Copying, Superstars, and Artistic Creation*

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Abstract

We provide a new perspective on the impact of unauthorized copying and copy levies on artistic creation. Our analysis emphasizes three important aspects of artistic markets: the predominance of superstars, the dynamics of talent sorting, and the importance of promotion expenditures. In the short run, piracy reduces superstars' earnings and market share, and increases the number of niche and young artists. From a dynamic perspective, piracy may help more young artists start their careers, thereby increasing the number of highly talented artists in the long run. The long run impact on artistic creation of levies on copy equipment may crucially depend on whether their yields primarily accrue to superstars or are allocated to help young artists.

Keywords: artistic creation, superstars, private copy, piracy, levies.

JEL Classification: L10, L82.

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1 Introduction

The music industry and other artistic markets are experiencing profound changes as a result of digital recording, Internet file-sharing, and new electronic devices. This has launched a far-reaching debate on the consequences of the new technologies for artistic creation and the possible need to redefine intellectual property rights.

According to some individuals and companies in the artistic industry, file sharing and unauthorized copying is causing huge losses to artistic creators and producers, and will have a very negative impact on artistic creation in the long run.[1] They have asked for controls and restrictions on the use of the Internet for copying, as well as for levies on copy equipment. Levies would provide compensation for unauthorized copying and restore incentives for artistic creation. These arguments have led many countries in Europe and other parts of the world to implement taxes and levies on copy equipment and electronic devices (see Table 1 for a sample of these new taxes). In general, the revenues from these levies are allocated across copyright holders, creators, performers, and publishers according to their legal sales.

Others argue that current copyrights are already excessive in most Western countries and that their yields mostly accrue to a relatively small number of superstars and artistic firms that obtain economic rents.[2] The new communication technologies are helping the careers of young and niche artists and may reduce the concentration of

[1] There is controversy, however, over the real effect of file sharing and unauthorized copying on music sales. Rob and Waldfogel (2006) and Zentner (2006) find some negative effect on sales, whereas Oberholzer-Gee and Strumpf (2007) finds no effect at all. Also, the fall in the value of total sales in recorded music has not always been accompanied by a fall in the number of units sold. For example, according to recording industry statistics, total sales in recorded music in the UK fell by about 10-percent between 2002 and 2006, but the number of CDs sold this last year was still higher than in 2002: 164.4 millions (source: IFPI). Moreover, other sources of revenues such as concerts and merchandising seem to be soaring. For example, concert-ticket sales in North America increased from $1.7 billions in 2000 to $3.1 billions in 2006 (source: Pollstar).

[2] The copyright term in the United States is the life of the author plus 70 years. See Akerloff *et al.* (2002) for arguments against the last extension in the US that was approved in 1998, and Kretschmer et al. (2008) for arguments against the current proposed extension in the European Union. See Varian (2005) for a survey on the general issues relating to copyrights.

sales in artistic markets.[3] Restrictions on file sharing and the implementation of levies on copy equipment may revert this process and harm the general public.

Here, we are interested in some specific questions. May file sharing and copying really favor niche and young artists? Can this be done without hampering high-quality artistic creation in the long run? Can file sharing and copying even enhance high-quality creation? This paper analyzes the short and long run consequences of unauthorized copying for artistic creation, and the effects of implementing different types of copy levies. The paper focuses on the interaction between copying and three key aspects of artistic markets that have largely been neglected by the conventional analysis of intellectual property. These aspects are the predominance of superstars, the importance of promotion expenditures, and the dynamics of talent sorting.

These three aspects of artistic markets can be briefly explained as follows. First, artistic creation is intensive in an innate input: *talent*. Rosen (1981) showed that this factor, combined with the scale economies associated with the joint consumption of artistic goods, leads to the *superstar* phenomenon: concentration of output and extremely large rewards for the most talented artists.[4] Second, promotion costs are

[3] Anderson (2004) has pointed out an interesting way the new ICTs are raising the opportunities for the *long tail* of niche and young artists. By the long tail, Anderson (2004) refers to the thin part of the distribution of sales, to distinguish it from the head or thick part that concentrates most sales. For example, 20% of goods tend to account for more than 80% of sales in most industries. According to Anderson, the number of goods that can be provided in conventional brick-and-mortar stores is constrained by shelf space, storage costs, and the size of the local market. In contrast, internet stores of digital products do not have those constraints. As a result, online stores do not need to restrict their supply to the most popular hits, but can also provide access to the large tail of niche and young artists. Brynjolfsson et al.(2003) found that 30% to 40% of Amazon book sales are titles that would not normally be found in brick-and-mortar stores. See also Brynjolfsson et al. (2007) on how Internet sales exhibit significantly less concentration than traditional sales.

[4] Several papers provide evidence of the strong concentration of sales in the market for popular music. See Rothenbuhler and Dimmick (1982), Crain and Tollison (2002), and Krueger (2005), among others. Krueger (2005), for example, reports that in 2003 the top 1% of artists obtained 56% of concert revenues, and that the top 5% took in 84%. Similarly, there is evidence of the extremely skewed distribution of copyright yields across artists, even if data about these earnings are not easily accessible (they are privately held by collecting societies). For example, Kretschmer and Hardwick (2007) report data on the distribution of payments in 1994 by the UK Performing Right Society. This

a crucial ingredient in explaining the demand for artistic products and greatly affect the division of market shares between superstars and niche as well as young artists.[5] Third, there is a dynamic positive link between the current number of young artists and the future number of highly talented superstars. As pointed out by MacDonald (1988), talent and charisma are not easily detected. As a consequence, the condition for having a large number of highly talented artists in the future is to have many young artists starting an artistic career today (even though most of them will not succeed).[6]

Thus, our analysis makes an explicit distinction between superstars (or high-type artists) on the one hand, and niche and young artists (or low-type artists) on the other. First, we analyze the short run equilibrium of artistic markets. In the short run, the number of superstars is exogenously given whereas there is free entry into the sub-market of niche and young artists. Piracy reduces superstars' earnings and the incentives to invest in their promotion. This tends to increase the market share and the number of niche and young artists, thereby raising artistic diversity.

Second, we consider the dynamics of the market and its long run equilibrium. We build a simple overlapping-generations model of artists where only a fraction of young artists starting the artistic career show talent and become superstars later in their careers. The number of superstars is then endogenous. Piracy helps more young artists start their careers, which in turn increases the number of highly talented artists in the long run.

Third, we consider policy. We compare the consequences of different levies on copy equipment and analyze alternative schemes for allocating their yields. We find that taxes on copying may hinder the promotion of niche and young artists, and hamper

society distributed £20,350,000 among 15,500 writers for the public performance and broadcasting of their works. The top 9.3% of writers earned 81.07% of the total. Ten composers earned more than £100,000, whereas 53.1% of the composers earned less than £100. These authors' estimations for the period 2004-2005 show similar results. For evidence on superstars' rents in the motion picture industry see Chisholm (2004).

[5]For example, Peitz and Waelbroeck (2004) cite several sources showing that marketing and promotion are the main costs of making and selling a recorded CD.

[6]See Terviö (2009) for a general analysis of the market failure in discovering talent and how this leads to an inefficiently low output and higher earnings for known talents.

artistic creation in the long run. Moreover, the most common policy followed by Western countries of distributing levy yields in proportion to market sales strongly favors superstars. This increases the incentives to promote superstars, thereby fuelling market concentration again, which in turn reduces artistic diversity in the short run as well as high-quality artistic creation in the long run.[7] We find that artistic creation can be stimulated more effectively in the short as well as in the long run by allocating levy yields using non-linear (in sales) schemes that strongly favor young artists.

