

# Music Piracy and its Effects on Demand, Supply, and Welfare

April 5, 2011

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Prepared for 2011 Innovation Policy and the Economy

## Abstract

The decade since Napster has seen a dramatic reduction in revenue to the recorded music industry, and organizations representing the recording industry have argued, first, that piracy explains this revenue reduction and, second, that the effective weakening of copyright protection for recorded music will reduce the amount of new music coming to market. Much of the research in this area has sought to document the effect of file sharing on the recording industry's revenue, and most observers agree that technological change has sharply reduced the effective degree of protection that copyright affords since 1999. But a separate and potentially more important question is what has happened to the supply of new music in the decade since file-sharing. This paper reports findings from emerging literatures on these questions. A new index of the quantity of new music derived from critics' best-of lists suggests that the quantity of new consequential recorded music has not declined since Napster.

## Introduction

The decade since Napster has seen a dramatic reduction in revenue to the recorded music industry. Between 1975 and 1999 the value of US shipments of recorded music rose steadily from \$5.8 to \$12.8 billion (\$2000).<sup>1</sup> Between 1999 and 2008, annual US revenue from physical recorded music products has fallen from \$12.8 billion back to \$5.5 billion.<sup>2</sup> Even with digital sales included, US revenue was a third below its 1999 level. The decline is not confined to the US: Worldwide revenue from physical recorded music fell from \$37 billion in 1999 to \$25 billion in 2007.

Organizations representing the recording industry have argued two points vigorously. First, they maintain that piracy is the cause of the reduction in revenue they have experienced. Second, they raise a concern that the effective weakening of copyright protection for recorded music will have serious consequences for whether new artists' works will be brought to market and made available to consumers. The Recording Industry Association of America: "Our goal with all these anti-piracy efforts is to protect the ability of the recording industry to invest in new bands and new music..." And: "this theft has hurt the music community, with thousands of layoffs, songwriters out of work and new artists having a harder time getting signed and breaking into the business."<sup>3</sup>

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<sup>1</sup> From the Statistical Abstract of the United States 1995, table 915, page 578, deflated using the CPI from the Economic Report of the President 2010, Table B-62, page 262.

<sup>2</sup> See [http://www.riaa.com/keystatistics.php?content\\_selector=keystats\\_yearend\\_report](http://www.riaa.com/keystatistics.php?content_selector=keystats_yearend_report) , accessed April 28, 2010. Also, see Leibowitz (2006).

<sup>3</sup> See <http://www.riaa.com/physicalpiracy.php>, accessed October 20, 2010.

The struggles of the recorded music industry have spawned practitioner, policy maker, and academic debates over the role of unauthorized file sharing.<sup>4</sup> Most of the research in this area has sought to document the effect of file sharing on the recording industry's revenue, and most observers agree that technological change has sharply reduced the effective degree of protection that copyright affords since 1999. While the question of whether file sharing displaces legal sales and weakens copyright is an interesting academic question – and it is a vital question for the recorded music industry – it is only one of three questions raised by file sharing. Copyright has traditionally allowed the recording industry to generate revenue from recorded music. Weakened copyright may be bad news for sellers of recorded music, but its consequence for consumers depends on whether the supply of valuable new music dries up. A second important question, then, is what has happened to the supply of new music in the decade since file-sharing.<sup>5</sup> The third question, following from the first two, is how have the effect of changes in demand and supply affected welfare overall?

This paper reports findings from emerging literatures on these questions in three sections following the introduction. Section I lays out a simple framework for thinking about the effect of piracy on the well-being of consumers and producers. Section II describes what we have learned about the effects of piracy on demand, i.e. the sales-displacing effects of unpaid consumption. Section III describes what (little) we know about the music industry's supply response since Napster. A brief conclusion follows.

## **I. Welfare from Music**

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<sup>4</sup> Oberholzer-Gee and Strumpf (2006) initiated the contemporary empirical debate over file sharing. See also Rob and Waldfogel (2006), Blackburn (2004), Zentner (2006), among others.

<sup>5</sup> This question has received some attention from economists. See Handke (2006, 2009) and Oberholzer-Gee and Strumpf (2009), which we discuss further below.

## 1. Static and Dynamic Welfare Analysis

Like any product, music generates surplus for two parties, buyers and sellers. While recorded music is durable in some senses – the recordings can last forever and can be reproduced digitally without degradation in quality – most music depreciates for most users. While many people still listen to classical music that is hundreds of years old, for the most part, consumers prefer new music. Rob and Waldfogel (2006) provides direct evidence that music depreciates: consumers attach lower value to popular music, the longer they have owned it.<sup>6</sup>

The possibility that music depreciates is important for a welfare analysis of supply disruptions. If it did not, then the consumer losses from a disruption to new supply would not matter much. The amount of music available increases by perhaps a few percent in a normal year, so a complete cessation of new production would still leave consumers with nearly as much variety as they would have faced if new products had continued to arrive. If the additional satisfaction that consumers derive from music falls with the size of their collections, then the loss of new music would have small effects on welfare. But because most music does seem to depreciate for most users, disruptions to supply are potentially important for consumer well-being.

