# The Economics of Art Thefts: Too Much Screaming over Munch's *The Scream*?*

Antonio Nicita[1] and Matteo Rizzolli[2]

The theft of Munch's *The Scream* in 2004 fired up a debate over museums' protection policies because of the low level of security and the lack of any insurance against theft. In this paper we provide a rationale for the choices made by the Munch's museum. More generally, we show how diverting expenses in security and insurance to investments over the notoriousness of their collections reinforces the protection of Museums' properties. This is because of two counter-intuitive effects: (1) investments in precautions, while reducing thieves' profits, may adversely attract them towards works of art of higher value; (2) insurance may actually increase the incentive to steal works of art for the purpose of ransom.

Keywords: theft, protection, cultural economics, law and economics.

## 1. Introduction and Aim of the Paper

On 22 August 2004, Edvard Munch's famed *The Scream* was stolen from a museum in Oslo. Armed thieves forced their way into the museum in the morning of a visiting day and abruptly removed the painting while brandishing weapons. With this theft in mind we will try in the following pages to frame the art crime business into an economic analysis which looks at the incentives that move thieves, art owners and museums as well as at the strategic interactions among these players. As we will see, the heist of *The Scream* has been paradigmatic in many respects, and the fact that it caused much eyebrow-raising in the press has actually led us to try to understand the dynamics of a market which is as much big and relevant as it has been poorly explored in the literature. The public debate that followed the theft insisted on mainly two points: the first one concerned the negligible level of precautions in terms of monitoring and security in place at the museum; the second one regarded the fact that the painting was uninsured. We will show that this can be explained once one considers a number of drawbacks that characterise precautions and insurance.

Indeed, it is not granted that more precaution discourages thieves from committing the crime. In fact, even if, on the one hand, investments in precautions increase the efforts that thieves have to put into stealing, on the other hand, they actually act as a signal of overwhelming rewards for thieves from theft: the more elaborate the precautions are, the higher is the expected reward (Shavell, 1991). It emerges that increasing observable precautions may encourage rather than

reduce incentives to steal, for any given probability of being detected. A weaker deterrence effect is here coupled with increasing dissipation of protection costs.

Similarly, investments in insurance offer higher incentives to steal for the purpose of ransom, as the insurance company may be tempted to buy back the piece from the thieves, as long as the cost of ransom is lower than the cost of liquidating the insured price. This is exactly what happened in the 1993 theft of another version of *The Scream* from the National Art museum in Oslo. In that case thieves demanded $1m for the painting.[3]

Building on these two observations, we conclude that the behaviour of the Munch's museum may have neither been irrational nor hazardous. Instead it might be optimal to divert expenses both from private observable precautions and from insurance of works of art, especially masterpieces, to invest in the notoriousness of their paintings. This investment may take the form of public exposi-tions in museums and exhibitions as well as the listing in registries of artworks, catalogues and data-bases. In fact we argue that any increase in the famousness of the painting has the effect of hindering thieves from stealing it (if thieves' intention is to resell it on the black market).

We build a model where the degree of famousness of the painting on the licit market adversely affects its second-best value – once stolen – on the black market and thus its value for the thief. This is because masterpieces are very difficult to be turned into cash as well-publicised loots are funda-mentally impossible to sell on the legal market, as major reputable houses and galleries demand proof of art ownership before listing them and, we will see, they are hard to sell also on the black market. Moreover, attention of the media which is likely to follow the theft further augments the hardness of selling off what has been stolen. We thus argue that besides investing in precautions and/or in insurance, owners of valuable works of art may have another option: that of investing in famousness and thus in reduction in the post-theft value of the stolen asset. When the post-theft value of a painting is significantly reduced, thieves may anticipate that expected gains from theft will dramatically decline and thus divert their attentions to assets characterised by a market value uncorrelated with theft.[4] Moreover, we suggest that in the case of works of art, the option of reduc-ing their post-theft value is embedded in museums' policy and mission to disseminate the knowl-edge about the pieces of art in the collection. The suggestion is that by spreading the knowledge of the characteristics of the assets owned to a wide audience, owners increase the famousness of their property and thus reduce thieves' ability to resell the stolen assets. Moreover, when owners are museums, this strategy also turns to be efficient. Museums generally do not incur in any extra cost for accomplishing a policy that stands in their own mission: that of giving public exposure of their assets. In order to be effective the above strategy should be coupled with the decision not to insure their property. Thus, a credible reduction in post-theft value of a stolen asset should be accompanied with a policy of not insuring masterpieces. The above reasoning, we conclude, provides a rationale for the apparently irrational and foolish strategy followed by the Oslo Munch museum.