A growing economic literature is gradually addressing the effects of the new information and copying technologies on artistic markets and other industries (see Peitz and Waelbroeck, 2006, for a survey). Alcalá and González-Maestre (2008) and Zhang (2002) are the closest papers to this one. Alcalá and González-Maestre (2008) build a model with the three aspects of artistic markets emphasized here and analyze the optimal length of the copyright term. Nonetheless, they do not consider the possibility of unauthorized copying and do not explore its consequences. Zhang (2002) considers the role of promotion costs and copying in artistic markets in a duopoly model where digital copies help reduce the distortionary effects of the large-audience artist's persuasive advertising. However, in Zhang (2002)'s model there is no entry to the low-type sub-market, nor to the high-type artistic sub-market. Contrarily, analyzing entry in each of these markets is crucial in our investigation of how unauthorized copying and copy levies may affect artistic creation in the short and in the long run.[8]

Two final notes on the scope and the limitations of the paper. First, the paper is mostly motivated by the music and recording market. However, similar mechanisms are present in most activities where creative work is important and can be easily copied, as in movies and books. Second, a key assumption throughout the paper is that superstars' earnings are above their opportunity cost; i.e., they obtain rents. This seems

[7] Moreover, as long as not all the equipment subject to copy levies is used for copying artistic material (as it happens with many data CDs, hard disks, pen drives, etc.), this scheme for allocating copy levies may involve a transfer of resources from the rest of the economy to superstars.

[8] Also, previous papers such as Gayer and Shy (2003) and Kinokuni (2005) have analyzed the effects of copy levies on technological markets. However, to the extent of our knowledge, this is the first paper analyzing the effect of these levies on artistic creation.

a reasonable hypothesis, which is motivated by the empirical evidence on the concentration of market share and revenues by superstars. Moreover, the dynamic model in Section 3, where the number of superstars is endogenized, shows that superstars can indeed obtain rents in equilibrium (even if there is free entry to the artistic market as young artists and all talented young artists become superstars later in their careers).

The rest of the paper is organized as follows. Section 2 lays out the static version of the model and analyzes the short run equilibrium of artistic markets with and without piracy. Section 3 sets the dynamic version of the model and investigates the long run impact of copying on artistic creation. Section 4 considers different types of levies on copy equipment and analyzes their impact on artistic creation. Section 5 concludes.

2 Superstars and Niche Artists: the Short Run

In this section, we set the static version of our model and analyze the short equilibrium of artistic markets. Artists may be either high-type (superstars) or low-type (niche and young artists). In the short run, the number of high-type artists is exogenous, whereas there is free entry to the low-type artists' sub-market. The exogeneity of the number of high-type artists reflects the idea that the set of superstars changes with lower frequency than the set of niche and young artists. The number of high-type artists is endogenized in the dynamic model in Section 3 where we analyze artistic markets in the long run.

Each active artist creates a single artistic good (such as a song, novel, movie, etc.). Therefore, artistic creation is proportional to the number of artists, though we may distinguish between high-quality artistic creation (which results from high-type artists' work) and low-quality artistic creation (which results from low-type artists' work). Being active as an artist involves opportunity costs F^l for low-type artists and F^h for high-type artists.[9] As discussed in the Introduction, we assume throughout the paper

[9] F^l and F^h can be interpreted as the fixed cost of creating a low- and a high-type artistic good, respectively. In addition to including the artist's time opportunity cost, it can be seen as also including the costs of other inputs needed for creation (e.g., recording or filming equipment). It may be realistic to assume $F^h > F^l$.

that superstars' earnings are above their opportunity cost F^h; i.e., they obtain rents.

Once an artistic good is created, it can then be infinitely reproduced at some constant marginal cost. Consumers can consume artistic goods by buying *original reproductions* (*originals* for short), which pay copyrights, or *unauthorized copies* (*copies* for short), which do not. We first analyze artistic markets when piracy does not exist; i.e., individuals can only consume artistic goods by buying originals. Then, we introduce piracy and consider the case where all artists are copied. We end this section by summarily analyzing all possible intermediate cases where superstars are affected by copying but low-type artists are not.

2.1 The Model Without Piracy

There is a measure-one continuum of consumers who spend an amount S of money on artistic goods. The representative consumer solves the following utility maximization problem:

$$\begin{aligned} &\max_{x,y} \quad [a \ln x + (1-a) \ln y], \\ &s.t. \quad p^h x + p^l y = S; \end{aligned} \tag{1}$$

where x (respectively, y) is consumption of superstars' originals (resp., low-type artists' originals) and p^h (resp., p^l) is their price.[10] Superstars' market share a is endogenous. It positively depends on the number of superstars as well as on their total expenditures on promotion and marketing relative to market size. Only high-type artists enjoy promotion and marketing expenditures, which may be thought to be managed by competitive artistic promotion firms.[11] Specifically, high-type artists' market share a

[10] See Alcalá and González-Maestre (2008) for how this setting can be framed into a two-stage budgeting model with a general consumption good in addition to artistic goods.

[11] The relationship between creators and artistic firms (such as labels and publishers) are regulated by contracts that can make artistic firms the main beneficiaries of stronger copyright protection. The potential conflict of interest between creators and artistic firms has been analyzed in Gayer and Shy (2006). Here we simplify this issue by assuming that promotion firms are perfectly competitive or, alternatively, by considering each superstar in the model to be a vertically integrated structure of a high-type artist and an artistic promotion firm.

is determined by the following expression:

$$a = 1 - \beta e^{-\gamma n A/S},\ A = \sum_{i}^{n} A_i, A_i \geq 0,\ i = 1, 2, .., n\ ; \tag{2}$$

where A_i is artist i's promotion expenditures, n ($n \geq 2$) is the number of high-type artists, and β and γ are exogenous parameters, $1 > \beta > 0, \gamma > 1$.[12] Thus, superstars would capture all the market if and only if their total promotion expenditure A is infinite.

Competition takes place according to the following multistage game:

Stage 1: Each high-type artist chooses simultaneously and independently her level of A_i.

Stage 2: Each potential low-type artist decides whether to enter and be active in the low-type artistic sub-market. As noted, entry involves a fixed opportunity cost F^l.

Stage 3: Firms compete à la Cournot.

Let us consider the Cournot-Nash equilibrium at Stage 3. Standard calculations show that inverse demand functions are given by $p^h = aS/x$ and $p^l = (1-a)S/y$. Hence, each high-type artist's profit function is

$$\pi_i^h(x_i, x) = \frac{aSx_i}{x} - cx_i - A_i - F^h,\ i = 1, 2, ..., n.$$

where x_i is artist i's sales and c is the constant marginal cost of reproducing originals, which is assumed to be the same for all artists. Cournot equilibrium first order conditions yield the following equilibrium levels of price, sales per artist, and profits:

$$p^h = \frac{n}{n-1}c;\quad x_i = \frac{n-1}{n^2}\frac{aS}{c};\quad \pi_i^h = \frac{aS}{n^2} - A_i - F^h. \tag{3}$$

[12] A firm's advertising tends to increase both the demand for that firm's good and the overall demand for the type of good being advertised. As a result, advertising increases the share of this type of good in consumers' expenditure (Sutton, 1991). In our formulation we model advertising as a public good for high-type agents, ignoring the competitive effects of advertising within high-type agents and focussing on the aggregate interactions between the low-type and the high-type sub-markets. Moreover, we do not entertain any assumption on whether advertising is informative or merely persuasive, but simply assume that it is effective in stimulating demand.