The welfare analysis of sharing zero-marginal-cost digital products has two parts, which could be termed static and dynamic. The static analysis describes music that already exists. It is easy to see that file sharing simply increases welfare. Producers lose, but their losses – when consumers steal things they used to pay for – are all transfers to consumers, who now enjoy

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<sup>6</sup> There is interesting variation across works' depreciation rates. Rob and Waldfogel (2006) estimate that the value that survey respondents attached to a Beatles album appreciated 26 percent per year of ownership while a Britney Spears album depreciated 28 percent annually.

greater surplus (the price they had formerly paid plus the former consumer surplus). In addition to the transfers from producers to consumers, file sharing also turns deadweight loss – circumstances in which consumers valued music above zero but below its price and therefore did not consume – into consumer surplus. In a purely static analysis, eliminating intellectual property rights benefits consumers more than it costs producers and is therefore beneficial for society.

Of course, the static analysis above is valid only for works that already exist. The dynamic analysis is different. If developing products requires producers to incur substantial fixed costs, they may only make these investments in the hopes of obtaining returns. If the returns are eliminated, then producers may stop investing. If music fully depreciates in one period, then there is no supply available in the second period, and there is no surplus for either party. In contrast to the rosy static effects of file sharing on welfare, the dynamic impact of a weakening of copyright is potentially devastating.

The simple framework focuses our inquiry on two broad research questions. First, has the advent of file sharing reduced the effective protection afforded recorded music by copyright? Second, if effective copyright protection has been weakened, has this interrupted the flow of valuable new products?

## **II. Effects of Unpaid Consumption on Legal Demand for Recorded Music**

### **1. How Might Piracy Affect Legal Sales of Recorded Music?**

Despite the recording industry's confidence that piracy has caused the reduction in their revenues, there has been a robust scholarly debate on the question, animated in part by ambiguous theoretical predictions on piracy's effect.

We can analyze the possible effects of piracy with a demand curve representing the distribution of consumers' maximum willingness to pay for recorded music (in the form of 12-song CDs), along with a horizontal marginal cost curve representing the cost of getting a CD to the store (including physical costs of pressing, packaging, and delivery, as well as the royalties contractually due to artists and labels). Prior to the Internet recorded music was sold on compact discs bundling roughly 12 songs for about \$15 in the US. Consumers had no alternative to the labels' recordings of their artists' music. Music CDs were sold by single-price monopolists, who set their price above the positive marginal cost. In the resulting market, the area under the demand curve was divided into four parts of interest: consumer surplus (CS), producer surplus (PS), deadweight loss (DWL), and (marginal) costs. There is a trapezoid of possible consumer welfare that is not experienced because marginal costs are positive (regions A and B in Figure 1).

The arrival of the Internet affected both demand and costs in important ways. With the introduction of the Internet, the marginal cost of distribution fell (in principle) to zero. (In fact, the marginal cost of legal distribution did not fall to zero, because artists and labels continued to require their royalties; and the labels were slow to adopt digital distribution channels.) Assume, for initial discussion, that consumers' willingness to pay (i.e. the demand curve) for recorded music is unchanged.

With this innovation the *full* area under the demand curve can be divided among CS, PS, and DWL. None of it need be allocated to (marginal) costs of production. If the price remains at its pre-Internet level, DWL now makes up a larger part of the area (the union of the regions labeled DWL, A, and B in Figure 1), PS has increased (to include both PS and costs), and CS is unchanged. Yet, with the reduction in costs, all of the area under the demand curve is now potentially available to buyers and sellers. That is, with pricing schemes more sophisticated than uniform pricing, more – and conceivably all – of the area under the demand curve would potentially be available to sellers. While it would be at best incomplete to suggest that the changes wrought by the Internet were unambiguous good news, the cost-reducing effects of the Internet have the potential to benefit producers and consumers alike.

Of course, changed cost structure is not the only effect of the Internet. More extensively analyzed has been the effect of the Internet-enabled piracy on the willingness of consumers to pay for legal copies of recorded music. And while it seems natural to assume that the availability of free alternatives does not, on balance, raise demand, nuances arise even here. Each point on the pre-Internet demand curve represents a consumer's willingness to pay for a particular album of music. If that valuation exceeded the price (roughly \$15), then that point would represent a transaction, which would have produced both consumer and producer surplus. If that valuation fell short of the \$15, then that point would not represent a transaction. Instead – once zero marginal cost distribution is feasible - the point would be associated with the deadweight loss arising from a situation where willingness to pay exceeds marginal cost but falls short of price.

