

The Impact of Digital Innovation and Blockchain on the Music Industry

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Abstract*

Analogous to the emergence of the internet, the introduction of blockchain technology augurs disruptive change to the music industry. Though in its infancy, the technology presents interesting policy issues related to registering and monetizing intellectual property, policing piracy, and creating and executing more flexible contracts between and among members in the music supply chain, among others. This paper assesses the ability of the distributed ledger technology to steer the industry toward a distributed model and its potential to drastically alter the entire music supply chain. It initiates a conversation about policy implications and how policymakers might address the issues related to adopting blockchain technology, including designing policies that support an environment that enables the well-deserved compensation of artists.

JEL Codes: O33, O34, P48, G28

Keywords: blockchain technology, business models, creative industries, digital technologies, intellectual property

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Introduction

The Internet has rearranged the music industry in a vertical structure that now reaches the lowest commercial levels of the music business. The reorganization of the value chain, though marginal throughout the 20th Century, has speeded up since the emergence of streaming services early in the 21th Century.¹ The novel introduction of blockchain technology in the second half of the 2010s foretells an even more radical change to the industry structure based on the ability of the distributed ledgers to steer the industry toward a distributed model. The technology, though in its infancy, holds the potential to drastically alter the entire music supply chain. The technology presents interesting policy issues related to registering and monetizing intellectual property (IP), policing piracy, and creating and executing more flexible contracts between and among members of the music supply chain, among others.

While it is early to anticipate how the novel technology will impact various stakeholders, it is important to initiate the process of understanding its truly disruptive nature on business models and develop thinking around how policymakers would address the issues raised by its adoption. While some areas of blockchain technology, such as bitcoins, and the role of blockchain in finance and banking have received significant attention, the same cannot be said for its role in the music industry. This paper explores the impact of blockchain on the music supply chain and policy implications for the industry.

This paper looks at what technological changes mean for increasing and distributing music industry revenue, more specifically, how the artist's share of revenue may be affected. The aim is to understand what the current trends and anticipated industry changes due to blockchain mean for artists, particularly the impact of such a disruptive innovation on the way they generate and collect revenue. This paper is divided into five core sections followed by a conclusion. The first section explains how the music industry is structured, followed by a discussion, in the second section, of how the internet changed the music industry, focusing on the decline in revenue resulting from digital streaming. The third section briefly explains blockchain technology, discusses some emerging models, and covers initiatives of the Inter-American Development Bank (IDB). The next section focuses on how blockchain could impact the supply chain. The fifth section

¹ Part of this is because most of the digital distributors, even the independent distributors, eventually feed into distribution networks controlled by Sony, Universal Music Group, or Warner Music Group. This was not the case in the early days of the digital revolution. In the 1990s, there was a robust network of independent distributors that have now all collapsed or been absorbed by major distributors.

discusses policy implications related to blockchain for the U.S. music industry.² The final section provides some conclusions.

Music Commercialization in the Pre-Internet Era

To assess the monopolistic implications of copyrights in the assignment of music revenues, it is important to understand the institutional landscape of the music industry more closely. The music recording industry involves many discrete entities. These businesses link together in a sophisticated way to create a supply chain that includes the following key players:

- Artists (authors and performers)
- Publishers (e.g., Sony/ATV)
- Labels or record companies (a few big ones dominate: Sony, Universal Music Group, and Warner Music Group)
- Retailers
- Performance rights organizations (PROs), also referred to as collective management organizations or collection societies (e.g., Broadcast Music, Inc. [BMI] and the American Society of Composers, Authors and Publishers [ASCAP])
- Streaming digital service providers (i.e., Internet intermediaries such as Spotify)

The music industry supply chain starts with authors and performers, who create and perform the music. Although copyright laws treat authors and performers differently, from a competition perspective they are the ultimate rights holders in the music industry value chain and their negotiating capacity is very much alike.³ As a negotiating group, on average, this group is highly dispersed and therefore lacks the leverage to negotiate the terms and conditions of their licensing agreements with their counterparties in the industry, most likely PROs and labels. Therefore, their position is weak and often the income received from their licensing agreements, particularly for unknown artists, tends to be meager.

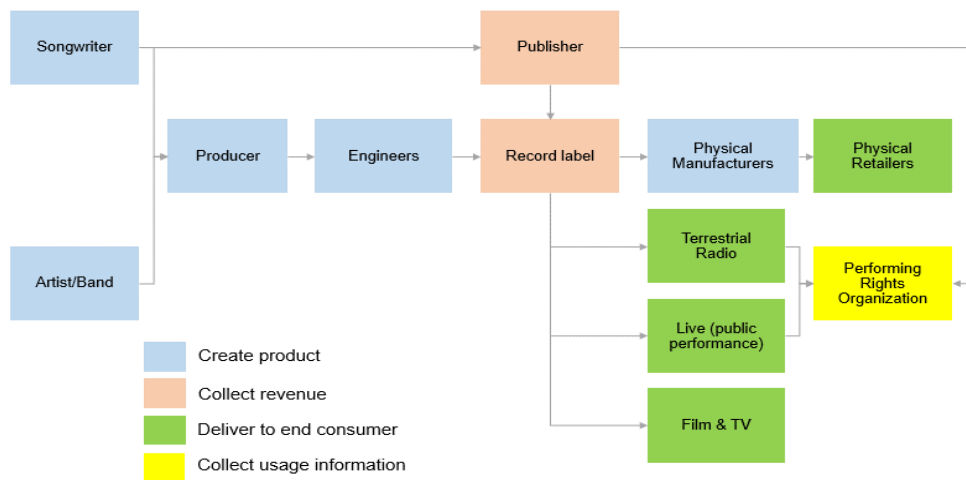
² While the aim of the paper is to discuss the impact of blockchain on music globally, readers may notice that there is heavier reliance on data from the United States and inferences derived from such data. Given that the objective of the paper is to initiate a preliminary discussion about the implications of blockchain, more readily available information, which tends to be U.S. centric, was used, while not limiting the research to U.S. data. The paper was not envisaged as a comprehensive treatise of the music industry in all countries. The authors have been cautious to arrive at inferences that are truly global and not simply U.S. centric.

³ It is important to distinguish the two types of artists—authors and performers—as their copyright and other related rights are different (Stopps, 2014). Authors are songwriters, composers, lyricists, and arrangers. They create works and their rights are protected by copyright (*droit d'auteur*), which is for the duration of the author's life plus 50 to 70 years. Examples include Bernie Taupin, Lady Gaga, Elton John, and Bob Marley. Performers are singers and people who play musical instruments. They create fixed performances, also known as recordings. Their rights are related rights (or neighboring rights). Their copyright protection is mostly 50 to 70 years from the first release to the public.

The next step in the supply chain is the labels, which finance, record, manufacture, promote, and market the music. Next are the distributors, which take CDs in bulk from the labels, warehouse them and ship them, on-demand, to retailers or directly to consumers. Distributors are also the gatekeepers for digital delivery to streaming services and digital retailers like Amazon and iTunes. The last step is the retailers, which put the CDs on the (physical or virtual) shelf and sell them directly to consumers. Retailers collect the money.

Each group in the supply chain brings unique capabilities that combine to make the supply chain work. The money paid by the consumer flows back through the supply chain (in a pretty, and often delayed, and convoluted manner) to provide the financial return needed by each member of the supply chain to make the system economically viable. There is another supply chain, through the broadcast industry to consumers (Stensrud, 2008), in which PROs are the key players. Figure 1 summarizes the pre-internet supply chain.

Figure 1. Recorded Music Supply Chain: Prior to the iTunes era⁴



Source: Hosoi, Kim, Stainken, et al. (2015).

Intermediaries such as labels and PROs add value in three main ways:

1. Providing artists with access to recording equipment, operational support, branding and marketing, and sales channels
2. Monitoring and managing IP (registration and infringement)
3. Monetizing IP by managing royalty payments (e.g., processing licensing fees)

⁴ This and other figures depicting the music industry value chain are the authors' attempts to depict the maze of stakeholders and their relationships. Owing to the complex nature of these relationships, these representations should be viewed as broadly illustrative.