To obtain the subgame perfect Nash equilibrium of the game, we can rewrite high-type artist's profit function at the first stage, as

$$\pi_i^h(A_i, A) = \frac{(1 - \beta e^{-\gamma nA/S})S}{n^2} - A_i - F^h, \ i = 1, 2, ..., n.$$

Maximizing with respect to A_i yields the equilibrium value of a:

$$\frac{\beta e^{-\gamma nA/S}}{n}\gamma - 1 = 0 \ \rightarrow \ a = 1 - n/\gamma. \tag{4}$$

Inequality $n < \beta\gamma$ must hold to insure $A_i > 0$. We assume that γ is always high enough to guarantee this condition. Moreover, $\pi_i^h \geq F^h$ requires n to be small enough or S large enough.

In turn, each low-type artist's revenues are:

$$\pi_j^l(y_j, y) = \frac{(1 - a)Sy_j}{y} - cy_j - F^l \ ; \ j = 1, 2, ..., m.$$

Where y_j is artist j's sales. Cournot equilibrium in the low-type sub-market yields the following price and sales per artist:

$$p^l = \frac{m}{m-1}c, \quad y_j = \frac{m-1}{(m)^2}\frac{(1-a)S}{c}; \tag{5}$$

The equilibrium number of active low-type artists m^* is determined by the free entry condition $\pi_j^l = \left(p^l - c\right) y_j - F^l = 0$. Using the expressions above yields

$$m^* = \left(n\frac{S}{\gamma F^l}\right)^{\frac{1}{2}}. \tag{6}$$

2.2 The Impact of Piracy

We now introduce piracy: consumers can obtain unauthorized copies of artistic goods at an exogenous cost p^c. Market equilibrium may be significantly different depending on the level of p^c with respect to the parameters determining p^h and p^l. Different cases lead to different combinations of copies of superstars' work and niche artists' work being blockaded, deterred, or accommodated. In this subsection we assume that p^c is low enough such that in equilibrium $p^c < p^l \leq p^h$. As a result, all artists are pirated. This case may seem the most relevant one from the empirical point of view and is

likely to make the strongest case against piracy. In the next subsection, we briefly characterize the other possible cases (only superstars are copied, copying is deterred, etc.), which are analyzed in detail in the Appendix.

There is a great heterogeneity across consumers with respect to consuming originals or unauthorized copies. For example, casual observation suggests that youngsters tend to consume copies relatively more often than other population groups. This can easily be explained in terms of consumer heterogeneity across a large set of parameters: moral restraints on copying (since people may find copying to be immoral), internet skills, opportunity costs of the time needed to search and download files from the internet, valuations for quality (as long as originals have higher quality), valuations for non-digital components that may be bundled with the digital product (such as the CD or DVD case with pictures, artwork, lyrics, information, etc.), and risk aversion with respect to the possibility of infecting the computer with viruses, adware and spyware.[13] Consumer heterogeneity has been considered by the theoretical literature in different ways (see Peitz and Waelbroeck, 2006). In this paper, we consider a continuum of consumers with different (constant) marginal rates of substitution υ between copies and originals. The consumer problem is now recasted as:

$$\begin{aligned} &\max_{x,z_x,y,z_y} \left[a \ln(x + \upsilon z_x) + (1-a)\ln(y + \upsilon z_y)\right], \\ &s.t. \;\; p^h x + p^c z_x + p^l y + p^c z_y = S. \end{aligned} \tag{7}$$

where z_x is consumption of copies of superstars' work and z_y is the same for low-type artists' work. Assuming that υ is uniformly distributed across individuals in the interval $[0,1]$, the fraction δ of individuals that buy originals in the case of high-type goods is $\delta = p^c/p^h$ (provided that $p^c < p^h$; otherwise, $\delta = 1$). The remaining fraction $1-\delta$ consume copies. Hence, if $p^c < p^h$, the demand for high-type originals is $x = p^c aS/(p^h)^2$. Similarly, if $p^c < p^l$, the demand for low-type artists' originals is $y = p^c(1-a)S/(p^l)^2$ (otherwise, their demand is $y = (1-a)S/p^l$ as in the previous subsection). Clearly, demand is more elastic as a result of competition from copies.

[13] The empirical work cited in the Introduction finding that file sharing in the Internet has a small or null effect on legal sales suggests that a large share of the population has a strong preference for originals.

As already indicated, in this subsection we assume that p^c is low enough such that in equilibrium $p^c < p^l \leq p^h$. Hence, all artists' work is pirated (although not all consumers buy copies). Thus, using the corresponding demand function, high-type originals' price and sales are $p^h = \frac{2n}{2n-1}c$ and $x_i = \frac{(2n-1)^2}{4n^3}\frac{p^c a S}{c^2}$, respectively. Thus, profits of each high-type artist (in terms of the variables at stage 1 of the game) are

$$\pi_i^h = \frac{2n-1}{4n^3}\frac{p^c a S}{c} - A_i - F^h.$$

We can rewrite the profit function of each high-type artist as

$$\pi_i^h(A_i, A) = \frac{2n-1}{4n^3}\frac{p^c S}{c}(1 - \beta e^{-\gamma n A/S}) - A_i - F^h, \ i = 1, 2, ..., n. \tag{8}$$

Maximization with respect to A_i yields the new level for a, which is denoted with superscript c:

$$\beta e^{-\gamma n A/S} = \frac{1}{\gamma}\frac{c}{p^c}\frac{4n^2}{2n-1} \rightarrow \ a^c = 1 - \frac{1}{\gamma}\frac{c}{p^c}\frac{4n^2}{2n-1}. \tag{9}$$

In turn, low-type artists' profit maximization conditional on the demand when their work is pirated (i.e., when $p^c < p^l$), yields equilibrium price $p^l = \frac{2m}{2m-1}c$ and per artist output $y_j = (1-a)\frac{p^c}{c^2}S\frac{(2m-1)^2}{4m^3}$. Then, using the free entry condition, we obtain the short run equilibrium number of low-type artists in the case of piracy:

$$m^c = \left(\frac{2m^c - 1}{m^c}\frac{n^2}{2n-1}\frac{S}{\gamma F^l}\right)^{1/2}. \tag{10}$$

Comparing (6) with (10) shows that $m^c > m^*$ if and only if $m^c > n$, which is taken for granted.