Piracy reduces sales inasmuch it allows consumers who value products above their price and *who would previously have purchased* to obtain products without payment. But to the extent

that low-valuation consumers engage in piracy, it would not reduce sales and would instead only turn deadweight loss into consumer surplus. This distinction is important given the large volumes of unpaid music consumption occurring via file sharing networks. Suppose that volumes of pirated unpaid consumption vastly exceed volumes of paid consumption from the pre-piracy era. It seems likely that much of this unpaid consumption arises from situations in which the consumer's valuation falls short of the pre-Internet price. (Otherwise, paid sales prior to piracy would have been higher).

Despite the potentially beneficial effects of the Internet on consumers of digital products, the availability of unauthorized a la carte music files online holds the distinct possibility of harming sellers of those products, mainly because some of the unpaid consumption arises from circumstances when the consumer valuation exceeds the price. But reduction in sales is not theoretically pre-ordained; file-sharing could raise legal demand, through two mechanisms. First, because music is an experience good, consumer sampling of music prior to purchase can allow them to become sufficiently informed about the quality of music to render them willing to pay for it, particularly for less established artists. Sophisticated versions of these arguments are put forth in Shapiro and Varian (1999), and Blackburn (2004) presents relevant evidence. In addition, small-scale sharing can increase legal demand by an argument that recalls the theory of public-goods. Suppose albums cost \$15 and that Jim and Susan each attach a value of \$8 to a particular album. Alone, neither of them purchases the album, but if they form a music sharing club, they are together willing to buy things they would not purchase alone.

Thus, the appearance of file sharing might, in principle, have stimulated legal demand for recorded music. Theory alone cannot determine whether unpaid consumption stimulates or

depresses paid consumption. The competing possibilities motivate interest in the positive question, does file sharing reduce sales, addressed by the empirical literature.

## 2. How *Has* Piracy Affected Legal Sales of Recorded Music?

The effect of piracy on sales is inherently difficult to study for two reasons. First, piracy is an illegal behavior and therefore not readily documented in, say, government statistics. As a result, it is difficult to get data on volumes of unpaid consumption, particularly in ways that can be linked with volumes of paid consumption (more on this below). A second and equally important difficulty is the usual scourge of empirical work in the field, i.e. its non-experimental nature. Even if we can observe volumes of piracy, as some creative researchers have, it is difficult to establish the causal impact of piracy on paid legal consumption. The reason for this, in the parlance of empirical researchers, is that piracy is itself a potentially endogenous variable.

Broadly, there are two empirical approaches to the study of piracy. One approach examines products over time, asking whether, say, albums that are stolen more during some week are purchased less during that week. Examples of studies using this approach include Oberholzer-Gee and Strumpf (2007) and Blackburn (2004).

The second major type of data covers individuals; such data are usually obtained from surveys. If respondents report reliably, then this approach gives rise to information on individuals' volumes of both paid and unpaid consumption. Data of this sort allow the researcher to ask whether those who steal more purchase more (stimulation) or less (sales displacement). Moreover, if the data cover products from different points in time, the researcher can ask the analogous questions over time within individual. That is, one can ask whether those

stealing more songs from a particular vintage (relative to other vintages) purchase more or fewer songs from that vintage relative to other vintages.<sup>7</sup> A variant on the use of individuals as units of observation is the use of groups of individuals, for example the populations of cities or countries as in Zentner (2005), Peitz and Waelbroeck (2004), Liebowitz (2008), and Smith and Telang (2009).

Regardless of whether the product or the individual is the unit of analysis, studies of piracy generally relate the volume of unpaid consumption (which we term  $S$ , for stealing/sharing) to volumes of paid consumption (which we term  $B$  for buying). The dependent variable is  $B$ , while the independent variable of interest is  $S$ . In addition to differences in the unit of analysis, studies also differ importantly in their empirical strategy, the identifying assumptions by which they seek to uncover the causal relationship between  $S$  and  $B$  from the statistical relationship. Some studies rely directly on the cross sectional relationships across products or individuals, asking questions such as: 1) are albums which are stolen more are purchased more or less?, or 2) do people who steal/share more songs purchase more or fewer songs? Positive coefficients on  $S$  are interpreted as a stimulating effect of stealing/sharing on purchase, while negative coefficients are interpreted as evidence of sales displacement.

A moment's reflection suggests difficult challenges dogging these approaches. In the cross-product case, it is reasonable to worry that popular products will be purchased and stolen with high frequency, while products which are unpopular will be both stolen and purchased less frequently. Across people, the analogous concern is that people who like music will, as a result, both purchase and steal it. Then we will observe positive relationships between  $B$  and  $S$  from

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<sup>7</sup> See Bounie et al (2007), Anderson and Frenz (2010), Zentner (2006), Rob and Waldfogel (2006, 2007), Waldfogel (2009), and Bai and Waldfogel (2010) for studies using individual-level data drawn from surveys.

either approach even in the absence of any sales-stimulating effect of stealing. To put this another way, the cross sectional approach, across products or people, appears biased against finding sales displacement.