Record labels add great value to the entire supply chain, most significantly in providing artists with access to recording equipment, operational support for physical format manufacturing (vinyl, 8-tracks, cassettes, CDs, etc.), branding and marketing, and sales channels. Their role, though still significant, has diminished with the advent of internet-based intermediaries (Hosoi et al., 2015).

BMI, ASCAP, and SESAC (originally the Society of European Stage Authors and Composers) are the PROs responsible for collecting and distributing royalties for public performances of a musical work in the United States, as stipulated by the U.S. *Copyright Act*. These organizations act as the intermediaries between authors and music users, such as restaurants and bars, live music venues, radio stations, theme parks, and any other establishment that uses music in a public setting, to protect copyrights and make music licensing more convenient. The PROs give these organizations blanket licenses to use the music written by their authors. Often, these organizations need to get blanket licenses from all three of the PROs since many songs have multiple authors and the individual writers may belong to different PROs (Rubright, 2016).

In the pre-internet era, prior to platforms such as Spotify, iTunes, and YouTube, operational support included production of music hardware (vinyl records or CDs or audio tapes). Furthermore, bundling was common, wherein many compositions were assembled on one physical device (e.g., a CD), which allowed juxtaposition of a lesser known artist with a renowned name. This ability of labels to bring prominence to budding artists helped labels considerably influence the fortunes of artists. Internet platforms have reordered this model by allowing individual compositions to be sold and consumed, in addition to allowing some artists to bypass certain intermediaries. Bundling now takes place on streaming service playlists. These playlists, controlled by the digital streaming services, are enormously influential.

During this era, and throughout the 20th Century, the music industry generated a myriad of institutions that funneled revenues according to a highly complex and expensive system of commercialization supported by licensing agreements for registered copyrights. This ecosystem reduced the transaction costs of music commercialization between artists and performers on one hand and music outlets such as streaming services (e.g., Pandora, Spotify, and Apple) as well as intermediaries (i.e., PROs and music labels) on the other hand. However, these institutions reduced transaction costs unevenly because of the significant information asymmetries prevailing among the members of the ecosystem, allocating the lion's share of revenue to intermediaries, to the disadvantage of authors and performers. These asymmetries arose from the peculiar way that

copyrights were conceived as legal monopolies, whose possession gave market power to whoever happened to be in a position of factual economic preeminence in the industry.

Intellectual property laws are territorial, meaning musicians or their proxies can register their IP with a national office.⁵ The Berne convention, Universal Copyright Convention, World Trade Organization, and other international treaties and trade agreements offer international protection, but there is no such thing as an international copyright.⁶ In some senses, the more globalized nature of the music industry made possible by the internet has enhanced the importance of labels and other intermediaries that have a vested interest in policing IP infringement and can use their clout with governments to discourage it—something individual authors or less organized entities simply cannot do.⁷ This landscape was shaken, but not undermined, by the advent of streaming services, as discussed in the next section.

The Impact of Internet Streaming on the Music Industry

Music industry pundits often highlight the impact of internet streaming, which introduced a new and disruptive model of music commercialization, on the landscape of the music industry. The Apple iTunes Music Store was launched with iTunes 4.0 on April 28, 2003. Initially, the online store offered individual song downloads for \$0.99 and whole album downloads for \$9.99. When compared to the average suggested list price of a CD in 2002 of \$14.99, major record labels proved willing to accept a 33 percent reduction in price—a non-negligible decline in overall margins. Further, this agreement effectively cut the record labels out of the distribution loop, which they had controlled since the creation of the vinyl record. On April 3, 2008, less than five years after its inception, iTunes became the largest music retailer in the United States. For nearly a decade, iTunes and its consumer ownership rights model had been the industry standard.

Where Napster weakened consumer need for the security that accompanied physical album possession, the iTunes Music Store then legitimized digital music within a song-by-song purchasing framework. This had the effect of further eroding both the market for traditional physical album ownership and of upending album bundling norms in the recording industry. Until relatively recently, few legal subscription-based music streaming services proved capable of garnering substantial traction, particularly considering the market share retained by Apple. A host of web-based streaming music services emerged in the wake of Napster, including The Hype

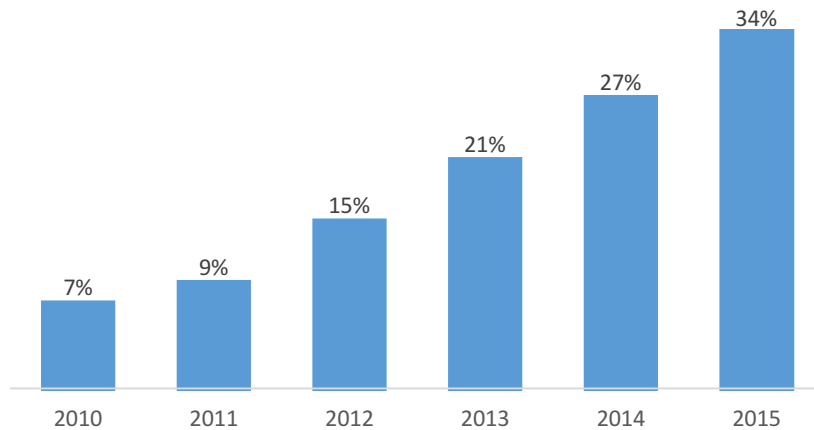
⁵ Copyrights and related rights do not necessarily need to be registered (unlike patents, which must be registered). They can be, but it is not a requirement in national/regional/international IP laws and treaties.

⁶ In jurisdictions other than the United States, there are significant neighboring rights.

⁷ The concentration of copyright ownership may be partially driven by the inability of small groups of rights holders to effectively enforce rights. Many small publishers have essentially sold off their catalogs like scrap metal or have at least consolidated under publishing administrators.

Machine, SoundCloud, Last.fm, iHeart-Radio, and Pandora Radio. The market share of streaming services has grown rapidly in the past five years (Figure 2).

Figure 2. Proportion of Total U.S. Music Revenue from Streaming



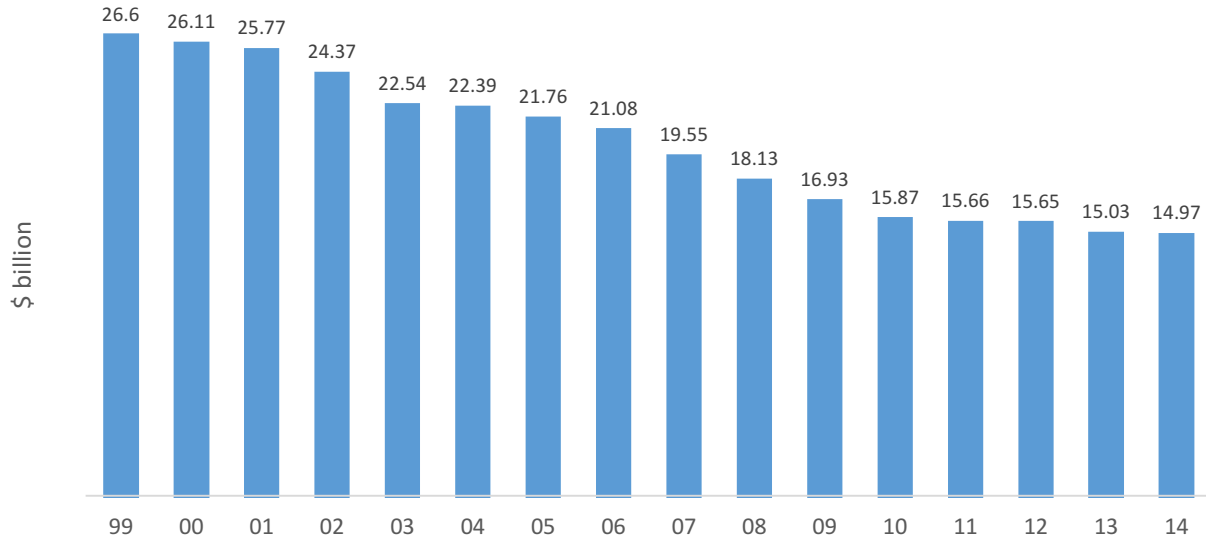
Source: Friedlander (2016).

Today, the streaming market for music can be generally broken up into two groups: the internet radio sector, including Pandora and iTunes Radio, and the on-demand sector, including Spotify, and Apple Music.