Proposition 1 *Consider the short run equilibrium where the number of superstars is given and parameters are such that all artists' work is pirated. The number of niche and young artists in the market is larger with piracy than if piracy could be completely prevented.*

The intuition for this result is that superstars' promotion expenditures act as a barrier to entry against low-type artists. Copying reduces the profitability of superstars'

promotion costs (compare (9) with (4)), thereby leaving a larger market share for low-type artists.[14] Copying also brings about a reduction in the prices of both high- and low-type artistic goods that benefit consumers.[15]

2.3 The General Case: From Blockaded Copying to Accommodation

In general, there are several possible cases on the value of p^c with respect to (the equilibrium levels of) p^h and p^l. This leads to different characteristics of equilibrium. We briefly describe here the different cases and refer to the Appendix for a detailed analysis. Denote by $\overline{p^h}$ the price of high-type originals that was obtained in Subsection 2.1 for the case of no piracy, $\overline{p^h} \equiv \frac{n}{n-1}c$, and by $\underline{p^h}$ the price of high-type originals when high-type work is copied, which was computed in Subsection 2.2: $\underline{p^h} \equiv \frac{2n}{2n-1}c$. Similarly, denote by $\overline{p^l}$ the price of low-type work when its market is not affected by piracy and by $\underline{p^l}$ its price when low-type work is copied. The possible cases depending on the exogenous level of p^c are:[16]

[14] Empirical evidence regarding the market for rock concerts seems to be consistent with the model's prediction of decreasing superstars' market share. According to Pollstar (an industry trade magazine), ticket revenues from concerts in North America in 2007 rose to $3.9 billion, which represents about 8% increase over 2006 with $3.6 billion and the ninth consecutive year with increasing revenues. However, the top 20 tours combined saw a 15% decline in ticket revenues compared with the top 20 tours from 2006.

[15] The effect of copying on CD prices has been openly recognized by the Recording Industry Association of America. See RIAA (2007).

[16] See the Appendix, where it is also shown that $\overline{p^l} = \frac{m}{m-1}c$ and $\underline{p^l} \equiv \frac{2m}{2m-1}c$. It could also be the case that $\underline{p^h} \not> \overline{p^l}$. In such a case, the analysis is somewhat simpler since case (iii) is replaced by a different case where both high- and low-type artists fix the same price p^c, thereby both deterring piracy.

$$
\begin{aligned}
(i) \qquad & p^c > \overline{p^h}; \\
(ii) \qquad & \overline{p^h} \geq p^c \geq \underline{p^h}; \\
(iii) \qquad & \underline{p^h} > p^c > \overline{p^l}; \\
(iv) \qquad & \overline{p^l} \geq p^c \geq \underline{p^l}; \\
(v) \qquad & \underline{p^l} > p^c.
\end{aligned}
$$

These cases correspond to (i) all copies are blockaded, (ii) all copies are deterred, (iii) copies of superstars' work are accommodated whereas copies of low-type work are blockaded, (iv) copies of superstars' work are accommodated whereas copies of low-type artists' work are deterred, (v) copies of superstars' work as well as of low-type artists' work are accommodated. Note that the analysis in the previous subsection corresponds to this last case.

Figure 1 depicts m as a function of p^c, following the analysis in the Appendix. The key result is that m is larger in all cases where the market is affected by piracy (cases (ii) to (v)) than when it is not affected (case (i)). The following proposition characterizes m as a function of p^c along the five cases.

Proposition 2 *Consider the short run when the number of superstars is given. The number of niche and young artists m is a continuous function of p^c, which is characterized as follows. There is a critical value $p^o < \overline{p^h}$ that maximizes m. This value p^o is the lowest level p^c such that superstars are pirated but low-type artists are not affected by piracy, which occurs for $p^c = \overline{p^l}$. For $p^c > p^o$, m is monotonically decreasing, whereas for $p^c < p^o$, m is monotonically increasing. Moreover, m is constant for small values of p^c such that all artists are copied, as well as for values such that none is copied. In all cases, the number of niche and young artists is larger when the market is affected by piracy than when it is not.*

Proof. See Appendix. ■

As noted, the key result is that m is larger in all cases where the market is affected by piracy than when it is not. Still, the quantitative differences between cases (ii) to

(v) will be of interest when discussing policy alternatives in Section 4. Thus, it is useful to briefly discuss which cases may be most relevant. Since casual observation indicates that the work of most artists is copied, it seems that the most relevant case is the one initially analyzed (Subsection 2.2). Still, the case where only superstars are copied may be of particular interest. Superstars' work is more likely to be copied, not only because their originals tend to be more expensive but also because their larger market makes their work more easily available in P2P networks. But more importantly in the case of the music industry, revenues from records (as opposed to revenues from concerts) are relatively more significant for superstars than for young and niche artists. There is an important reason for this: the economies of scale of joint consumption that give rise to the superstar phenomenon have a limit for live performances but have no limits for records. In fact, the main goal of superstars' concert tours, at least until the advent of the Internet, was to promote new records. This is not the case for niche and young artists, some of who are willing to provide records on the Internet even for free as a way to become popular and increase demand for their live performances (see Peitz and Waelbroeck, 2004).[17] The model can account for these circumstances by means of a reinterpretation. In the simplest reinterpretation, it can be assumed that consumption of high-type artists' work consists of buying or copying records, as before, whereas consumption of low-type artists' work consists of attending live performances. (Now, in the case of low-type artists, y represents concert ticket sales and c represents the marginal cost of using a venue with one more seat). Under this interpretation, which emphasizes the different origin of the main source of revenues for each group of artists, only superstars can be copied. Results for case (iii) are then the most interesting ones.

[17] At any rate, the importance of live performances is increasing for all types of artists. For example, according to the Music Managers Forum –a trade group in London– musicians derived two-thirds of their income in 2000 via record labels, with the other one-third coming from concert tours and merchandise. In 2007, this proportion had been reversed. Still, consumers' total expenditure on music seems to be roughly the same. According to some concert promoters, music lovers seem to have a *mental budget* to spend on music and have switched their spending from CDs to tickets and merchandising (see *The Economist*, July 5th 2007). This suggests that our assumption of a constant consumers' budget in the artistic market may be a reasonable approximation even when the nature of the good being bought changes from recorded music to concerts.

3 Piracy and Artistic Creation in the Long Run

In this Section, we endogenize the number of high-type artists and analyze the long run consequences of piracy on artistic creation. We take a dynamic artistic-career perspective: young artists may or may not be talented, but their talent and charisma is unknown when they enter the artistic market. After some period in the market, only a fraction of them show talent and become superstars.[18]

3.1 A Model of Overlapping Generations of Artists

We consider an overlapping-generations extension of MacDonald's (1988) model of artistic markets. This extension is similar to the one in Alcalá and González-Maestre (2008). They key difference is that here we introduce piracy and consumer heterogeneity. Artists live for two periods. Every period, there is an infinite pool of potential young artists among the population. Young artists are *talented* with probability ρ, but neither they nor artistic promotion firms can observe this characteristic until after they complete a period as active artists in the market. Individuals entering the artistic profession do so in their first period of life as young artists. Only the fraction ρ of young artists that reveal themselves as talented in this first period continue the artistic career in their second life period as high-type artists and receive advertising. Non-talented artists drop out from the artistic market.[19]

[18] Some economists have raised doubts about superstars necessarily having above average talent (see for example Adler 1985). If superstars do not have more talent than the average artist, the arguments in this paper can be simplified and the results are reinforced. In fact, our short run static model would suffice to show that piracy increases overall artistic creation since there is no distinction between high- and low-quality creation.

[19] The details of the process of how artists with heterogeneous and unknown talent are sorted by the market through an information accumulation process are analyzed in MacDonald (1988). Assuming that future performance is correlated with past performance, MacDonald shows that individuals enter the artistic career only when young (i.e., the first life period), and remain in the artistic market for the second period if and only if they receive a good review of their performance in the first period. If this happens, their performances in the second life-period are attended by a larger number of consumers who pay higher prices (i.e., the artist becomes a superstar). Our setting is intended as a reduced form of this process.

