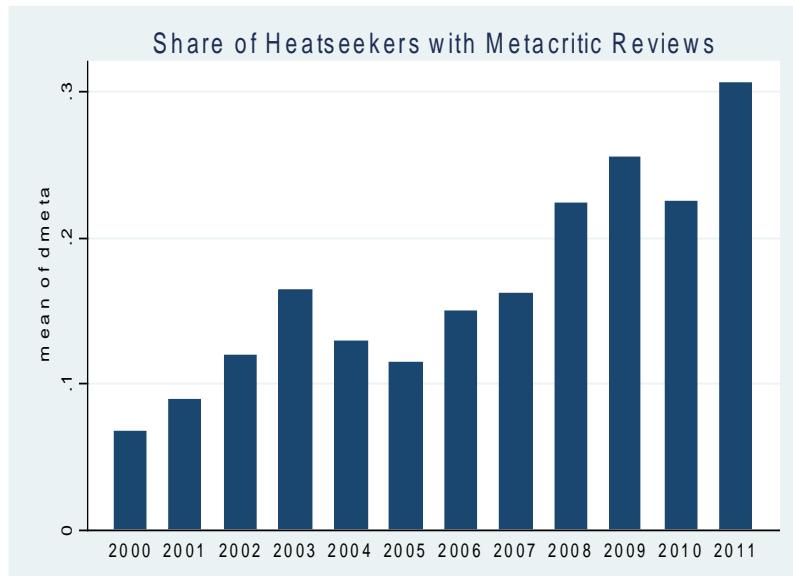


Figure 14

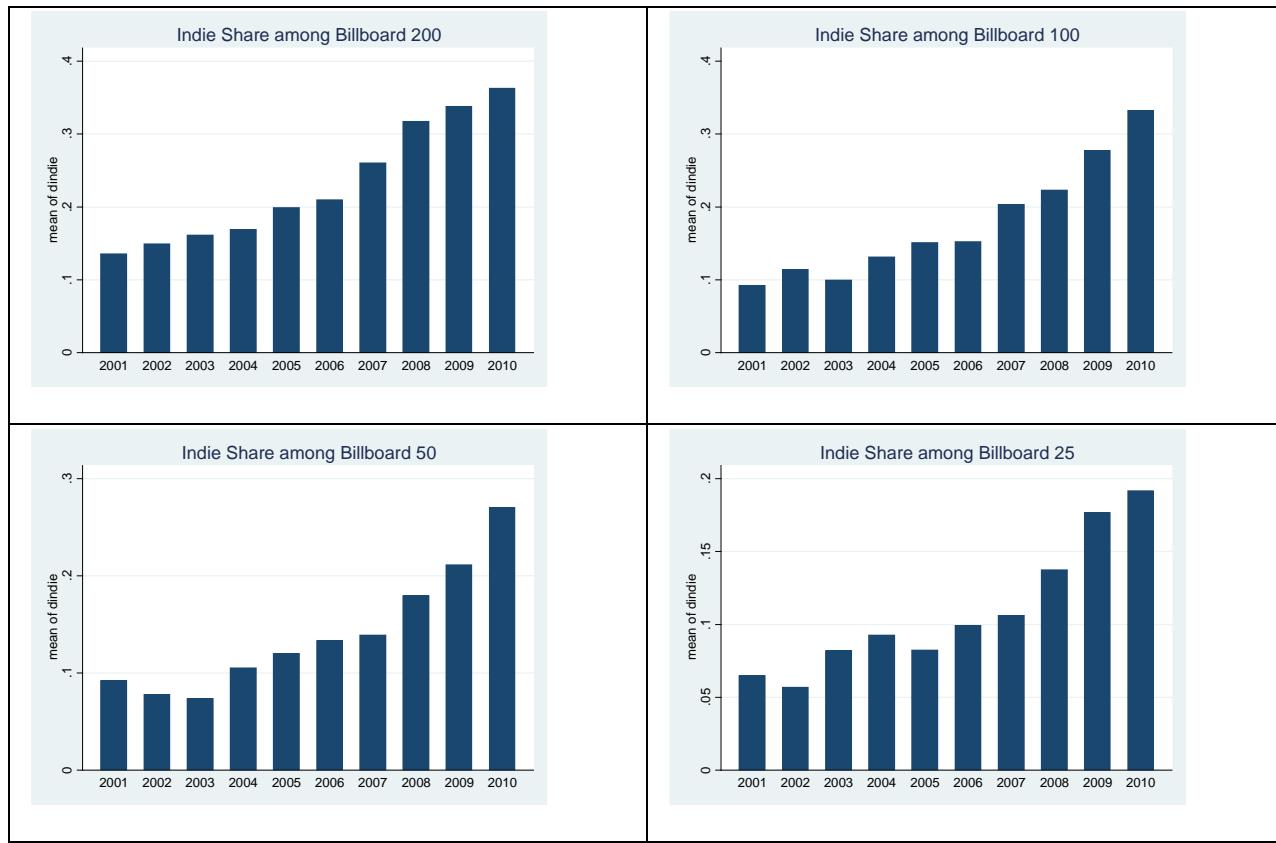


Figure 15

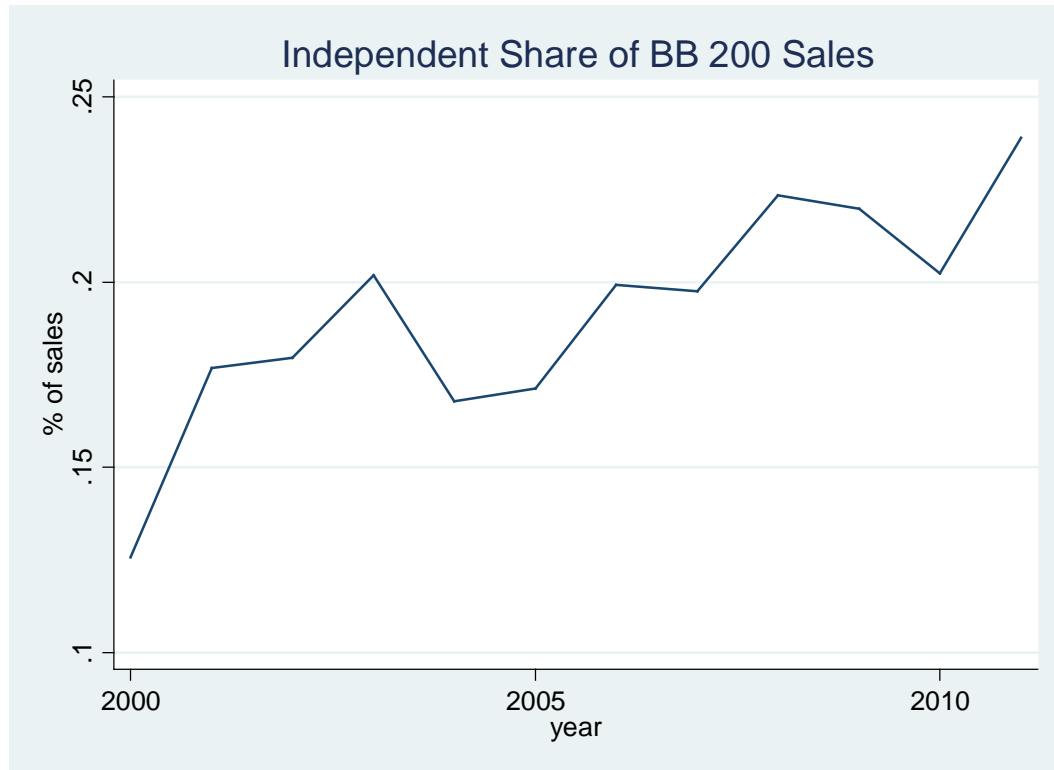


Table 1: Number of Artists Appearing Annually on Lists

year	Discogs releases	BB airplay	Metacritic	BB 200	Last.fm
1990	2,534	88		575	
1991	2,742	244		507	
1992	3,008	237		474	
1993	3,425	238		530	
1994	3,893	211		514	
1995	4,532	204		532	
1996	3,880	197		570	
1997	5,029	220		598	
1998	5,198	217		599	
1999	5,482	194	17	605	
2000	5,586	216	222	661	
2001	5,709	206	306	723	
2002	5,768	213	353	737	
2003	6,057	202	419	781	
2004	6,566	220	448	800	
2005	7,118	202	462	810	175
2006	7,862	211	492	877	183
2007	8,707	195	484	927	182
2008	9,191	206	798	1,021	197
2009	8,875	198	954	1,101	208
2010	8,226	178	835	1,018	229