As a result of streaming, music industry revenue has experienced a secular decline since the beginning of the millennium. The U.S. recording industry earned about \$7 billion a year, down from a peak of around \$15 billion in 1999–2000, though there has been modest recovery in the past three years attributable mostly to streaming services. The share of CDs in the revenue composition saw the sharpest decline and that tendency has not been reversed. In 2014, the Recording Industry Association of American (RIAA) indicated that streaming music services made more money for the industry than physical CD sales for the first time. The share of streaming is increasing not just compared to CDs, but also compared to downloaded music.

Declining revenue is also occurring globally (based on data collected by the International Federation of the Phonographic Industry and RIAA, see Figure 3). However, the share (in percentage terms) of physical music globally is still significantly higher than its share in the United States; this is unsurprising because streaming requires reliable internet access, which is less likely to be prevalent in less advanced nations.

Figure 3. Annual Global Recorded Music Revenue

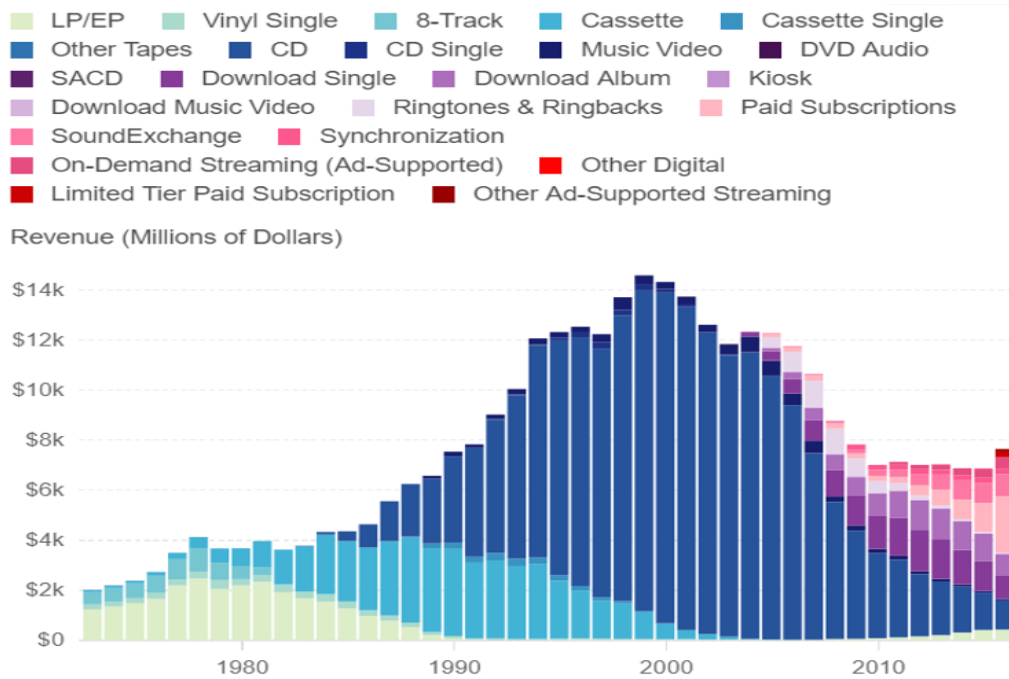


Source: Ingham (2015).

Moreover, the emergence of streaming has resulted in an overall decline in revenue to be shared throughout the industry's supply chain (Figure 4). While some have argued that the increase in streaming could actually reverse the decline in music industry revenue and that by 2020 revenue could reach 2008 levels (Moskovitch, 2015), we remain skeptical of such claims because Spotify and other models have yet to turn a profit. Nevertheless, the trend is encouraging for the industry as a whole, though it is less certain that it will positively affect artists. While Spotify allows and encourages artists to bypass labels and by some accounts such artists receive a greater share of revenue,⁸ the royalty pricing is still opaque and we remain unconvinced that the model substantially ameliorates the situation for artists. Undoubtedly, artists who do not wish to go through a label now have an option that was previously unavailable to them.

⁸ Three caveats: (i) artists still have to use an aggregator of some kind; (ii) anecdotally, overall rates seem lower than those received by the majors and large independents; and (iii) artists forgo advances and are generally capital starved, and thus it is not clear bypassing labels is really much of an advantage.

Figure 4. Revenue Sharing



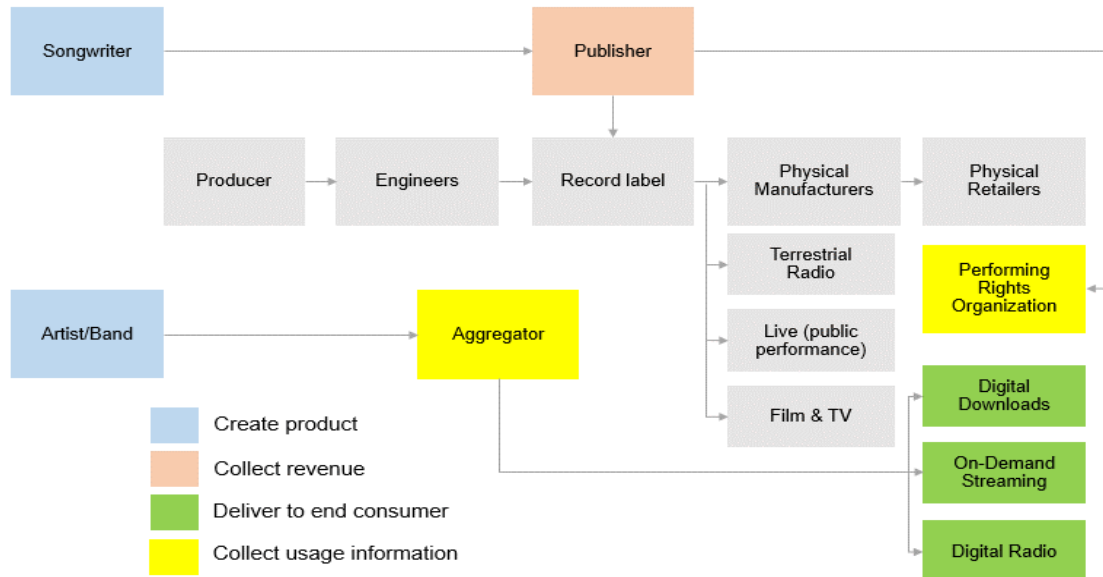
Source: Shaw (2016).

The decline in the amount of revenue to be shared did not affect stakeholders evenly. Authors and performers were the most negatively affected because the internet introduced a new type of entity into the supply chain—aggregators (i.e., platforms such as YouTube, Spotify, and Pandora)—which reinforced the information asymmetries and thus the structure of the revenue model prevailing in the industry. Streaming services operate primarily to facilitate exposure to new songs, terrestrial radio content, remixes, and music that is like users’ tracked preferences (as indicated by proprietary algorithms). Some platforms provide access to original content, whereas others distribute copyrighted content. However, none of these services provide listeners autonomy to pre-select and listen to copyrighted musical works in advance. In 2008, the streaming music service Spotify launched in Europe. Spotify is a unique blend of local music playing software, random internet radio, and customizable, on-demand song jukebox. It quickly gained widespread popularity, and in 2010, the service expanded to the United States. Spotify’s business model requires that the company take massive losses while providing free content to attract users. As the company’s consumer base and revenue stream become more established, access to free content will be discontinued, thus reducing costs and, in theory, turning a profit. However, this model is complicated by variable licensing costs (Richardson, 2014).

Streaming services such as Spotify allow for a curious listener to stream playlists curated by friends or music aficionados without committing to purchasing an MP3 or a full album. An artist with his library of work on Spotify may, therefore, have his music heard by consumers that otherwise would not have been reached. This could then lead to better attendance at concerts and an overall larger fan base. Through streaming, artists can cultivate some royalties from these listeners and from other listeners who may have once opted for piracy as a means of collecting music. For an artist that simply wants his or her music to be heard, regardless of royalties, the internet streaming model can be an appealing vehicle. Artists who are new to the business or who have not traditionally expected to make sustainable revenue often appreciate the impact that streaming has on cultivating a fan base and may not complain about the minimal royalties they see from their streams. The formulas used by streaming companies such as Spotify and other on-demand streaming services to determine royalty payments are a highly popular area of contention for concerned musicians. For example, Spotify has published a simplified version of its payment calculations and has made clear that it does not have a pay-per-stream model; instead, the service uses a complicated formula⁹ that does not produce uniform payments. While the service doles out 70 percent of its intake to rights holders, the company itself has yet to make a profit (Hogan, 2015).