Thus, every period, the artistic market looks as it did in Section 2, except that low-type artists are now only interpreted as young artists and that the number of high-type artist at time t, n_t, is given by:

$$n_t = \rho m_{t-1}. \tag{11}$$

Every period, new potential young artists decide whether to enter the artistic market (in which case they create an artistic good) or to stay out, in which case they earn income F^l. The number of young artists is again determined by the free entry condition $\pi_j^l = \left(p^l - c\right) y_j - F^l = 0$.[20]

3.2 The Long Run Impact of Piracy

3.2.1 The case where all artists are copied

As in the previous section, we first compare the case of no piracy with the case where all artists are copied in equilibrium, which occurs if $p^c < p^l$ and $p^c < p^h$.

Consider an economy where copying is not possible. Substituting with (11) in equation (6) and considering the steady state, yields:

$$n_{ss}^* = \rho^2 \frac{S}{\gamma F^l}; \tag{12}$$

where n_{ss}^* is the steady state number of high-type artists if there is no piracy. In turn, substituting with (11) into equation (10) yields:

$$n_{ss}^c = \frac{2n_{ss}^c - \rho}{2n_{ss}^c - 1} \rho^2 \frac{S}{\gamma F^l}. \tag{13}$$

[20] Potential artists' decision to enter the artistic career may depend on lifelong expected utility of starting an artistic career. This involves taking into account first-period earnings as well as expected discounted second-period earnings (which include the possibility of succeeding and becoming a superstar). Alcalá and González-Maestre (2008) analyze the decission to start an artistic career in this case. They show that, as long as the time discount factor and the probability of becoming a star are sufficiently low (or that young artists are liquidity constrained), second life-period earnings can be ignored for the qualitative results of the model. This is the simplifying approach we adopt in this paper. They also show that, from the young artists' perspective, changes in the market environment that shift revenues from superstars to young artists imply transforming future and uncertain revenues into actual current revenues. Hence, the present discounted value of starting an artistic career increases.

where n_{ss}^c is the steady state number of high-type artists if all artists are pirated. Since $\rho < 1$, we have $n_{ss}^* < n_{ss}^c$. Thus, piracy increases the long run number of high- and low-type artists. The intuition for the result is as in the previous section. Copying reduces the profitability of stars' promotion costs, which therefore decrease. Consequently, young artists enjoy a larger market share and their number rises. Since the number of talented high-type artists in the long run depends on the abundance of young artists in previous periods, this increases the long run number of high-type artists. The lower ρ is, the larger the ratio n_{ss}^c/n_{ss}^* is, since a lower fraction of talented artists involves the need for a larger number of young artists trying the artistic career.

Note that neither p^c nor c affect n_{ss}^c. The reason is that they induce two opposing effects which cancel each other out. On the one hand, higher c/p^c ratio tends to increase the price of originals with respect to irregular copies and increases the fraction of consumers buying irregular copies. This lowers the incentives for superstars' promotion expenditures thereby increasing young artists' market share. On the other hand, higher c/p^c also has a negative effect on young artists' revenues per unit of sales. These two effects cancel each other out when $p^c < p^l$.

As with the analysis for the short run, this analysis is conditional on superstars being able to cover their opportunity costs; i.e., $\pi^h \geq 0$. The important point now is to note that superstars can indeed obtain rents in the long run equilibrium, even if there is free entry to the artistic career as a young artist. Superstars may obtain rents because there is no free entry to the status of superstar. In order to become a superstar, artists must go through a young-artist period and show their talent. But the market for young artists is limited. In fact, it is more limited the more resources superstars spend on their promotion. Superstars' promotion expenditures may create a bottleneck to access the superstar status.

Still, piracy might in principle reduce superstars' revenues so as to hit the constraint $\pi^h \geq 0$. Thus, we may want to explicitly consider this constraint in the analysis. To do so, note that for every p^c there is a maximum number of high-type artists that can obtain non-negative profits (given the parameters of the market). That is, for every p^c there is an n such that $\pi^h(p^c, n) = 0$. Using (8) and (9), which correspond to

expressions for the case of piracy, the pairs (p^c, n) leading to $\pi^h = 0$ satisfy

$$\pi^h(p^c, n) = 0 = \gamma \frac{p^c}{c} \frac{2n-1}{4n^2} + \frac{1}{n} \ln \left(\frac{1}{\beta\gamma} \frac{c}{p^c} \frac{4n^2}{2n-1} \right) - \left(1 + n \frac{\gamma F^h}{S} \right). \tag{14}$$

This schedule is drawn in Figure 2. The pairs satisfying the constraint $\pi^h(p^c, n) \geq 0$ are those in or below the schedule: higher p^c involves less copies, so that the market can support a larger number of superstars. Points (p^c, n) that are strictly below this schedule imply $\pi^h_{ss} > 0$; i.e., superstars obtain rents. Depending on the value of the parameters in (14) such as S/F^h, this schedule may cross the $m(p^c)$ schedule at different points. Our analysis above is conditional on this crossing being to the left of the relevant value of p^c. This hypothesis does not seem to be inconsistent with available data on superstars earnings.

The following proposition summarizes the main point in this section.

Proposition 3 *In the long run, if high-type artists obtain rents and all artists are pirated, piracy increases the number of low- as well as high-type artists.*

3.2.2 Considering all cases

The Appendix considers all possible cases of p^c with respect to p^l and p^h. It turns out that the long run number of high-type artists is a continuous function of p^c, denoted as $n_{ss}(p^c)$. Figure 2 draws this function. Results are summarized in the following:

Proposition 4 *In the long run, if high-type artists obtain rents, piracy increases the number of low- as well as high-type artists. Moreover, the number of both types of artists is constant as a function of p^c for both small and large p^c, increasing for intermediate-low values of p^c and decreasing for intermediate-large values of p^c. The maximum level of both types of artists is reached when p^c equals the critical level $\overline{p^l}$ such that below that level, low-type artists are not affected by piracy.*

Proof. See Appendix. ■

Thus, n_{ss} follows the same pattern, as a function of p^c, as $m(p^c)$. Again, as in Section 2, differences between cases (ii) to (v) do not affect our key result that piracy always leads to a larger number of artists. Notwithstanding, these differences are of some interest when discussing policy alternatives in the next section.

4 Taxes and Levies on Copying Equipment: Helping Artistic Creation?

As noted in the Introduction, in most European countries, the policy response to file sharing and copying has been to implement levies on recording equipment and electronic devices such as CDs, DVDs, hard discs, and MP3s. Then, most revenues from these levies are allocated among writers, performers, and copyright holders in proportion to their legal sales. In this Section we discuss the implications on artistic creation of these and other alternative policies. In order to analyze the impact of different policy alternatives, it is useful to think about copy levies as involving two separated policies: a tax on copy equipment and a subsidy to artists. We first discuss the impact of different copy taxes and then discuss the impact of different schemes for allocating tax revenues across artists. As in the rest of the paper, the analysis is conducted assuming that high-type artists obtain rents. When the different cases outlined in the previous sections lead here to different results, we focus on the case where all artists are copied and on the case where only superstars are copied since these are the two most relevant cases according to the discussion at the end of Section 2.

4.1 Taxes on Copy Equipment

Note first that taxes on copy equipment may or may not be proportional to the amount of the material being copied. For example, levies on CDs and DVDs may be roughly proportional to the amount of copying. In contrast, levies on electronic devices such as MP3 players and last-generation cell phones, are not. Levies on electronic devices are rather a fixed cost on copying. We must therefore distinguish between *proportional copy taxes* (e.g., taxes on CDs and DVDs) and *fixed copy taxes* with respect to the amount of copying (e.g., taxes on MP3 players, cell phones, and the like). These two policy alternatives can easily be mapped in terms of the model in this paper. A proportional copy tax is equivalent to a rise in p^c. In turn, a fixed tax is equivalent to a reduction in the amount S to be spent on artistic goods.