## 2. Art Crime and its Study

Crimes related to artworks can be of various kinds. Forgery and fraud, theft and extortion, looting and trafficking across international boundaries, money laundering, and document and identity fraud as well as vandalism are at stake when crime meets art. It is difficult, however, to compute the magnitude of the problem. Crimes related to art are difficult to track because of a number of problems, including severe lack of statistical data. Only few countries devote special police forces to track and deter this particular kind of crime and there is no up-to-date attempt of deducting such estimates from international databases such as the *Art Loss Register*, the one run by the *Inter-national Foundation for Art Research* and those run by police agencies such as the FBI and the Italian

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[3]The authorities never paid that amount, but starting negotiations helped them to recover the work and to arrest the thieves.

[4]This fact can be exploited by owners. For instance, stolen mobile phones can be put on a black list by communicating the IMEI code to the competent authorities. These phones can no longer access the national lines and lose much of their value. Sure they can still be hacked or exported abroad.

authorities. A twenty-year-old work by Lawrence *et al.* (1988) estimated the value of stolen art to be in the range of $50m to $4bn a year. Other institutions such as the *Association for Research into Crimes against Art* claims that art crimes are the third largest source of criminal revenues worldwide, following drugs and arms trafficking and that such crimes generate $2–6bn per year (ARCA, 2010). This upper bound is confirmed by Atwood (2006) who, however, widens the estimation to between $300m to $6bn a year. However, as Naylor (2008) points out, *what really makes art (and other collectibles) different from most businesses, legal and illegal alike, is that the principal commodity lacks any kind of objective reference price* and this makes all of such estimates closer to sensationalist journalism than to sober academic research. In fact, the lack of in-depth research on the matter is remarkable. Art and cultural property crimes are an interdisciplinary subject that spans disciplines such as art history (Houpt, 2006), criminology (Mackenzie *et al.*, 2005; Atwood, 2006), sociology and organisational studies (Lane *et al.*, 2008; Naylor, 2008) as well as legal studies (Del Piano, 1993; Bibas, 1994; Rhodes, 2006). Also, economics plays a part, especially under the quantitative profile. Earlier studies tried to quantify the volume of different art crimes (Pearson, 1986; Lawrence *et al.*, 1988) and more recent ones use advanced econometric techniques to quantify the international trade in stolen arts (Fisman and Wei, 2009). To our knowledge, however, there is no law and economics paper dealing with art crimes.

Sure, law and economics provides a robust general theory of crime deterrence (see Polinsky and Shavell, 2008, for the last major survey on the subject) that, building on the work of Becker (1968), provides a framework to understand some general aspects of the behaviour of would-be criminals such as potential art thieves. In particular, it is arguable that thieves are no-less-than-other-criminals sensitive to the Beckerian variables that are: (1) the magnitude of the sanction and (2) the probability of detection. Rational thieves of works of art measure the severity of the *expected sanction* against the potential *gains from crime* and decide to commit the crime if there is a net expected gain.[5] In the paper we focus on a specific crime: the theft of masterpieces. While we stick to the general framework of optimal deterrence for what concerns the left-hand side of the equation – the *expected sanction* for theft – we elaborate on the right-hand side of it – the *gains from theft* – and we argue that these gains crucially (but not straightforwardly) depend on how famous the stolen masterpiece is.[6] The intuition that there is no linear relation between the value of the masterpiece and its selling price as loot is the key to our work. From this point, we derive some important and counter-intuitive policy implications concerning the insurance of masterpieces and the role that museums play in deterring art crimes as well. To be clear, however, in this paper insurance and museums are modelled in a very stylised way, and sure the model does not capture many other aspects that are involved in the insurance of high-value goods or in the economics of museums.[7]

The present paper proceeds as follows: in the next section we explore the main features of a black market for works of art, how the first and second-best values are related via famousness, and the profit function of thieves. In Section 4, we show the options available to owners to secure their properties. We will oppose investments in precaution to investment in famousness and show how these are superior especially for museums. In Section 5, we further demonstrate the countervailing effect of insurance in increasing incentives to steal and conversely the deterrence effect of not insuring. In Section 6, we draw the main conclusions.