⁹ Streaming payments for songwriter publishing royalty calculations are mandated by federal copyright law, which is extremely complex, and not the choice of Spotify or other streamers. The sound recording side was modeled on this. The calculations for recordings are generally not public, but judging by complaints from labels and the leaked Spotify–Sony contract, they are markedly similar.

Figure 5. Recorded Music Supply Chain: Digital Era, Smaller Artists



Source: Hosoi et al. (2015).

While newer models afforded artists alternative means to sell their compositions, they also added a new layer of stakeholders looking for their share of the shrinking revenue base. Furthermore, while aggregators made a dent in the business of existing intermediaries, they did not render intermediaries obsolete. Labels and PROs kept their vital tasks of maintaining IP, preventing and policing infringement, and, most importantly, collecting and distributing royalties on behalf of authors and performers.

It is important to stress that aggregators are simply sub-distributors that go through the same major label-owned distribution networks (e.g., independent distributors Essential and Darla are simply sub-distributors in Sony's supply chain). There are a couple exceptions, such as Tunecore and CD Baby, but they represent an insignificant portion of the market. Also, the internet has not disintermediated publishing revenue. The authors' publishing royalties go through the same (pre-internet) routes:

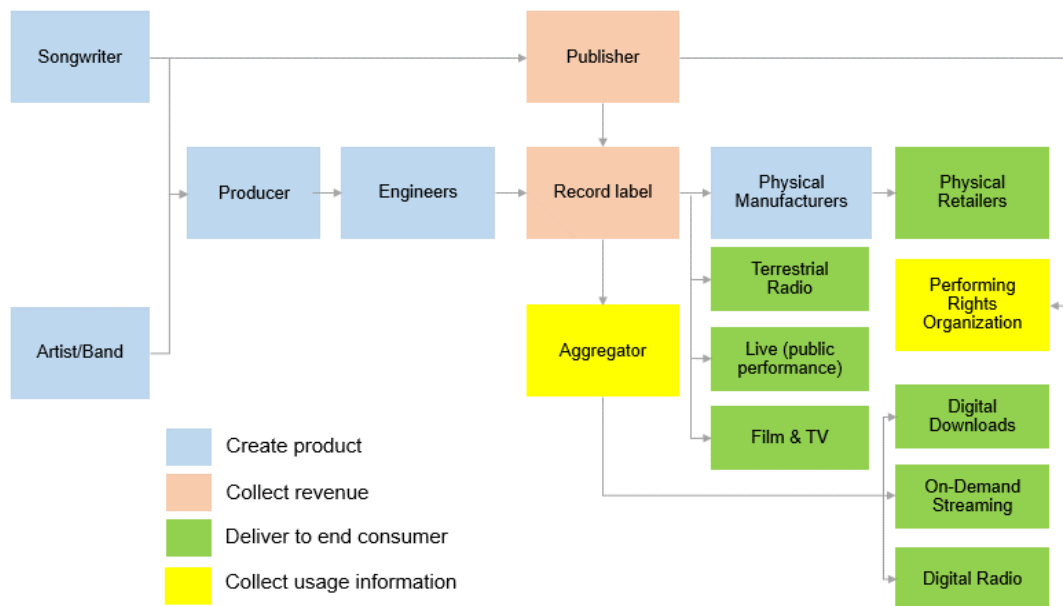
- Major publishers owned by Sony, Warner, and Universal;
- Publishing administrators like BMG Rights Management GmbH and Kobalt Music Group, Ltd.; and
- Harry Fox Agency, which is owned by SESAC.

Moreover, publishing revenues for independent authors are often unpaid (Sydell and Selyukh, 2015). David Israelite, head of the National Publishers' Association, was quoted as saying that up

to 25 percent of streaming publishing royalties go unpaid (Christman, 2015a). Regardless, the publishing system has not really changed and one could argue that it is much less efficient in getting revenue to artists. This represents a consolidation, not disintermediation, as the unpaid royalties remain at the Quodpoly of streaming services (YouTube, Spotify, Apple Music, and Amazon).

Thus, the overall structure of the industry remained by and large marred by information asymmetries that favored the old intermediaries (labels, PROs) and the new ones (aggregators). These organizations remained in charge of policing IP, collecting revenues, and paying artists. The perversity of the model wherein the artist gets paid last¹⁰—once everyone else has received their share—also remained intact. Despite all the hype, the newer models did not improve the negotiating power of the artists (barring superstars, possibly), nor did they offer authors greater control over revenue management. The internet did, however, drive all members of the supply chain involved in physical assets, such as creating music CDs and retailers, out of business.

Figure 6. Recorded Music Supply Chain: Digital Era, Major Artists



Source: Hosoi et al. (2015).

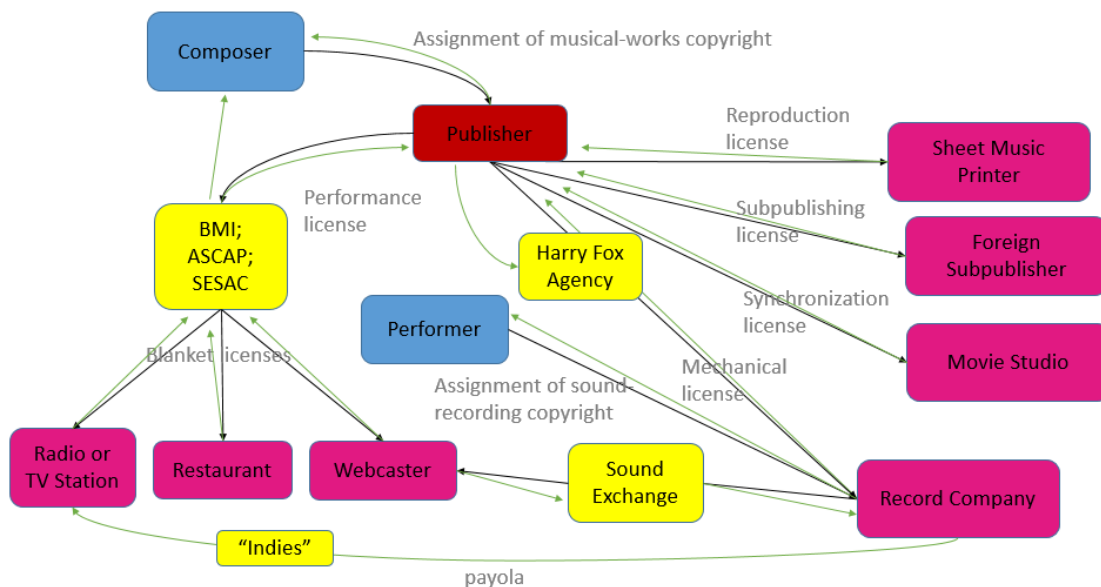
¹⁰ Note that this model does not consider recording advances. Also, many professional and commercially viable acts are paid up front. While it is true that independent artists may never see an advance, there is a commercial threshold where artists are offered advances in other forms, especially marketing and publicity. Also many distributors provide advances by manufacturing and shipping physical products for artists.

Evidently, there are multiple contracts governing the payment structure and schedule among intermediaries. While it is beyond the scope of this paper to delve into details of types of contracts that each member of the supply chain enters into with other members, it is important to highlight that the industry's woes are not simply caused by standard contracts among multiple parties that accord the same treatment to all types of music or types of consumers, rendering it impossible to optimize any price. The problems are exacerbated by outdated laws governing the music industry. It seems that most of the national, regional, and international regulations associated with copyright and related rights in the music industry were meant for the vinyl age. Regulations have not kept pace with the evolution of the internet, despite some notable measures, such as Pandora and Spotify being required to license music from major labels. Most contracts are straightjacket (e.g., blanket contracts between PROs and malls/restaurants based on square footage, not restaurant profitability) or consent decrees,¹¹ which allow PROs to set royalties.¹² The main problems in the contracts are opacity and rigidity. The lack of ability to accurately value IP a priori also diminishes the industry's ability to maximize profits. In summary, the music industry remains extremely fragmented, as illustrated in Figure 7.