Table 2: Log Sales and Log Rank using Certification Data

	Coef.	Std. Err.
alpha		
1970	omitted	
1980	0.8232	0.0649
1990	1.2295	0.0596
2000	0.1156	0.0610
beta		
1970	-0.6717	0.0093
1980	-0.7547	0.0063
1990	-0.7376	0.0043
2000	-0.6105	0.0048
constant	3.8853	0.0515

Note: Regression of the log certification-based sales of albums released 1970-2010 on their log sales rank within the decade.

Table 3: Nonlinear Least Squares Estimates of the Relationship between RIAA Certification-Based Sales and Weekly Billboard Album Sales Ranks

	(1)	(2)
alpha	0.3422	
beta	0.60063	0.61577
alpha		
1986	0.3495	
1987	0.04438	
1988	0.3216	
1989	0.3928	
1990	0.30106	
1991	0.23195	
1992	0.31962	
1993	0.4321	
1994	0.58778	
1995	0.44124	
1996	0.46895	
1997	0.42882	
1998	0.4038	
1999	0.53432	
2000	0.45097	
2001	0.48995	
2002	0.40985	
2003	0.32757	
2004	0.4351	
2005	0.2871	
2006	0.20662	
2007	0.24924	
2008	0.23785	
2009	0.15882	
2010	0.82928	

Notes: Estimates calculated using amoeba search algorithm. Standard errors to follow via bootstrapping.

Table 4: Top Artists on Last.fm in 2006 without BB Airplay

ARTIST	listeners
DEATH CAB FOR CUTIE	5,200,000
COLDPLAY	5,200,000
RADIOHEAD	4,700,000
MUSE	3,900,000
ARCTIC MONKEYS	3,000,000
THE POSTAL SERVICE	2,800,000
THE BEATLES	2,400,000
SYSTEM OF A DOWN	2,300,000
BLOC PARTY	2,100,000
NIRVANA	1,900,000
THE ARCADE FIRE	1,900,000
FRANZ FERDINAND	1,700,000
PINK FLOYD	1,400,000
THE STROKES	1,300,000
THE SHINS	1,100,000
INTERPOL	1,100,000
METALLICA	1,000,000
LINKIN PARK	973,630
PLACEBO	914,018
THOM YORKE	860,097
JACK JOHNSON	823,208
THE WHITE STRIPES	806,304
OASIS	759,511
YEAH YEAH YEAHS	685,532
SUFJAN STEVENS	674,766

Note: “listeners” is the sum of weekly listeners for each of the artists’ songs appearing on the weekly top song lists, across all weeks in the year. Included artists are those not appearing on the Billboard airplay list during the year.

Table 5: Top 2006 Airplay Artists not on Last.fm Weekly Top 420

ARTIST	BB airplay index
MARY J. BLIGE	14.3111
BEYONCE	12.01077
NE-YO	10.25575
CASSIE	9.814961
CHRIS BROWN	9.78202
YUNG JOC	8.242962
SHAKIRA	6.865558
LUDACRIS	6.041351
CHAMILLIONAIRE	5.734164
AKON	5.227035
CHINGY	4.291855
THE PUSSYCAT DOLLS	3.868749
T.I.	3.838763
NELLY	3.655194
DEM FRANCHIZE BOYZ	3.337012
FIELD MOB	3.009316
LIL JON	2.825482
JAMIE FOXX	2.409102
NATASHA BEDINGFIELD	2.189499
E-40	2.088703
RASCAL FLATTS	1.898755
CHERISH	1.891394
BOW WOW	1.870972
CIARA	1.863268
T-PAIN	1.803415

Note: BB airplay index is the sum of (1/rank) across airplay chart entries for the artist within a year. Included artists are those not appearing on the last.fm weekly top song lists during the year.