In principle, the cross sectional approach can circumvent the unobserved heterogeneity problem by the use of instrumental variables which, in this context are factors giving rise to variation in S that (except through their effects on S) have no direct effect on purchase behavior (B). Researchers have most commonly tried to use measures of computer or Internet sophistication as an instrument for the stealing.<sup>8</sup>

Panel data methods provide an alternative to the use of instrumental variables for surmounting the unobserved heterogeneity problem. With panel data on B and S for, say, albums, one can ask whether albums sell more or fewer copies in the particular time periods when they are being more heavily stolen.<sup>9</sup> Using product-level data, this approach is vulnerable to a concern that the popularity of a particular product changes over time, and this change in popularity drives changes in both B and S. If temporal shifts in an album's popularity give rise to variation in both its volume of paid and unpaid consumption, then even panel-based approaches with product level data will be biased against finding sales displacement.

The challenges with individual-level panel data are related but a bit different. Panel data on individuals allow the researcher to ask whether people buy more or less in periods when they steal more. This approach surmounts fixed unobservable differences (such as a particular individuals' level of interest in music). But this approach is undermined if changes in the

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<sup>8</sup> See Zentner (2006), Rob and Waldfogel (2006), and Anderson and Frenz (2010).

<sup>9</sup> Smith and Telang (2008) implement a product-level panel strategy to study the impact of televised movies on DVD sales and its interaction with the availability of pirate copies.

individual's interest in music manifests itself as changes in the individual's tendency to both buy and steal music. A final approach adds an instrument to panel data. Here, the instrument should ideally be something that changes the volume of stealing over time that does not directly affect the tendency for consumers to purchase the paid version of the product.<sup>10</sup>

Whether across individuals or products, studies with direct measures of unpaid consumption (S) allow the estimation of a sales displacement rate, while studies using proxies for the volume of unpaid consumption cannot. A substantial group of studies uses computer ownership or Internet access as a proxy for file sharing, asking whether individuals or groups exposed to higher levels of technology that can be used for file sharing engage in more or less music purchase.<sup>11</sup>

### 3. Sales Displacement Results on Music

Most empirical studies of the effect of unpaid consumption on paid consumption in music find sales displacement (negative effects of S on B), but their results fall into patterns according to the empirical approaches employed.

First, studies employing a purely cross sectional approach – asking, for example, whether individuals who steal more buy more or less tend to find little or no evidence of sales

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<sup>10</sup> See Oberholzer Gee and Strumpf (2007) or Blackburn (2004).

<sup>11</sup> One group of studies uses micro data on paid consumption of media products in conjunction with individual-level data on a file sharing proxy (Zentner (2006), Hong (2007), Michel (2006)). Another group of studies uses aggregate data on sales of media products in conjunction with average Internet connection rates (Liebowitz (2008), Smith and Telang (forthcoming), Peitz and Waelbroeck (2004)).

displacement.<sup>12</sup> Given the inherent bias of this approach against finding sales displacement, it is not prudent to interpret positive relationships as evidence of sales stimulation. As a result, it is difficult to conclude much about sales displacement from this evidence. On the other hand, given the inherent bias, negative coefficient estimates are more strongly suggestive of an actual sales-displacing relationship. In this light, Rob and Waldfogel (2006)'s cross sectional coefficient estimate of -0.2 on S (for "current" music) is strongly suggestive of larger sales displacement. Even more indicative of sales displacement, Waldfogel's (2010) cross sectional regressions of purchased songs on stolen songs (and controls) for 2009 and 2010 produces estimated displacement rates of about -0.3.

Purely cross sectional studies using computer or Internet use as an indirect measure of file sharing find mixed relationships between Internet use and paid music consumption. For example, Zentner's (2006) OLS regression yields a positive coefficient, although when he instruments P2P activity with measures of computer sophistication, he finds a negative effect: P2P use depresses the CD purchase probability by 30 percent. However, the studies making use of repeated cross sections for periods before and after the dawn of file sharing (the 1999 appearance of Napster) tend to systematically find an increasingly negative relationship between these proxies for file sharing and music purchase following 1999 (see Hong (2007), Michel (2006)). In the absence of information on the volume of unpaid consumption, these findings cannot be readily translated into rates of sales displacement. However, increasingly negative relationships between computer/Internet use and music purchase in the period immediately

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<sup>12</sup> For example, Bounie et al (2007) finds mixed evidence of sales displacement among a sample of French students. Anderson and Frenz (2010) actually reports a large positive coefficient in what is essentially a regression of B on S, with controls. Rob and Waldfogel (2006) reports an insignificant coefficient on S in a regression for "hit" albums.

following the appearance of Napster provides rather strong suggestive evidence that file sharing depresses sales of music.

Studies using groups of individuals, for example DMAs along with measures of Internet use also find increasingly negative relationships between Internet penetration and paid music consumption following 1999 (Liebowitz (2008)). Peitz and Waelbroeck (2004) find that countries with higher - and therefore greater growth in - Internet penetration experience smaller growth in CD sales, which they interpret as a depressing effect of file sharing on legal sales.