¹¹ PROs operate under consent decrees with the Department of Justice. These agreements were made to guarantee fair royalty rates for authors and for the radio stations, television networks, and even restaurants and retail shops that play their music.

¹² While PROs may be able to set prices for restaurants, for the vast majority of the digital market, rates have been set by the Department of Justice. However, regardless of who sets the rates, value and competition are limited by this structure. See Christman (2015b).

**Figure 7. The Music Industry Today:
Complex Web of Connections between Centralized Databases**



Source: <http://dotblockchainmusic.com/>.

Finally, the internet had made piracy a much bigger challenge because it is so easy to rapidly replicate and proliferate compositions at no cost, substantially reducing the industry's top line. In fact, piracy has added to the industry's cost of policing IP infringement internationally, especially in jurisdictions where there is lax enforcement or lack of adequate legal protections for copyrights. The question now is whether newer technological breakthroughs such as the blockchain could alter the status quo, thereby helping the authors and musicians overcome such hurdles.

What Is Blockchain? How Would It Work for the Music Industry?

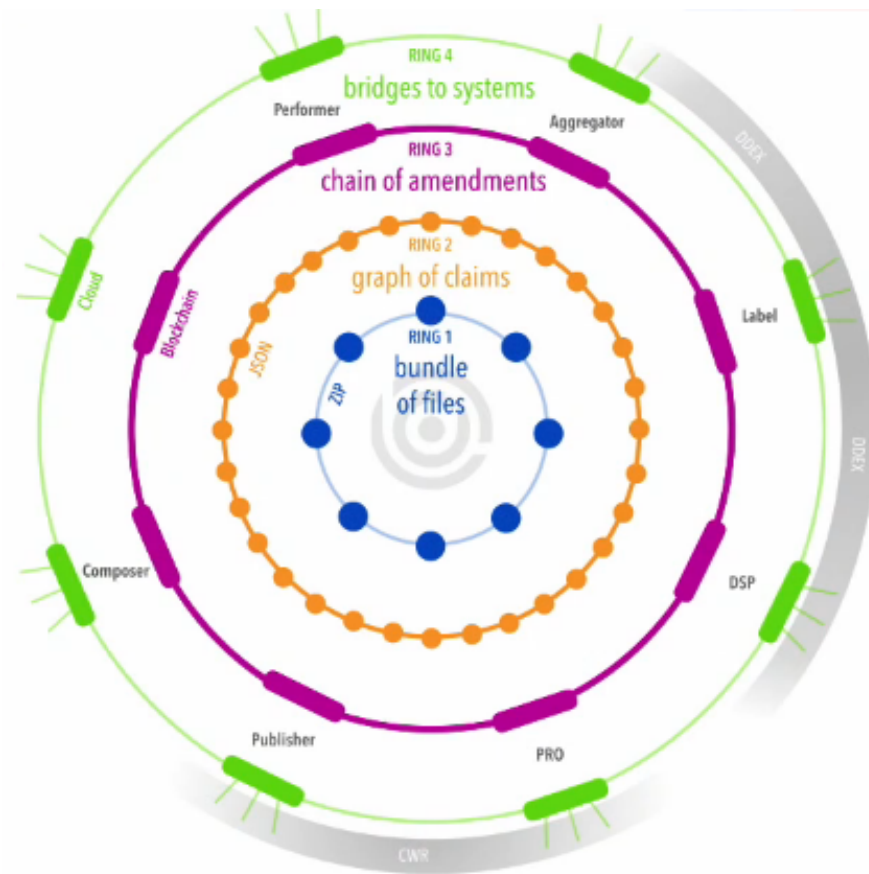
Blockchain technology is a type of distributed ledger or database that keeps records of digital transactions. However, rather than having a central administrator like a traditional database (e.g., banks, governments, and verifying companies), a distributed ledger has a network of chronologically evolving replicated databases, synchronized using the internet, and visible to anyone within the network. Blockchain networks are either private, with restricted membership, such as an intranet, or public, accessible to any person in the world, like the Internet. When a digital transaction is carried out, it is grouped in a cryptographically protected block with other transactions that have occurred within a certain period (e.g., in bitcoin it takes 10 minutes) and sent out to the entire network. Miners (members in the network with high levels of computing power) then compete to validate the transactions by solving complex coded problems. The first

miner to solve the problem and validate the block receives a reward (e.g., in the Bitcoin blockchain network, a miner would receive bitcoins). The validated block of transactions is then time stamped and added to a chain in a linear, chronological order. New blocks of validated transactions are linked to older blocks, making a chain of blocks that show every transaction made in the history of that blockchain. The entire chain is continually updated so that every ledger in the network is the same, giving each member the ability to prove who owns what at any given time.

The distributed, open, and cryptographic nature of blockchain allows people to trust each other and transact peer-to-peer, making the need for intermediaries obsolete. This also brings potential security benefits. Hacking attacks that commonly impact large centralized intermediaries like banks would be extremely difficult to pull off on a blockchain.¹³ For example, if someone wanted to hack into a particular block in a blockchain, they would need to hack into that specific block as well as all of the preceding blocks going back the entire history of that blockchain. Further, they would need to do it on every ledger in the network, which could be millions, simultaneously. Blockchain is hence a highly disruptive technology, and advocates argue that it is the most important IT invention since the internet that could shape many industries (Thompson, 2016). Figure 8 depicts a very rudimentary schematic representation of how blockchain would work for music.

¹³ However, large Bitcoin hacks have occurred, the most famous being the Mt. Gox attack (Lee, 2017).

Figure 8. Blockchain System for the Music Industry



Source: Rogers (2017).

Currently, music can be streamed and downloaded at the click of a button, but payments to the people who make that music can be slow and opaque. Blockchain technology offers transparency through the value chain, allowing musicians and their managers to see exactly how much money they are owed, as opposed to a culture of non-disclosure agreements and black boxes. Though some of the claims made for blockchain technology are premature, it appears to have at least the potential to transform the music industry (O'Dair, Beaven, Neilson, et al., 2016).

Blockchain technology could solve the issue of identifying a real copyright holder and ease the challenge of tracking derivative works (metadata) through the blockchain. This could make it possible to see not only the creators, but also those who were materially involved through a distributed ledger of metadata. Thus, the real dynamic value of a product (e.g., song or piece of music piece) could be calculated by tracking a complex system of relationships and enable micropayments to investors without resorting to third-party services. This would create a peer-to-peer ecosystem for artists that would enable them to control their own fate and receive fair

compensation for the value they create. They would have the choice to monetize their work or distribute it free of charge, without input from a distributor. Certain illustrations of blockchain mechanisms are Nielsen SoundScan,¹⁴ OP_RETURN,¹⁵ and application programming interface (API).¹⁶ The goal of API is to demystify rights ownership, digital distribution, and usage by providing developers and enterprises with tools to access and manage digital assets, including copyrights. API also provides incumbents a means to provide the much-called-for transparency and efficiency. However, the technology is experimental and has not yet gained traction.

Currently, the main stakeholders in the industry are developing the open-source technology that will support blockchain development in the music industry. The Open Music Initiative (OMI) is led by the Berklee College of Music Institute for Creative Entrepreneurship in collaboration with the MIT Media Lab and with support from several major music labels, streaming services, publishers, collection societies, and nearly 60 other founding entities. The OMI's mission is to promote and advance the creation of open-source standards and innovation related to music to help assure proper compensation for all creators, performers, and rights holders. OMI is not a database or a standard, but instead an open-source technical architecture comprised of core functional blocks and APIs that will allow developers and stakeholders to build their own systems and tools that are OMI compliant. Over 180 companies have joined OMI to date, including Universal, Sony, Warner, YouTube, Spotify, Pandora, SoundCloud, SiriusXM, Sound Exchange, Harry Fox, Alibaba, Netflix, Viacom, Intel, and Red Bull Media House, as well as PROs like GEMA, SACEM, SOCAN, SESAC, and many others. Following are examples of how artists could use blockchain to address certain issues in the music industry.