According to expressions (10) and (13), which are valid for the case where all artists are copied, larger consumer expenditure S increases m and n_{ss}. The same occurs for cases $(ii) - (vi)$ (see expressions (A.1), (A.3) and (A.4), and (A.5)-(A.7) in the Appendix). Therefore, given the equivalence between policies and the parameters in the model, fixed taxes on electronic devices reduce m and n_{ss}. On the other hand, Figures 1 and 2 show that a *small* increase in p^c (which, as we noted, is equivalent to implementing a proportional copy tax) has no effect on m and n_{ss} when all artists are copied. The reason is the same one underlying previous results: these taxes have two opposing effects on low-type artists' revenues –a positive effect on low-type artists' earnings given their market share and a negative effect due to a market share loss in favor of superstars. However, when only superstars are affected by copying (i.e., for $\overline{p^h} > p^c > \overline{p^l}$ in Figures 1 and 2), a proportional copy tax (which is equivalent to increasing p^c) has a negative effect on m and n_{ss}. The following proposition summarizes these results.

Proposition 5 *Fixed taxes on electronic devices reduce the short run number of niche and young artists, as well as the long run number of high-type artists. If only superstars are affected by copying, proportional copy taxes also have a negative impact on the short run number of niche and young artists and the long run number of all artists.*

4.2 Allocating the Revenues from Copy Levies

The allocation of levy revenues across artists may or may not be in proportion to their legal sales. For example, niche and young artists could receive a share of levy revenues larger than their share of sales. We will distinguish between a *proportional-to-sales allocation* of levy revenues (revenues are allocated across artists in proportion to their legal sales) and a *lump-sum allocation* (artists receive a fixed amount that is independent of their sales). Clearly, there may be many intermediate policies involving revenue allocations that are non-linear in sales, which would be roughly equivalent to a combination of these two policies.

Again, these two policy alternatives can easily be mapped in terms of the model in this paper. A lump-sum allocation of levy revenues across artists is equivalent to

a reduction in artists' opportunity costs F^h and F^l. In the case where all artists are copied, expressions (10) and (13) show that higher F^l decreases m and n_{ss}. Therefore, lump-sum payments to artists increase m and n_{ss}. The same occurs for cases $(ii)-(vi)$ (see expressions (A.1), (A.3) and (A.4), and (A.5)-(A.7) in the Appendix). On the other hand, a proportional allocation of levy revenues across artists is equivalent to a subsidy that reduces the cost c of each original reproduction. Now, note that wherever p^c or c enter the expressions determining the number of artists, they enter them as a ratio c/p^c. Hence, a proportional-to-sales payment to artists has the same effect as a proportional copy tax. Hence, the same analysis carried out for proportional copy taxes (see the second part of Proposition 5) holds for proportional-to-sales allocations of levy returns. Summarizing, we have the following

Proposition 6 *Allocating the revenues from levies as lump-sum payments to artists increases the short run number of niche and young artists as well as the long run number of high-type artists. However, allocating the revenues from levies across artists in proportion to their legal sales may reduce the short and the long run number of artists. This will in fact be the case if only superstars are affected by copying.*

Propositions 5 and 6 warn about the risks for artistic creation of a policy based on levies that are allocated according to legal sales. These policies may only favor superstars. If superstars obtain rents, copying may favor young and niche artists in the short run, and all sorts of artistic creation in the long run. Taxes on copying material may hamper this effect. Moreover, if levy revenues are allocated in proportion to sales of records, they raise the incentives to invest in the promotion of superstars, potentially offsetting the Internet's market-concentration loosening effect.[21]

Proposition 6 suggests that the most effective policy from the point of view of artistic creation would be to use the yields from levies to help young artists. Of course,

[21] Also note that, in principle, levies have the characteristic that total revenues being collected equal total payments to the beneficiaries of the levy. Hence, the total amount of resources allocated to the artistic industry remains constant. However, if not all the equipment subject to copy levies is used for copying artistic material, then copy levies involve a transfer of resources from the rest of the economy to the artistic industry. In such a case, levies with proportional-to-sales allocation of revenues may involve a subsidy to superstars from the rest of the economy.

any lump-sum-like scheme for allocating levy revenues should make sure that artists are indeed active. This may require conditioning payments on some minimum output in terms of sales or live performances. Non-linear *strongly concave* schemes linking levy payments received by artists to their sales may also constitute an intermediate useful compromise between strictly proportional schemes and lump-sum schemes. Moreover, resources allocated to young artists need not to be implemented as direct payments but can also take the form of subsidizing young artists' productions and live performances or reducing general taxes on them.[22]

5 Concluding Comments

New communication and copy technologies are affecting artistic industries in many ways. This paper focuses on the effects in a setting that emphasizes three central aspects of artistic markets: the predominance of superstars, the importance of promotion expenditures, and the dynamics of talent sorting. Under reasonable conditions, we find that piracy may lower superstars' incentives to spend on promotion, which makes entry and survival by niche and young artists easier. As a consequence, the number of artists and therefore artistic diversity may increase. Moreover, talented artists can only be sorted by the market after a period in the *long tail* as a young artist. Therefore, by giving more market opportunities to young and niche artists, piracy may also enhance high quality creation in the long run. It follows that it cannot be taken for granted that copy levies recently implemented in many Western countries, whose revenues are mostly allocated in proportion to sales, will favor artistic creation. These levies on copy equipment and other possible restrictive policies may reinforce the already strong market position of top artists.

In general, the aim of optimal copyright protection is to find the right balance between underutilization of ideas caused by intellectual property rights, and underprovision of ideas that results from lack of appropriation of benefits by creators. However,

[22]For related literature discussing alternative mechanisms to finance creation that may be more efficient than granting monopoly rights, see for example Shavell and van Ypersele (2001), and Romer (2002).

this trade-off does not necessarily arise in artistic markets if most revenues accrue to a reduced number of creators (superstars) that obtain rents. In such a case, higher protection of copyrights may increase both underutilization and, in the long run, underprovision. The reason is that stronger copyright protection may provide too many incentives for superstar business, thereby choking the development of new artistic careers that are the long run source of ideas.

As noted throughout the paper, our results are conditional on the premise that superstars obtain rents. Is this hypothesis reasonable? Many people may find it obvious that this is the case. However, economists are rightly skeptical of anything taken as given. Our model shows that superstars can indeed obtain rents in the long run equilibrium. Moreover, we cite empirical evidence that is consistent with this hypothesis. Still, more detailed data on the distribution of artists earnings would be useful. Collecting societies do not readily share data on the distribution of copyright earnings. It would seem reasonable that at least the statistics on the allocation of copy levy yields across artists and copyright holders were made public, since collecting societies now benefit from the legislative and administrative capacities of governments to implement the levies. This information would help assess how skewed the distribution of payments is in favor of a small amount of superstars and how reasonable the hypothesis is that superstars obtain rents.