Longitudinal studies using individual-level survey data have found systematically negative coefficients on  $S$ . Rob and Waldfogel (2006) find coefficients of -0.08 and -0.16; Waldfogel (2010), which studies displacement of purchased songs by stolen songs using data from 2009 and 2010, finds coefficients on  $S$  of -0.15 and -0.24, respectively.

Finally, studies making use of product-level panel data find mixed results. Oberholzer Gee and Strumpf find essentially no relationship between file sharing and sales in a regression with album fixed effects. They continue to find no effect when they instrument file sharing using the timing of German school vacations. Blackburn (2004) uses a similar approach, albeit a different sample of albums and a different instrument. He uses the RIAA lawsuits of 2003-4 as a source of variation in file sharing. While he finds no effect for the average album, he finds greater sales displacement for albums by better-known artists. Because better known artists sell a disproportionate number of albums, his results indicate the existence of sales displacement overall.

While most studies attempting to ascertain the effect of piracy on legal sales look narrowly at sales displacement, Liebowitz (2006) instead makes the decline in music sales his direct object of study. He evaluates a list of candidate explanations that are alternatives to piracy, including changes in album prices, consumer income, music quality (as implied by radio listening), markets for substitutes and complements (videogames and movie), the development of new technologies for portable music listening (Walkman and later iPods), and replacement of albums with CDs. Finding that none of these factors could explain the reduction in recorded music sales, he concludes that piracy must be responsible.

With few exceptions, empirical studies of file sharing in music find sales displacement. The few studies that provide a direct estimate of sales displacement suggest a rate closer to zero than one, however. RW's best estimates are around -0.2.

There is relatively little study of the static welfare effects of piracy. Rob and Waldfogel (2006) collect survey data on consumers' valuations of albums they purchase and stole when file sharing was available as an option. Assuming that consumers would have purchased the music consumers valued above its price, the authors can compare the welfare effects of piracy. They find that only a third of the gain to consumers from piracy comes at the expense of producers while the remainder is drawn from reduced deadweight loss.

### **III. Supply: The Availability of New Recorded Music**

It seems reasonable to draw the conclusion that in the period since Napster, it has become more difficult for producers to generate revenue from recorded music products. If the profits that this revenue generate provide the inducement for firms to offer new products, then we might expect a reduction in the number of new products available over time. While I focus below on the availability of valuable new recorded music products generally, it's worth noting at the outset that piracy could give rise to a variety of supply responses. For example, the possible effects of reduced appropriability need not be the same across types of products. If piracy is more prevalent among fans of certain musical genres, we might expect new product development to shift away from those genres and instead toward the categories favored by consumers not engaging in piracy. And as various observers have emphasized, recorded and live music are complements. If it becomes more difficult to make money selling recorded music, performers (and their recording labels) may shift effort to the provision of live music.<sup>13</sup>

Characterizing the supply of creative products is difficult, particularly if one's goal is quantify the effect of new products on welfare. At first blush the obvious way to measure the supply of recorded music is with the number of songs or albums available. By extension, the new supply is the number of new songs or albums available in, say, a given year. Oberholzer-Gee and Strumpf (2009) and Handke (2006, 2010) point to evidence that the number of albums released in the US and Germany – and that the number of labels operating in Germany – have not declined in the past decade to argue that file sharing has not interrupted supply.

While this evidence is quite interesting, one might be concerned about that the great skew in the sales distribution undermines proportionality – and perhaps even the monotonicity –

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<sup>13</sup> See Connolly and Krueger (2006) and Mortimer, Nosko, and Sorenson (2010) for interesting evidence along these lines.

between titles and welfare. According to SoundScan, there were 97,751 new albums released in 2009, but only 2050 sold over 5000 units.<sup>14</sup> Thus, the amount of surplus generated is not proportional to the number of products made available, so the number of products provides a potentially misleading measure of the welfare effects of supply.<sup>15</sup> And while the evidence on the number of recording labels operating is quite interesting, it is also not by itself a measure of the amount of surplus that recorded music generates for consumers or producers.

A natural second impulse is to want detailed data on prices and quantities of music purchased, along with other data, for estimating demand systems for calculating the consumer and surplus from new music. But even this approach faces a difficult challenge: Because of file sharing, an album of equal appeal released today rather than 15 years ago garners lower sales, simply because effective demand has fallen. Hence, the surplus implied by a demand system estimated in the file sharing era will understate the contribution of new products to welfare.

What we want is a measure of the number of products released each year whose appeal surpasses some time-constant value threshold. The index of appeal should be related to demand, but the index must be unaffected by file sharing so that it can be used to create an index of the flow of valuable new works both before and after Napster. That is, we cannot quantify supply with, say, the number of albums selling more than 5000 copies. If file sharing undermines purchase incentives, then an album needs to be better now to garner 5000 sales than 15 years ago. A solution to this conundrum pursued in Waldfogel (2011) is a time-constant quality

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<sup>14</sup> See Glenn Peoples. "Analysis: Important Sales Trends You Need to Know." *Billboard.Biz*, June 2, 2010.