## 3. Framing the Thieves: A Model of the Black Market for Paintings

The case of Munch's *The Scream* is only the last of a series of thefts of famous masterpieces. Famous art heists are puzzling for a number of reasons. Stolen masterpieces are exceptionally *hot goods*;

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[5]Of course, also all the standard extensions of the model in terms of risk aversion, marginal deterrence, judgment proofness, non-monetary sanctions, and so on apply to this case. See Garoupa (1997) for another survey.

[6]The standard theory of optimal deterrence makes the gains from crime depending only on the ability of the criminal.

[7]For a comprehensive survey on the economics of museums, see Frey and Meier (2006). Interestingly in the whole paper the word crime or theft is never mentioned.

they are very difficult to place even in the black market (Heilbrun and Gray, 2001). Sooner or later, these hot goods come back to the public attention and the unlawful appropriation must be cleared.[8] So, why should one be willing to steal a piece of art that cannot be shown or sold to anybody else? As Mackenzie *et al.* (2005) we distinguish between *art-motivated* and *profit-driven* thieves.

*Art-motivated thieves.* Certainly there can be individuals who derive a personal and hidden satisfaction from anonymous possession of a masterpiece. Maniac collectors may commission the theft to professional thieves knowing that they may not be able to share the pleasure of admiring such works of arts with anybody. Conklin (1994) provide some examples such as Etoh Mvondo who stole three paintings from different Paris museums in the late 1980s because he was ''fascinated by the idea of owning a Renoir at the age of twenty'' and Dr Frank Waxman who again in the 1970s stole 170 artworks from galleries in several major US cities with no evidence that he had tried to sell any of the pieces.

Not surprisingly, few examples of this type of thief involve criminals who already have to hide and conduct very segregated lives. Shuinichi Fujikuma, a known Japanese gangster of the 1980s had been behind the Marmottan heist of nine paintings, including Renoir's *Bathers* and Monet's *Impression, Soleil Levant* in Paris in November 1985 (Forbes, 2008).[9] The Italian mafia is allegedly behind the theft of Caravaggio's *Nativity with Saints Francis and Lawrence*, stolen in Palermo in 1969. According to few *pentiti*, the painting was put on view as a trophy at meetings of the top bosses of Cosa Nostra.[10] We may also mention the fictional character of James Bond's villain Dr No who, in the first movie in the series, displayed Goya's portrait of the Duke of Wellington in his lair.[11]

All these heists have in common the fact that the motivation of the thief (or of its commissioner) was the intimate and lonely pleasure of enjoying the masterpiece. We concede that our economic model does not add much to explain and predict the behaviour of such thieves other than offering the standard law and economics finding that, the more one increases the probability of detecting the crime or the harsher the punishment, the more the individuals may be deterred from committing the crime. Their gains from committing the crime are idiosyncratic as they depend only upon the ''solo pleasure'' of enjoying alone the stolen work of art.

*Thieves for profit.* From now on, we will concentrate on the thieves who are driven by some profit-maximising goals. Take, for instance, the famous heist of the *Da Vinci's Mona Lisa* in 1911. Three men, one of whom had worked in the Louvre, entered the museum on Sunday, knowing that the museum was closed on Monday. They hid in a closet, and the next day came out wearing white smocks, which was effectively their identification as workers there. They took the Mona Lisa off the wall (despite it weighing 250 lbs with its glass cover), removed it from its frame, hid it under a smock, and walked out. After theft the painting was missing for two years. The person

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[8]Notice that paintings and other masterpieces are not replaceable or modifiable in any form in the way that other very valuable items – for instance diamonds and jewels – are. Their value depends exactly upon their possibility of being distinguished for what they represent and any disguise destroys their value.

[9]The paintings were recovered in 1991 in Corsica. They had been too hot even to move to Japan which notoriously has a short statute of limitations on stolen art.