Registration Options

Songwriters need to cooperate to create a completely accurate database of every song. But songs are written in ad hoc circumstances—thousands of songs are created every day—with little documentation and someone would have to load all of that information into the database. Several

¹⁴ Nielsen SoundScan is an information and sales tracking system created by Mike Fine and Mike Shalett. SoundScan is a method of tracking sales of music and music video products throughout the United States and Canada. Data is collected weekly and made available every Wednesday to subscribers, including record companies, publishing firms, music retailers, independent promoters, film and TV companies, and artist managers. SoundScan is the sales source for the [billboard](#) music charts, making it the largest source of sales records in the music industry.

¹⁵ OP_RETURN is a script opcode used to mark a transaction output as invalid. Since any outputs with OP_RETURN are provably unspendable, OP_RETURN outputs can be used to burn bitcoins. OP_RETURN is the way of embedding general purpose metadata in a transaction and is always accompanied by a zero-value output (i.e., in the chain's native currency). OP_RETURN in Bitcoin works exactly like in MultiChain but with a much lower byte limit.

¹⁶ API is a set of subroutine definitions, protocols, and tools for building application software. In general terms, it is a set of clearly defined methods of communication between various software components. A good API makes it easier to develop a computer program by providing all the building blocks, which are then put together by the programmer.

music rights databases exist on a national level, such as the databases maintained by the U.S. Copyright Office and the PROs. Yet, at the very best, they provide information about a small fragment of the works that exist in the music industry and can suffer from a number of other issues, including inaccuracy and inaccessibility. While OMI has yet to show tangible results to create more comprehensive database, the endeavor of registering all songs is now new.

EU Commissioner Neelie Kroes started the Global Database Repertoire Working Group (GRD WG) in September 2008. The main objective of the group that resulted from these roundtables was to create a singular, comprehensive, and authoritative ledger of the ownership and control of musical works around the world (Milosic, 2015). While the GRD was ultimately a failure, there remains a fairly wide consensus in the music business that a better system of rights ownership information management is crucial to the developing digital music industry and, despite the failures of previous attempts, a global database still seems like the best system to pursue.

Similarly a system was proposed by the U.S. copyright office two years ago (US Copyright, 2015) for books and orphan works (US Copyright, 2015). Authors and composers supported the system, but it drew fire from technology players like Pandora and Apple. It was intended to create a statutory body (like SoundExchange for non-interactive radio) that could essentially license or negotiate all works except those for which the author has opted out. Authors that wished to opt out had to register in a database of some other kind. This meant keeping track of a much smaller number of works. Further there was huge incentive to register works. This system is akin to compulsory licenses (U.S. code 114: Scope of exclusive rights in sound recordings) except songwriters and rights holders have the right to opt out and negotiate privately. The U.S. Copyright initiative also did not suggest one-on-one negotiation. Those that opted out could assign negotiating rights to third parties like BMI, ASCAP, private companies, or new collectives or through a blockchain smart contract. Regardless, blockchain holds the potential to solve the vexing issue of global registry, which, despite investment of hundreds of millions dollars, remains intractable to date (Milosic, 2015).

On Irreversibility of Records

We stress that in blockchain there is no such thing as perfect immutability. The real question is under what conditions a blockchain can and cannot be changed. Further, do those conditions match the problem we are trying to solve? The chain's behavior depends on a network of corporeal computer systems, which will always be vulnerable to destruction or corruption.

Hype Cycle

Many blockchain theorists believe it is ill-suited for high-frequency, low-value transactions, which has parallels with the streaming music business. Per research and advisory company Gartner, blockchain is not (yet) mature. The 2016 *Hype Cycle* report (Gartner, 2016) states that blockchain is at the peak of inflated expectations on their hype cycle and is 5 to 10 years from the plateau of productivity. Blockchain is not a distributed database replacement: blockchain *complements* distributed database technology, with appropriate information partitioning between the two. Blockchain is not usually suited for high-volume, low-value transactions: as blockchain for business matures, fabric developers will turn to non-functional requirements, including transaction throughput. In the near term, the technology remains better suited to low-volume, high-value transactions. (Palfreyman, 2017)

Joint Work by OMI and IDB Developing Blockchain in the Music Industry

The IDB has also joined this initiative. In partnership with Berklee College of Music, the IDB executed a music LAB (the LAB) to pilot platforms based on blockchain technology for the music industry and with applicability to the creative industries in the Caribbean. The LAB undertook the following activities:

- Select technology fellows to work with competitively selected artists to develop prototypes of new technologies based on blockchain.
- Develop and provide a comprehensive curriculum for the selected artists.
- Select expert faculty to provide instruction and individualized mentoring to explore the future of monetization and new consumer experiences arising from the new technologies.

Success was judged by a presentation of the prototypes. Additionally, Berklee developed an online educational video based on the results of the LAB activities regarding how producers could use blockchain technology as a profitable business model.

The LAB, a partnership between Berklee College of Music, OMI, and the IDB, hosted 20 fellows (students, software developers, and artists) to develop new solutions using blockchain to address myriad issues faced by the music industry as discussed in earlier sections of this paper. The week-long LAB included participation in specifically designed workshops on IP commercialization and explored the technical challenges of using blockchain to:

- Catalog, attribute, and distribute live DJ mixes;

- Commercialize mixed tapes built from original material and back catalogs;
- Compensate musicians for visual works using their songs as data; and
- Identify individuals for their contributions to single tracks in new works.

The participants were expected to:

- Actively participate and contribute to the LAB's objectives;
- Participate in a follow-up workshop to share their experience of using new technologies; and
- Openly share their knowledge of IP monetization, including how technology adoption may improve artist compensation, with other artists in the region.

At the end of the LAB, teams presented to a group of leading industry professionals and other major players in the music industry. The following solutions were developed:

- *DEEPLIVE*: An organized platform where fans can view an artist's entire identity and share meaning behind the music.
- *LÜM*: A new service that allows for unique emotional moments in a live performance to be captured and analyzed for artists and businesses involved in the music industry.
- *ECHOWE*: A sample marketplace where copyright holders can set the intention of their music so it can act on its own as if it were alive.
- *FIBER*: A media player that tells the holistic story of a song by bringing it to life in virtual reality.

Notwithstanding, the technology is in its infancy and the very few experimental models do not use money but rather cryptocurrency. Hence the ability to project how business models would evolve is very limited. Hence, it is very important to stipulate that there is currently no successful model of blockchain. Even the pilots rely on bitcoins and not actual money. Furthermore, since blockchain is a platform technology, there is no way to know what type or how the platforms aimed at musicians will evolve. For example, Spotify and YouTube are two current platforms for music built on one underlying technology—the internet—but they work very differently and have dissimilar relationships with the stakeholders in the music supply chain.

Hence to imagine the possible ways blockchain would impact stakeholders, it would be important to restrict conceptions to the key features of the technology:

- Distributed database
- Peer-to-peer transmission

- Transparency with pseudonymity
- Irreversibility of records
- Computational logic that can make smart contracts possible

Thus, while the precise effect on various stakeholders may be impossible, this paper makes a valiant attempt to surmise potential impacts of blockchain on various stakeholders and policy issues.

How Blockchain Could Impact the Music Industry

Given the ability of blockchain to bring all stakeholders to one platform to share data and execute smart¹⁷ contracts, the prospect for price optimization and increased transparency remains enormous. The technology also holds promise for experimentation with new promotion methods, such as identifying fans of certain compositions or artists and inducting them for propagation of certain musical pieces and rewarding them for the same. Overall, while value has shifted away from content creators, labels, studios, and publishers, among others, in effect to content intermediaries like Apple and Google, blockchain may disrupt their business models as well.

Flexible Pricing and Revenue Optimization

Conceivably, a more frequent user of a composition could be charged differently from a sparing user, in contrast with existing models, which do not allow for such dynamic pricing. Similarly, PROs could charge end users (e.g., malls and restaurants) based on usage as opposed to a fixed rate. On the other hand, consumers of music could be required to pay simply for the items they play as opposed to for entire catalogs offered by PROs, as is currently practiced. The ability for revenue optimization is indeed enormous.