<sup>15</sup> Variation in the number of new titles from one year to the next can also provide a misleading measure of new production. The number of new albums in SoundScan fell from 105,000 in 2008 to 97,751 in 2009 because "in recent years, digital distributors flooded online retail with foreign catalogs being licensed to new territories. In effect, these distributors are catching up to all the music that's available from around the world. ...this won't go on forever. As fewer and fewer old recordings find their way to U.S. retailers for the first time, the unique number of titles released in a given year will fall." See Peoples (2010).

threshold based on critics' retrospective lists of the best works of multi-year time periods. The resulting measures of valuable new goods are the number of albums released each year that surpass one of various quality thresholds based on critics' reviews.

For example, Rolling Stone released its 500 best albums list in 2004. Entries on the “were chosen by 273 of the world’s pre-eminent musicians and critics ranging from Fats Domino to Moby” (Levy 2005). Figure 1 depicts the supply index derived from Rolling Stone’s list, and a few things are immediately evident. First, perhaps because Rolling Stone was founded in 1967, its editors are very fond of 1960s music. Second, the index trails off toward the year that the list appeared (2004). This may arise partly mechanically from the process of ranking: rankings released in a given year may be the result of a process begun a year earlier. Waldfoegel (2011) constructs indices from 64 album lists covering the period 1960-2007, and include 15,158 entries, as well as 24 song lists, which also cover 1960-2007 and include 1806 entries.

These are unusual data for measuring the quantity of economically important new supply which therefore require some justification. Waldfoegel (2011) documents that the indices track well-known historical trends in music. For example, historians of contemporary popular music believe that the late 1960s was a period of unparalleled creative output in recorded music, and the indices reflect this: all of the lists covering the period since 1960 show spikes in the late 1960s, as well as a second spike in the mid-1990s.<sup>16</sup>

The period following 1999 is crucial to assessing the Napster aftermath, so it is reassuring that there is substantial overlap across the entries on the 56 album lists – and 22 songs

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<sup>16</sup> For example, Larkin (2007) writes, “The 60s will remain, probably forever, the single most important decade for popular music.”

lists – covering the period since 2000. Two albums – *Funeral* by Arcade Fire and *Kid A* by Radiohead – appear on 47 of the 56 lists covering the 2000s. *Is this It?* by the Strokes and *Stankonia* by Outkast appear on 45 and 37 lists, respectively. The top 100 albums account for 40 percent of the entries on decade-best lists, 250 albums account for over 60 percent, and 500 albums account for over three quarters of the 4202 entries on 56 publications’ best-of-the-2000s lists. At least 300,000 albums were released during the decade. Yet, 500 albums – less than 0.2% of the decade’s new releases – account for three quarters of the entries on 56 critical best of the 2000s lists. Song lists exhibit a similarly substantial degree of overlap.

If the designation of being an acclaimed album is relevant to whether the album’s existence generates economic surplus, then critically acclaimed albums should sell more. Critical acclaim and sales are linked. First, half of the 50 most acclaimed albums of the 2000-2009 decade sold at least half a million copies, a feat accomplished by no more than a fraction of a percent of albums overall. Second, of the 7700 RIAA certified albums (as of 2004), those on the Zagat list sold roughly double the number of units, even when comparing Zagat-listed and non-Zagat-listed albums by the same artist.

Waldfoegel (2011) combines the underlying indices derived from the critics’ rankings into an overall index of the volume of consequential albums released annually from 1960 to 2007. The overall index are the year effects from a regression of log values of the individual indices on index dummies and common year dummies. Figure 2 shows the album index, along with its 95 percent confidence interval, and a few things are apparent (and are supported by formal statistical tests).

First, while the album index is lower following 1999 than it was before, its rate of change in the years following 1999 is, on average positive, although not statistically distinguishable from zero.<sup>17</sup>

Second, the post-1999 decline is a continuation of a decline that began in 1995. If one assumes that the trend between 1995 and 1999 would have continued beyond 1999, then the post-1999 evolution of the index is statistically significantly above trend. Using 1970 or 1990 as the starting point for the pre-1999 trend gives a similar result. Using 1980 as a starting point gives a post-1999 deviation that is statistically indistinguishable from zero.

Waldfoegel (2011) also treats the successful 2003 launch of the iTunes Music Store as an experiment raising the return to producing songs, relative to albums. A differences-in-differences regression reveals no divergence between album and song supply following 2003.