[10]The fate of the Caravaggio Nativity is still unknown. Apparently, it was stolen by Francesco Marino Mannoia who confessed he had used a razor blade to remove it from its frame and had taken it to an unnamed commissioner who later refused to buy it because the painting had been damaged during transport. Several *pentiti*, however, agree on the fact that, at an earlier point, the mafia has tried to place the painting on the market but without success because the painting was simply too hot. In 2009, the turncoat Gaspare Spatuzza told investigators that in 1999 he learnt that the Caravaggio had been hidden at some point in the 1980s in a barn where it was ''ruined, eaten by rats and hogs, and therefore burned''.

[11]The true motivation of the theft of the Goya portrait is different. It was actually stolen by Kempton Bunton, a retired bus driver who, in 1961 was outraged by the decision of the UK government to pay a huge sum of money to keep the painting on British soil and prevent Charles Wrightsman, a rich American art collector, to bring the painting to the USA. After offering to return the painting asking for a donation of £140,000 to charity to allow the poor to pay for TV licences and an amnesty for the thief, in 1965 Bunton returned the painting voluntarily. Later on he also surrendered to the police, who initially discounted him as a suspect, considering the unlikeliness of a sixty-one-year-old retiree executing the heist.

behind the theft was the Marquis de Valfierno, who did not really want to keep the painting, but rather the possibility of selling six forged copies of it. Thus, the motivation for theft was, rather than selling the original stolen work, to create several copies and sell them to uninformed customers. The painting was ultimately recovered and the thieves arrested.

Another *for-profit* motivation for the theft of masterpieces derives from the possibility for thieves to earn money from ransom. After the theft, the legal owner (in this case the insurance company) is often willing to pay a substantial amount to recover the masterpiece. In the next section, we try to build demand and supply curves for paintings in the legal and black markets, and we will see what changes when thieves have ransom as an option (this case will be explicitly analysed in Section 5).

### 3.1 Depicting the Market for Masterpieces

Let us first assume that it is possible to define distinct categories of paintings according to their *famousness* and *scarcity*. We assume also that it is possible to order these categories according to their market value[12] and that there exists a continuous distribution function of "types" of paintings over their market value which increases exponentially as $p_{\mathrm{m}}$, the market price, approaches zero (a Pareto distribution, for instance). We set at the two extremes (with zero price $p_{\mathrm{m}} = 0$ and $p_{\mathrm{m}} = p_{\mathrm{m}}^{\mathrm{max}}$), respectively, the type of painting with no market value and the type of painting which genuinely is a masterpiece. On the horizontal axis, we provide the market price at which each type of painting is sold or acquired. Thus, for every type of painting the value $p_{\mathrm{m}}$ is the first-best value of the painting, determined by the demand and supply conditions present on the licit market for paintings. Along with its market value also usually goes the fame of the painting.

In the case of masterpieces, the market value largely reflects the fame of the painting as well as its intrinsic artistic qualities, which are certainly not of concern here. The more valuable the painting, the more famous and well known it is.[13] We can thus think of an *index of famousness* in terms of the percentage of people who know or have previously seen or heard of a specific painting. Thus, famousness can range from zero (no one knows the painting) to one (everybody knows it). The function famousness ($F$) increases exponentially along with the market value due to network information effects and high exposure to the public attention of highly valuable works of art. Thus, $F'$, $F'' > 0$. In other words, we could argue that while Munch's *The Scream* or Leonardo's *Gioconda* painting are known by a large number of individuals, if not virtually everybody, other paintings of – let us say – half the market value $p_{\mathrm{m}}$ of the two cited above are known by far fewer than half the number of individuals who know *The Scream* or *La Gioconda*. This relationship between market value and famousness holds in the legal market for paintings and artworks. On the black side of the market, famousness has its drawbacks.

Famous paintings are *hot goods*, and it is arguable that the black market price ($p_{\mathrm{bm}}$) that a potential thief manages to obtain for a specific stolen painting will be somewhat below $p_{\mathrm{m}}$ for a variety of reasons related to the unlawful title of possession of the painting.[14] The higher the degree of famousness, the more likely it will be detected once stolen, and the less likely the thief will manage to sell the painting. We can define the resaleability function as

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[12] The market value of the painting has here to be thought of as the first-best value of the work or, in other words, as the gross value set by a volunteer Walrasian auctioneer in a competitive market.

[13] Certainly, we could think that also as the inverse causal relation – the more famous the more valuable – holds true. For the sake of simplicity, we here consider the licit market price as being the independent variable.