During the last century, technological progress in communication and recording devices (such as radio, TV, records, tapes, etc.) greatly concentrated some artistic markets in favor of fewer top artists who obtained increasingly larger revenues. This process may not be over, as some recent changes in the economic and political environment are facilitating the globalization of culture, thereby increasing cultural uniformity and favoring further concentration. However, new communication and copy technologies may have a counterbalancing effect. Borrowing Tom Friedman's (2005) metaphor, new communication and copy technologies are flattening the artistic market by leveling it in favor of the long tail of young and niche artists. Governments should make sure that policies intended to favor artistic creation do not hinder this process.

6 Appendix

Proof of Proposition 2

As explained in the main text, there are five possible cases depending on the exogenous level of p^c:[23]

(i) $\quad p^c > \overline{p^h}$: copies are blockaded;

(ii) $\quad \overline{p^h} \geq p^c \geq \underline{p^h}$: superstars deter copies;

(iii) $\quad \underline{p^h} > p^c > \overline{p^l}$: only superstars are copied;

(iv) $\quad \overline{p^l} \geq p^c \geq \underline{p^l}$: low-type artists deter copies and superstars are copied;

(v) $\quad \underline{p^l} > p^c$: both low-type artists and superstars are copied.

Case (i):

This case was analyzed in Section 2.1, yielding expression (6) for m. Note that in this case, m does not depend on p^c.

Case (ii):

In this case, we have $p^h = p^c$. Hence, profits of each high-type artist at Stage 1 of the game are $\pi_i^h = \frac{p^c - c}{np^c} aS - A_i - F^h$. The first order conditions of the SPNE of the game yield:

$$\frac{\beta e^{-\gamma nA/S}(p^c - c)}{p^c} - 1/\gamma = 0 \rightarrow a = 1 - \frac{p^c}{\gamma(p^c - c)}.$$

Then, the number of low-type artists is given by the free entry condition, which combined with the expression for a above implies:

$$m(p^c) = \left[\frac{1}{1 - c/p^c}\frac{S}{\gamma F^l}\right]^{1/2}. \tag{A.1}$$

Note that this is decreasing in p^c. Also note that for $p^c = \frac{n}{n-1}c$, expressions (6) and (A.1) yield the same value for m, so that m is continuous as a function of p^c at the frontier between cases (i) and (ii).

Case (iii)

[23] As already noted in the main text, for $\underline{p^h} \not> \overline{p^l}$ the analysis is somewhat simpler since case (iii) is replaced by a different case where both high- and low-type artists fix the same price p^c, thereby both groups of artists deterring copies.

In this case, we have $p^h = \frac{2n}{2n-1}c$. Hence, output per artist is $x_i = \frac{(2n-1)^2}{4n^3}\frac{p^c a S}{c^2}$, and each high-type artist's profits at Stage 1 are $\pi_i^h = \frac{2n-1}{4n^3}\frac{p^c a S}{c} - A_i - F^h$. We can rewrite this profit function of each high-type artist as

$$\pi_i^h(A_i, A) = \frac{2n-1}{4n^3}\frac{p^c S}{c}(1 - \beta e^{-\gamma n A/S}) - A_i - F^h,\ i = 1, 2, ..., n.$$

The first order conditions for the SPNE of the game yield the new SPNE level for a, which is indicated with superscript c:

$$\frac{(2n-1)}{4n^2}\frac{p^c S}{c}\beta e^{-\gamma n A/S} - S/\gamma = 0 \rightarrow\ a^c = 1 - \frac{n^2}{\gamma}\frac{4c}{p^c(2n-1)}. \tag{A.2}$$

Using this expression and the free-entry condition in the low-type market yields the number of low-type artists:

$$m(p^c) = \left[\frac{c}{p^c}\frac{4n^2}{2n-1}\frac{S}{\gamma F^l}\right]^{1/2}. \tag{A.3}$$

Note that m is decreasing in p^c. Also note that equations (A.1) and (A.3) yield the same number of low-type artists for $p^c = \frac{2n}{2n-1}c$, so that m is continuous as a function of p^c at the frontier between cases (ii) and (iii).

Case (iv)

In this case the equilibrium price in the low-type market is $p^l = p^c$. Hence profits of each low-type artist at Stage 3 of the game are given by the free entry condition:

$$\pi_j^l(m) = \frac{(p^c - c)(1-a)S}{mp^c} - F^l = 0.$$

Thus substituting with expression (A.2) for a^c, we find:

$$m(p^c) = (1 - c/p^c)\frac{c}{p^c}\frac{4n^2}{2n-1}\frac{S}{\gamma F^l}. \tag{A.4}$$

Since $c/p^c > c/p^h = (2n-1)/2n > 1/2$, it is easily seen that m is increasing in p^c. Moreover, m takes the same value for $p^c = \frac{m}{m-1}c$ when using expressions (A.3) and (A.4), so that m is continuous at the frontier between cases (iii) and (iv).

Case (v)

This case was already considered in the main text, yielding expression (10) for m. Moreover, m takes the same value for $p^c = \frac{2m}{2m-1}c$ when using expressions (A.4) and (10), so that m is continuous at the frontier between cases (iv) and (v).

The overall relationship between p^c and m is illustrated in Figure 1, where the curve $m(p^c)$ represents the equilibrium level of m as a function of the copying price. Note that $m(p^c)$ reaches a maximum at point $p^0 = \overline{p^l}$, at the frontier between region (iii) and (iv).

Proof of Proposition 4

In the long run, the steady state value of n as a function of p^c can be obtained by using (11) to substitute into expressions (4), (A.1), (A.3), (A.4), and (10), which correspond, respectively, to cases (i)-(v) considered in the previous short run analysis. Cases (i) and (v) were already analyzed in the main text, yielding expressions (12) and (13). For the other three cases, we have:

$$\text{Case } (ii) \quad : \quad n_{ss} = \left[\frac{1}{1 - c/p^c} \frac{\rho^2 S}{\gamma F^l} \right]^{1/2}. \tag{A.5}$$

$$\text{Case } (iii) \quad : \quad n_{ss} = \frac{1}{2} + 2\frac{c}{p^c}\frac{\rho^2 S}{\gamma F^l}. \tag{A.6}$$

$$\text{Case } (iv) \quad : \quad n_{ss} = \frac{1}{2 - 4(1 - c/p^c)\frac{c}{p^c}\frac{\rho S}{\gamma F^l}}. \tag{A.7}$$

Recall from the main text that n is independent of p^c in cases (i) and (v). Now, it is easy to see that n is decreasing in p^c in cases (ii) and (iii), whereas it is increasing in case (iv). Hence, n_{ss} as a function of p^c follows the same pattern as $m(p^c)$ (see Figures 1 and 2), with a maximum at the frontier between regions (iii) and (iv).