The evidence thus far indicates no decline in the volume of new recorded music products forthcoming since Napster. It is possible, however, that the new music is coming from artists who were established prior to Napster. While products still come to market, it is possible that new artists are not establishing careers. To explore this Waldfoegel (2011) examines the albums on three analogous best-of lists, for the 1980s, the 1990s, and the 2000s, from Pitchfork Media. Of artists on the best-of-the 2000s list, 49 percent had debuted following Napster's appearance in 1999. The analogous annual shares for the two previous decades, the annual share of 1980s best-of albums from artists debuting after 1979, and the share of 1990s best-of albums from artists debuting after 1989 are very similar and are statistically indistinguishable.

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<sup>17</sup> The 95 percent confidence interval for the annual rate of change in new album supply following 1999 extends from -0.0052 to 0.019 (from an annual rate of decline of 0.5 percent to an annual rate of increase of 1.9 percent).

1. Discussion How do we reconcile the demand reduction wrought by piracy since Napster with the continued creation of new recorded music documented above? One possibility is that the supply curve is vertical, i.e. that creative activity is invariant to reward. While new music itself might be created without regard for reward, the mundane aspects of bringing it to market – production, promotion, and distribution – are generally undertaken by profit-seeking private firms, and they have costs which must be covered to keep new products coming forth. These are presumably the costs that concern IFPI and RIAA members. The intuitive reasonableness of an upward-sloping supply curve for new products suggests a different reconciliation of reduced demand with continued “output,” that new technologies have reduced costs, shifting supply out as demand has contracted. Bringing music successfully to market has three component activities – creation, promotion, and distribution – and new technologies have changed each of these substantially.

Creation includes both solitary artistic activity as well as recording, mixing, engineering, and manufacturing salable recorded music products. Many aspect of creation were traditionally expensive, but a succession of new technologies has reduced costs, and cost reductions have accelerated since Napster: Software such as Pro Tools turns an inexpensive personal computer into a home recording studio. A starter version of the software sells for about \$100.<sup>18</sup>

Music is an experience good, and consumers need to become aware of music to be interested in purchasing it. Record companies have traditionally invested substantially to promote their new releases on radio. Since Napster, the process of musical discover has changed substantially. While radio listening is in decline, consumers now learn about new music from a

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<sup>18</sup> See Donald Bell, “Avid Introduces new Pro Tools Studio Bundles.” CNET, Oct 1, 2010 ([http://news.cnet.com/8301-17938\\_105-20018292-1.html](http://news.cnet.com/8301-17938_105-20018292-1.html)), accessed October 28, 2010).

variety of web sources, including Pandora, MySpace, and YouTube. Over half (52 percent) turned first to the Internet, followed by 32 percent using radio, and Pandora was the most recognized name: among those who had ever listened to Internet radio, 28 percent named Pandora, followed by Yahoo Music (9 percent), AOL Radio (6), and Last.fm (4).<sup>19</sup>

Distribution, too, has been changed substantially by the Internet. Where distribution used to require substantial physical assets, it is now possible to distribute musically electronically. Using TuneCore's service, for example, an artist can make his song available on iTunes for \$9.99.<sup>20</sup> Clearly, the various costs of bringing music to market have come down substantially since Napster.

In his critical account of the music industry's response to digital transformation, Steven Knopper (2009) argues out that these changes largely obviate the roles of the major record labels.

Leeds (2005) makes the similar point that independent labels appear to have lower costs, allowing them to subsist on smaller sales:

“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.”

Changes in the cost structure of operating a record label are consistent with Handke's (2006) observation that the number of German record labels expanded following the advent of file sharing.

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<sup>19</sup> See “The Infinite Dial 2010: Digital Platforms and the Future of Radio.” ([http://www.fmqb.com/goout.asp?u=http://www.edisonresearch.com/home/archives/2010/09/the\\_american\\_youth\\_study\\_2010\\_part\\_one\\_radios\\_future.php](http://www.fmqb.com/goout.asp?u=http://www.edisonresearch.com/home/archives/2010/09/the_american_youth_study_2010_part_one_radios_future.php) accessed October 28, 2010).

<sup>20</sup> See <http://www.tunecore.com/>, accessed October 28, 2010. At the site: “What Does Worldwide Distribution Cost” \$9.99 per single, \$9.99 per ringtone, \$49.99 per album.”

Waldfoegel (2011) provides some evidence that independent labels are playing an increasing role . While the share of the top 100 on independent labels was 50 percent in both the 1980s and the 1990s, it rose to 60 percent in the period since 1999.<sup>21</sup> This difference (between the 2000s and the previous two decades) is significant at the 5 percent level in a one-sided test (p-val =0.04). The ascendance of independent labels has been noted elsewhere. Leeds (2005) writes of the independent labels' success in the face of the majors' difficult times:

“Even as the recording industry staggers through another year of declining sales over all, there are new signs that a democratization of music made possible by the Internet is shifting the industry's balance of power. ...But 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.”

