

# A Model of a Policy Blunder: Mandatory Copy Protection

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In the environment commonly used to justify the downstream licensing protections in intellectual property law we argue that mandating copy protection is not merely inefficient, but, because the potential losses are unbounded with respect to the possible benefits, it represent a gross policy failure – a policy blunder.

We consider the stark model commonly used in economic theory in which there is a fixed cost that that must be recovered, and the marginal cost of production is zero. Demand is perfectly elastic up to an upper bound. Consequently there is no cost of monopoly, and this is the ideal economic environment in which to impose downstream licensing restrictions.

Specifically, we consider a monopolist who can produce up to  $N$  different “songs.” Each song requires a fixed cost of  $F$  to produce. There are  $H$  different types of consumer: at a price of one or less consumer  $h$  demands  $d_n^h$  units of song  $n$  where  $d_n^{h+1} \leq d_n^h$  and  $d_{n+1}^h \leq d_n^h$ . At a price higher than one, demand is zero. Notice that we assume that higher number songs are not as good as lower number songs<sup>1</sup>, and that lower number consumers have a higher demand for songs. The latter just

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<sup>1</sup> The fact that higher numbered songs are not as good as lower numbered songs is the relevant assumption. We could have also assumed that the cost of producing higher numbered songs is larger than that of lower numbered songs. What is important is the difference between the value of the song and the cost of the song. It is convenient to number the songs so that the most valuable songs have the lowest numbers.

reflects the fact that some consumers like music more than other, and we have ordered them accordingly.

The equilibrium is simple enough: song  $n$  is worth  $D_n = \sum_h d_n^h$ . If  $D_n \geq F$  then the monopolist produces the song and sells it at a price of 1.

Now we will suppose that unless music is “copy protected” it can be redistributed costlessly by consumers and therefore trades at a price of zero. Without copy protection, no music is produced. Copy protection is of the voluntary sort: music can be encrypted, and encrypted music can be played only if it was purchased directly from the monopolist, and only if the consumer owns a decryption device. We assume that the purchase of a decryption device costs  $C$ . This may include the actual cost of the device, as well as collateral damage, such as the destruction of valuable business records, loss of privacy, or other problems with a computer that does not operate properly. Without loss of generality, we assume the decryption device is specialized, and can be used only to decrypt and listen to the music sold by the monopolist.

First consider the social optimum subject to the constraint that any consumer that consumes music must own a decryption device. Because higher numbered songs are not as good as lower numbered songs, we can let  $\hat{n}$  be the highest numbered song it is desirable to produce. The social surplus for consumer  $h$  to purchasing music is just

$$S^h(\hat{n}) = \sum_{n \leq \hat{n}} d_n^h - C;$$

if music is not purchased the social surplus is zero. Since lower numbered consumer like music more, we can define  $h(\hat{n})$  to be the highest numbered consumer for whom this surplus is non-negative. Total social surplus is just

$$S(\hat{n}) = \sum_{h \leq \hat{n}} S^h(\hat{n}).$$

Then we find the social optimum simply by choosing  $\hat{n}$  to maximize  $S(\hat{n}) - F\hat{n}$ .

The central point, is that the private market has no problem implementing this solution. Because consumers differ in their demand for music, but face the same cost of the encryption device, it is effective to price discriminate charging less money for the first units of music. In other words, a consumer who purchases  $d^h$  units of music of all types is charged  $d^h - C$ . This means that the monopolist fully appropriates the entire social surplus from the sale of music, and therefore chooses to produce the “socially correct” quality of music,  $\hat{n}$ .

By way of contrast, suppose that a law is passed that requires a consumer to own an encryption device<sup>2</sup>. Then consumers can be charged  $d^h$  for music because he must own the device in any case, and if we define

$$D(\tilde{n}) = \sum_{n \leq \tilde{n}} D_n$$

the monopolist maximizes  $D(\tilde{n}) - F(\tilde{n})$ . Since  $D(\tilde{n}) > S(\hat{n})$  ( $S$  includes the cost of the device,  $D$  does not), we will generally find that  $\tilde{n} > \hat{n}$ , that is the monopolist overproduces songs. Notice that the monopolist strictly prefers the device to be mandatory: when the device is voluntary, the

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<sup>2</sup> Implicitly we are assuming that the encryption device applies to a general purpose device such as the computer, which is sufficiently valuable that the consumer will buy it regardless of the cost of adding encryption, and that insofar as the cost of encryption is the increased failure of the general purpose computing device, this is not so great that the consumer chooses not to buy the computer at all. In the case of a special purpose device - one that can only play music - the mandatory scheme has some similarity to the market scheme in that the consumer need not purchase the device at all when the cost (direct and indirect) is higher than the private value of listening to music.

monopoly profits are reduced by the cost of the device. However: the cost of the device is part of the social cost of producing music. By assumption, without the device the music will not be produced. Hence, by making the purchase of the device mandatory, we actually subsidize the monopolist by taxing the consumers. The latter must pay  $C$ , which covers the cost of the device, and still pay the monopolist the full value of the music they then purchase. The mandatory device results in a transfer to the monopolist from the consumers. This is the redistributive effect. This redistribution, by altering the price at which the monopolist can sell the music, also induces an economic inefficiency: music is now “overpriced” and the monopolist has an incentive for overproducing it.

Overproducing a few songs and over rewarding a monopolist by subsidizing the cost of the device may seem like a small matter. However the social cost of mandating the device is not merely the fact that too many songs are produced. More seriously, consumers for whom it is not socially optimal to purchase the device are forced to bear the cost of the device. In particular, the social cost is at least  $(\tilde{n} - \hat{n})C$ . Notice that  $\tilde{n} - \hat{n}$  may be very large: in the case of mandating protection for general purpose computing devices, we would think of this as including the entire business market for computers. By way of contrast, the social benefit of music is  $S(\hat{n}) - F(\hat{n})$ . When  $C$  is very large, this social benefit is quite small. In any case it is a finite number. However, there is no bound on the social cost of mandating the device - as  $\tilde{n} > \hat{n}$ , the social cost of mandating may become infinite as  $C$  grows. The value of  $C$  may grow because of the side effects that installing such a device may have on tools that, such as PCs, have socially valuable uses other than listening to the music. Clearly this has a positive probability.

We would describe a policy where the potential social cost can be unbounded with respect to the social benefit as a *policy blunder* as

opposed to merely being an inefficient policy. We think that, in the face of uncertainty, it is important that the potential losses from being wrong bear some sensible relationship to the potential gains from being right. Threatening the entire computing industry to possibly protect digital music and movies cannot be a good idea. It is, as we said, a policy blunder.