Speedier Payments

Similarly, artists could be paid much quicker than they are with prevalent systems, which have inordinate delays in payments to artists. While blockchain is unlikely to change the ludicrous fact that artists are paid last, since all parties would share the same ledger, the time it takes for artists to get paid would likely decline drastically, alleviating some of their woes.

¹⁷ Smart contracts are algorithms that can help transparency and dynamic pricing.

Superior Valuation

The dynamic assessment of music usage could allow for greater flexibility in IP valuation. This might contribute to boosting industry revenue. In fact, dynamic re-valuation of a composition may be possible. In summary, the technology could allow the industry to capture greater upside. This is undoubtedly good news for indigent and aspiring artists who often sell themselves short to ingratiate themselves to labels or because they lack negotiating power. Indigent artists use Spotify to get exposure but still rely on Spotify's royalty rate, which can be abysmal. Blockchain could allow an artist to set their own rate or perhaps even superior price optimization models through smart contracts. Smart contracts could involve provisions that have options that should a specific musical item get great market traction, then the royalty rate or end user pricing could automatically be adjusted. In fact, it is highly likely that standard smart contracts would become *de rigueur*, which would obviate the need for an artist to develop their negotiation skills or hire a skilled negotiator. The *droit de suite* paradigm, which inspired the California *Resale Royalty Act*, may finally get some teeth. This would undoubtedly be an enormous relief to struggling artists.

Transparency and Negotiating Power

Some are of the view that greater transparency would bolster the negotiating powers of consumers and musicians. In our opinion, this is highly improbable. While transparency no doubt would reduce scope for willful cheating by specific stakeholders, greater data sharing is unlikely to empower either single artists or individual consumers to become better negotiators. This does not mean the technology would not benefit consumers or artists, but such gains would come because of market forces that smart contracts would be instrumental in unleashing.

Piracy

There is growing concern that blockchain could be the death knell of copyrights (Vogel, 2015; Gabison, 2016). This seems plausible because it would be almost impossible to pin liability of infringement once there is a decentralized network to which a pirated version can be uploaded. The absence of any realistic method of enjoining an infringer on a decentralized internet poses new challenges for copyright holders. The critical issue is that the features of blockchain that make pinning responsibility for pilferage are innate to the system and the two elements would need to be parsed. Despite the much-touted encryption capabilities of blockchain, it is unclear whether the technology could reduce piracy overall. While specific blockchain platforms may truly be immune to pilferage, a composition purloined through other means could still be amenable to quick replication and proliferation on the internet or underworld dark net. Thus, revenue offset by

piracy losses are unlikely to decline substantially absent concerted enforcement globally by relevant authorities. Hence, whether the net impact of the technology would be to improve the top line remains unclear, but there are strong reasons to believe that blockchain could potentially increase industry revenue even if only marginally.

Sharing Revenue

It is even less clear whether blockchain would significantly enrich the authors' share of revenue. It is important to remember that the technology creates one more intermediary: the blockchain platform. Hence this would certainly negatively impact the share of other members of the supply chain. However, would the share of others decline in favor of authors? To answer this, the value proposition of the intermediaries needs to be revisited.

The main services that PROs provide relate to policing IP infringement and processing royalty payments. In addition to some of these activities, record labels are also responsible for launching artists, especially by positioning them with more well-known artists. It is tempting to believe that blockchain would obviate the need for PROs and labels because artists could simply sell their compositions on blockchain, similar to what smaller artists do today with streaming services. Such a view may be over simplistic for numerous reasons. Even though artists can sell their compositions on platforms such as Spotify and Pandora, labels help create brand value and, even on the internet, they can help juxtapose a less know artist with a star, greatly improving the prospects of the less known star. Moreover, such an artist does not have the protective umbrella of a label to pursue infringers. A rough imperfect analogy would be small online retailers who sell through Amazon versus products that use a white label strategy. However, it ought to be noted that the PRO and label model is far more vulnerable now that companies like Apple, Spotify, and others are gradually moving to a Netflix model, where they are producing their own content.

Similarly, PROs have an entrenched architecture to process payments, making them seemingly indispensable. Most importantly, labels and PROs perform the critical function of fighting piracy. So, even if a specific blockchain platform may be piracy proof, the wider world is not, and the role of labels and PROs extends beyond monitoring what goes on in a specific blockchain platform. Furthermore, a blockchain platform depends on its members' participation. While it is a fool's errand to guess how these platforms will evolve and how the various platforms will compete, it is not reasonable to presume that a label or PRO would join a platform whose operating model would devour its own business. Hence, given the entrenched position and market power of labels and PROs, and their indispensable role in monitoring infringement, it is unlikely that their prominence or role in the industry would fade quickly. In the very long run, should very

few blockchain platforms dominate, creating oligopolies or a duopoly, *and* other modes of consumption of music become insignificant, it is quite likely that PROs, labels, and the blockchain platform itself could merge or take on each other's role.

New Business Models: Fans, Micropayments

Blockchain could also foster a generation of new music business models wherein consumers could also become promoters. This development would be a logical progression of many features made possible by Spotify, wherein users share their preferences with their friends. Conceivably, blockchain could offer monetary rewards (in the form of micropayments) to avid listeners who also zealously promote their favorite music. Such models will likely be a net positive for the music industry as a whole since revenue generated by repurposing fans as promoters is likely to far outweigh the incentives provided to such fans for their service.

Reorder, Not Decentralization

Today, the industry is largely consolidated because commercially viable artists sell or rent their rights to distributors and labels by accepting an advance. There is also a significant economic rationale here, effectively sharing risk in a high-risk, high-reward market. It is entirely possible that the industry will remain consolidated even with blockchain technology because there is still economic logic to the risk sharing that advances provide. The assumption that a distributed ledger leads to distributed ownership is not a given. Blockchain may reorder the industry the way the internet did, but it may not necessarily decentralize it.

Policy Issues Related to Blockchain Use in the Music Industry

Smart Contracts

Currently there are many contracts between various parties: musician/publisher to label, PROs to end users, PROs to musicians, etc. A smart contract could create a single algorithm governing the relationship among all parties. But these contracts will involve music creators and consumers in different jurisdictions, and the owner of the blockchain platform may have a role in denying certain provisions of the contract or be subject to its own laws in its jurisdiction. A smart contract is just an algorithm, which naturally raises issues related to jurisdiction. Which jurisdiction will have authority to interpret and enforce the contract or prosecute its violation? Thus, regardless, smart contracts will not obviate the need for lawyers and judges.

Policy modernization would require two areas of focus. One around smart contracts and whether they encourage provisions that fairly compensate all parties, especially authors. The other is how standing and culpability would be defined.

Regarding fair compensation, we firmly believe that policymakers ought to be cautious in assuming that Coasean bargaining would eventually lead to optimal outcomes. While there is little doubt that the ability to set prices and include options through smart contracts would improve the fairness of artist compensation, the weaker negotiating position of solitary artists, especially indigent upcoming artists, cannot be ignored. It is conceivable that, despite availability of smart contracts, an artist could be cajoled into a bad deal. While market maturity would make such situations less likely, at least in the early phases of smart contracts, greater oversight to ensure adequate protections to parties with weaker negotiating power may be helpful. Furthermore, existing guidelines, such as royalties fixed by consent decrees, would need to be reconsidered.

Notwithstanding the serious legal and policy issues surrounding smart contracts, we believe these protean contracts, which can dynamically respond to situations (e.g., triggering options for specific benchmarks or modifying royalty rates depending on the popularity of a composition) would eventually create superior compensation prospects for artists. It is likely that algorithms would become standardized, thus capturing all eventualities, and there would be off-the-shelf algorithms or smart contracts that could be available, much like standard rental leases in most cities.

Since smart contracts are algorithms designed to self-execute depending on contingencies, issues related to liability and standing would require re-examination. A close analogy would be a self-driving car. Should such a car meet with an accident caused by a mechanical failure leading the algorithm to malfunction, does the culpability lie with the software program firm or the manufacturer or the owner of the car? Similarly, should a smart contract go awry, what legal principles would be used to assign responsibility or liability to the creator of the algorithm, the blockchain platform, or the party that ought to have taken due precautions. Additionally, it is not inconceivable that antitrust issues would gain greater attention should blockchain platforms themselves start taking on many roles of labels or PROs and blockchain monopolies are created as a result.