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Table 1: Copy Taxes in some European countries in 2009

	Tariffs on Blank Carriers		**Tariffs on Devices**		
Country	*Data CD-r*	*DVD*	*Mp3 player*	*Hard disk DVD-recorder*	*Memory card*
Austria	0.34	0.54	3.00/9.00	9.00/22.50	-
Belgium	0.12	0.59	-	3%	-
Denmark	0.28	0.44	-	-	0.62
Finland	0.20	0.60	4.00/21.00	4.00/21.00	-
France	0.35	1.00	1.00/20.00	5.00/50.00	0.072/0.944
Germany	0.0288	0.174	2.56	9.21	-
Italy	0.25	0.58	3%	3%	-
Latvia	0.14	0.28	1.42	1.42	-
The Netherlands	0.14	0.60	-	-	-
Norway	Annual compensation set by Government				
Portugal	0.05	0.14	-	-	-
Spain	0.17	0.44	3.15	3.40	0.3
Sweden	0.06	0.25	0.08/27.90	13.00/27.90	-
Switzerland	0.03	0.23	9.66/27.20	0.22 per GB	-
Turkey	Amount of compensation set by Government				

Note: Figures are in Euros except when percentage (%) is indicated, which refers to a percentage on the sale price. When an interval is shown, the exact levy depends on GB of memory.
Source: De Thuiskopie (2009)

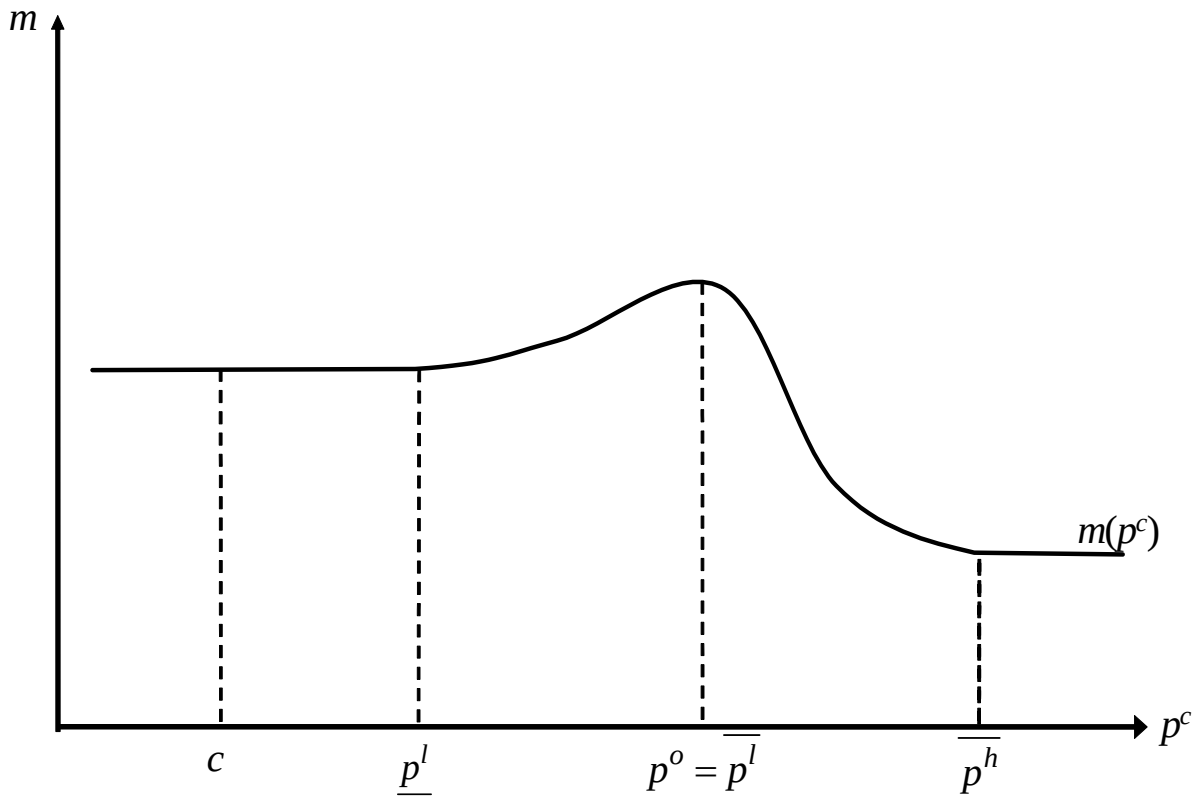

Figure 1: The short run number of low-type artists.

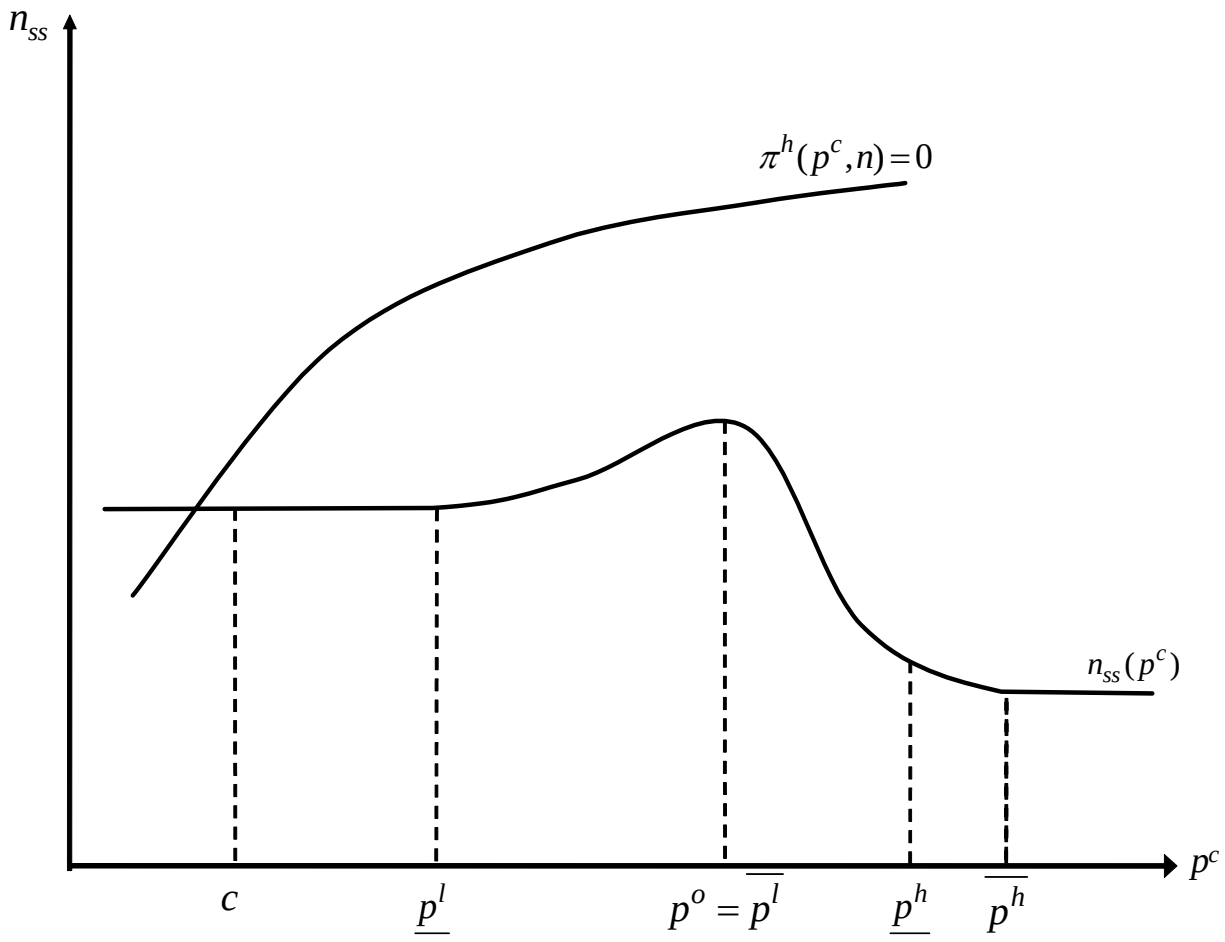

Figure 2: The long run number of high-type artists.