The heightened role of independent labels suggests a simple reconciliation of the continued supply of music despite financial distress at major labels: it appears that entities other than the major labels are bringing forth a higher share of music in the period since Napster. This still begs the question of why artists themselves would continue to produce works in the face of the smaller payoffs promised even by a successful independent label release. Many observers point to heightened roles of complements to recorded music in artists income. Connolly and Krueger (2006) and Mortimer, Nosko, and Sorenson (2010) document that concert revenue has increased since Napster, and Shapiro and Varian (1999) emphasized the possible stimulating effect of widely available – and difficult-to-protect – recorded music on the sale of other complements such as t-shirts.

## Conclusion

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<sup>21</sup> Pitchfork's focus on artists they view as interesting likely explains the high share of independent label releases among their most highly rated albums. According to Leeds (2005), independent labels' collective share of recorded music revenue rose to 18 percent (27 percent including indie albums distributed by majors) in 2005, its highest share in 5 years.

File sharing has presented a great challenge to the recording industry. It is clear to most observers that file sharing has undermined the effective copyright protection afforded to recorded music. In spite of this, the supply of recorded music appears not to have fallen off much since Napster, and there is at least suggestive evidence that independent music labels, which operate with lower breakeven thresholds, are playing an increased role in bringing new works to market.

Even if it is true that music supply remains forthcoming in the face of weakened effective copyright protection, it is not clear what relevance these results have for other media that differ in their creative processes. While new recording and distribution technologies have put the means to make and distribute music in the reach of many more people, it remains substantially more costly to create other types of works, such as movies. Even if one takes the suggestive results of this study to mean that copyright protection is not vital to ensure continued supply in music, we have no evidence that these lessons carry over to other media. It is often said – and is as true as ever in this context – that more research is needed.

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Figure 1

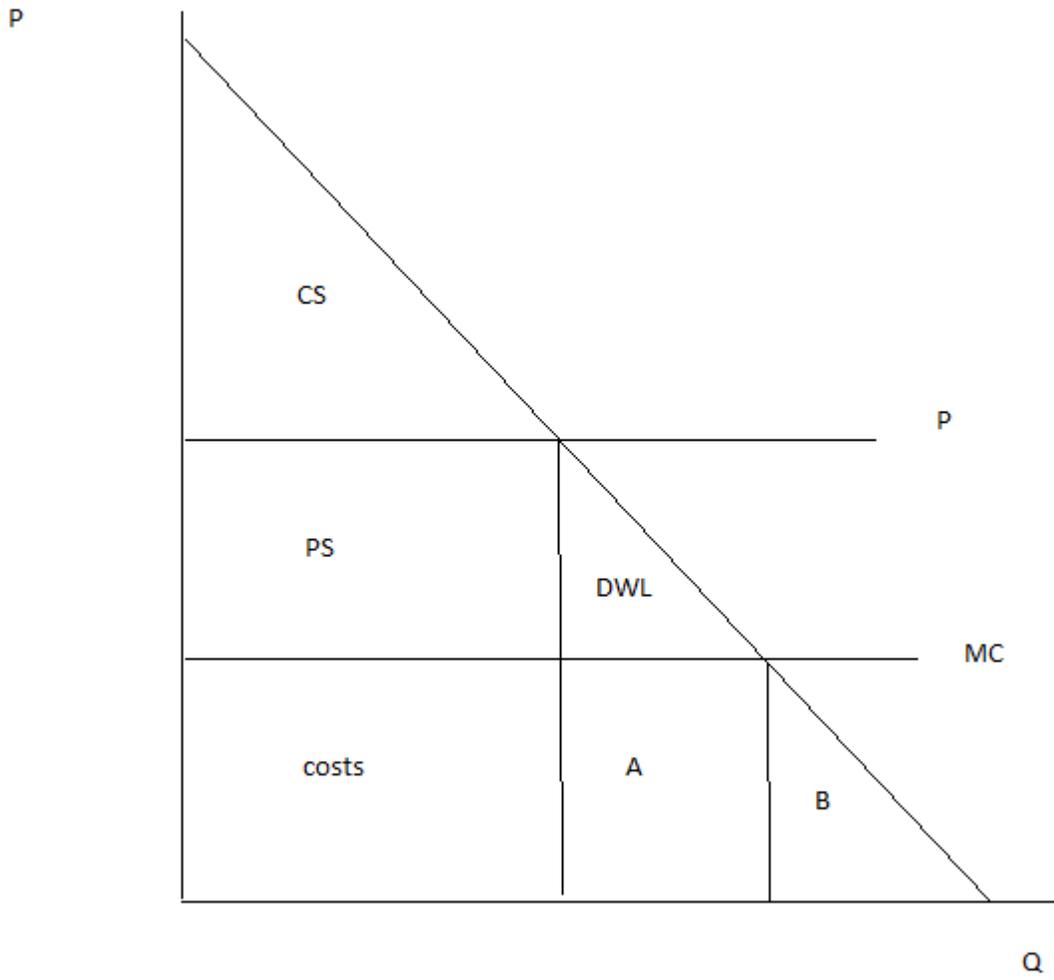


Figure 2