Intellectual Property

Unlike patents, major disputes in copyrights typically do not revolve around ownership (i.e., some other artist claiming to be rightful creator of piece of art, or plagiarism) but around non-payment by consumers enjoying the music (through piracy). Though we do not want to understate the

importance of plagiarism, the piracy issue is distinct from fair compensation by PROs and labels to artists. For technical patents, while infringement (consumer using the technology without payment) remains an important issue for the inventor, the key issue in patentability remains ownership of the novel idea (i.e., who invented the technology first). Thus, applying for and granting patents typically involves a battalion of lawyers and is an expensive process. Copyrights are easy to register and in most jurisdictions can be self-assigned (though assignment can be challenged by someone claiming to be the rightful owner). In summary, there are two key issues related to copyrights: assignment¹⁸ and piracy. While the former was relatively untouched with the advent of the internet, the internet created substantial opportunities for rapid replication and piracy of music thus challenging existing institutions. Blockchain is expected to impact both aspects of copyrights.

A musician could self-certify on blockchain. A distributed ledger could authenticate the author's ownership. However, this is unlikely to be a panacea because the creator of the register on the blockchain might not be the rightful owner to begin with and may have purloined it from the original creator. Thus, it is unclear whether blockchain registry would completely solve the issue of rightful ownership. It is likely that digital signatures could serve as complementary or supplementary evidence of rightful creatorship, and institutions currently involved in the verification process for IP would need to reform accordingly. It is also likely that, given the proliferation of registration on blockchain, such a means to self-certify authorship becomes prevalent practice and, like the patent system, there could be a move toward first to file, where first to file would mean the artist who first creates a digital signature of his music is the rightful owner.¹⁹ Regardless, blockchain has the potential to solve the vexing issue of global registry, which, despite investment of hundreds of millions dollars, remains intractable to date (Milosic, 2015).

In the existing system, copyrighting typically precedes monetization, especially for bigger or experienced artists who go through labels that conduct due diligence. Only in cases of negligent artists are there attempts to monetize without copyrighting. In blockchain, the registration (proxy for copyrighting) is in sync with monetization. In other words, it is not possible to monetize without some level of registering of the artist's work on the registry.²⁰ This could be valuable for the careless prodigy who is eager to monetize but has not made the effort to complete the routine registration needed in the present system.

¹⁸ Experts believe there is a rise in problems with assignment. Certainly, this is a problem on YouTube, where users often upload and vari-speed tracks to escape YouTube's content ID process.

¹⁹ Digital Audio Workstation software like ProTools, Logic, and Ableton could work here and may become the new PRO.

²⁰ However, there is the consideration that this may create a formality that Berne forbids in exercising exclusive rights under copyright.

Incumbency and Monopolies

Monopolies and entrenched interests are generally ill-disposed toward innovation and have varying success in thwarting technological advances that may upend the system. However, the exact response of monopolies is rarely uniform and depends on a number of variables. They may find it advantageous to co-opt a new technology. Labels agreeing to a drastic reduction in prices (upward of one-third) with iTunes is an excellent illustration of entrenched entities willing to readily accept a less exalted position in the supply chain in view of alternatives that would be worse or when the march of technology would render the incumbents obsolete. Nonetheless, as evident from the revenue data, the labels have been able to maintain their lion's share of declining revenue even with newer models like Spotify, which provides a means to supplant them.²¹ Moreover, incumbents could repurpose themselves to remain relevant. It is possible that PROs²² and labels will be compelled to improve their efforts in fighting piracy or become technologically savvy. They could generate products using, for example, artificial intelligence that could be deployed on blockchain to harness its vast potential in price discrimination and creating intelligent algorithms to leverage the possibilities offered by, for example, smart contracts.

Furthermore, as evidenced by the recent spate of acquisitions of blockchain start-ups by incumbents, it is possible that, while some of issues in the current system might be resolved, the ownership structure and power dynamics of the industry would remain unchanged. For instance, Spotify recently purchased MediaChain, a blockchain start-up (Perez, 2017), and, similarly, PROs like ASCAP and SACEM are partnering with IBM to explore blockchain applications. It will be interesting to see if incumbents use such acquisitions as a means to harness the new technology, to dominate another link in the value chain, or to supplant competition from emerging technologies by acquiring start-ups and shelving them.

Governance Structures

It is also important to keep in mind that the existing governance setting may also be (or become) an obstacle to innovation. Once established, governance mechanisms (embodied in legal rules, social traditions, and corporate practices) tend to live a life of their own and may become unsuitable to perform functions they previously performed or for which they were originally intended. Then change, or innovation, is called for but there is often intense resistance to such

²¹ Considering Spotify's purported equity deals with the recording side of the music business, it is unclear whether Spotify is supplanting the business or morphing with it.

²² Note that PROs are so hamstrung by consent decrees that this sort of artificial intelligence-enabled pricing would have to be approved by the Department of Justice because it may be seen as involving collusion.

change. Dismantling governance mechanisms and perhaps replacing them with alternatives may be necessary. Less drastically, institutional shake-ups may now and then be required (Edquist, 2005). While the internet did modify the role of certain established rules (e.g., piracy laws were modernized to address file sharing), the fundamental role and nature of stakeholders and governance rules remained largely intact. However, blockchain holds the potential to radically rethink and/or reform legal rules and social routines that may have long outlived their utility and may in fact be impediments to technological advances. In any case, blockchain could be the proverbial last straw to catalyze change. For instance, while consent decrees provided for PROs are long overdue for modernization, it could be that blockchain finally stimulates the much-needed change.

However, it would be a folly to think of blockchain as a monolith and presume that one set of prescribed policies would suffice. It is important to note that technology evolves even when the fundamental technological premise remains the same. For instance, iTunes, Spotify, and Napster are all based on the same backbone—the internet—but they all require different policy responses. Furthermore, technology and governance co-evolve (Perez, 2009) and each responds to the changes in the other.

Conclusions

It is unclear if blockchain will really harmonize the fragmented music industry or add to the cacophony of issues. We recognize that many of the issues we raise are based on embryonic business models (some piloted, some imagined) built on a nascent technology. However, this exercise is not about conjuring up Schrödinger's cat either. We believe such hypothesizing of how the technology and business models around it will evolve is a fundamental task of policymakers. They can help preempt negative impacts of technological change on the industry (most importantly on authors) and help design policies to bolster the music industry, ensuring well deserved compensation to artists and promoting budding talent. Despite the pervasive simplistic notion that technology liberates and empowers, not all technological change is necessarily benign or benefits artists. The advent of the internet generated optimism that the technology would emancipate artists from the middlemen and allow them to monetize their art unencumbered by traditional business models. While the industry no doubt morphed and obsolete players like retailers were thankfully removed from the value chain, the internet fell short of its promise of either expanding revenue or the artists' share. In fact, by every estimate, the internet has exacerbated their situation. While measures by policymakers to, for example, crackdown on internet piracy or require compulsory licenses have ameliorated the artists' pain, policymaking

itself has not kept abreast of rapid technological advances, and using policy instruments to protect and reward artists does not seem to be on the horizon.²³

By the same token, there is hope that blockchain would address numerous issues plaguing the industry. And, while the transformative nature of blockchain ought to be celebrated, it would be naïve to hope that, absent good policies, the industry as a whole (principally artists) will be well served merely by technological advances fueling novel business models. It is important to recall that the advent of the internet ushered in very destructive file sharing business models. Policymakers struggled to deal with this and, while eventually Napster's model was deemed illegal, it had already done considerable damage to the industry that still reverberates. We recognize the unenviable task of policymakers to infer policy implications of a technology that is in its incipient stages, but as the saying goes, let us think of the future, after all we will live in it. We thus believe that the sooner we start pondering the implications of blockchain the better it will be. Put simply, blockchain will not be the panacea that some techno-optimists would have us believe. While clearly we do not advocate interventions by policymakers that distort markets or stymie the advance of technology, it is our earnest entreaty that they begin the task of understanding the promise and perils of blockchain not merely for sake of commerce of music, but to serve and protect the artist—the creator of music itself!

²³ The archaic royalties set by consent decrees is a prime example of how policymakers have been slow to respond to evolving business models enabled by new technology.

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