[14] There are a number of reasons one can think of in support of this statement. First of all, a stolen piece of art inevitably carries with it the risk of being recognised and detected as a stolen good. The more famous the painting, the higher the risk. The risk of being caught and convicted, or at least the risk of suffering the social blame of being connected with the theft, will decrease the black market value of the stolen painting compared with its licit market value. Moreover, beyond the risk discount factor, it could be argued that owning a stolen painting does not deliver the same pleasure as when it is possessed rightfully. In fact an individual or an institution owns pieces of art partly to share its enjoyment with others. Conversely, the view of a stolen painting can hardly be shared with others and this may decrease the utility of its enjoyment and thus its value.
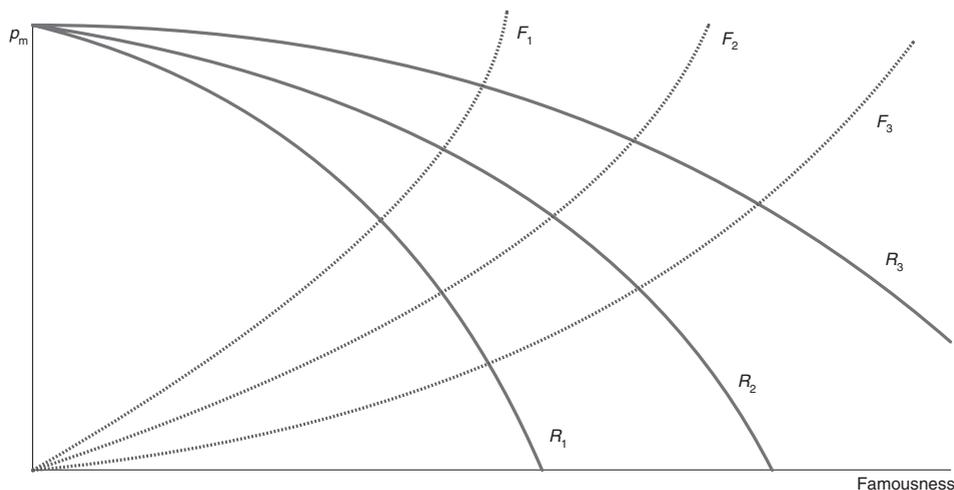
**Figure 1.** $f = F(p_m)$ and $r = R(p_m)$ family functions with $p_m$ defined in $[0, p_m^{max}]$. R, F $\exists$ [0, 1]

$$R(p_m) \equiv 1 - F, \quad \text{with } R', R'' < 0 \text{ and } R \in [0, 1]. \tag{1}$$

When a painting is fully resaleable, the thief can recoup all the first-best value of the painting by selling it (even on the black market). Conversely, when $R$ is equal to zero the thief cannot sell the masterpiece at any rate even on the black market. In other words, when the painting has little value, and $p_m$ is close to zero, the resaleability of the painting is 1. When the painting has great value, its resaleability quickly approaches zero, as the high risk of being caught and the limited use that can be made of the stolen painting will claim a huge discount of $p_{bm}$ over $p_m$.

Given the network effect of famousness, the relative decline of $p_{bm}$ over $p_m$ sharpens with the value of the painting. Of course, the famousness, and thus resaleability, of a specific painting can change over time due to investments made in advertising it or rather depending on the public exposure of the work. This is why in Figure 1 we have acknowledged the existence of a $kF$ and $kR$ family of curves where the parameter $k$ can be affected by an increase in investments made by owners of each type of painting in famousness or changes in knowledge by the public (for instance, the news of a theft increases the fame of the work and thus shifts upward the degree of famousness associated with that type of painting).

Let us assume that, once the thief has stolen a painting, he tries to resell it on the black market. We assume here that his utility is a linear function of the money he can make out of the painting. However, the value he will benefit from will critically depend upon the resaleability of the painting he has gained control of. On the one hand, low-value paintings will still be worth a pittance once stolen; on the other hand, high-value masterpieces will be hardly resaleable. We are now ready to depict the function of the black market price for paintings. Define $p_{bm}$ as the first-best value of the work of art weighted by its degree of resaleability:

$$p_{bm}(p_m) \equiv R p_m, \quad \text{with } \frac{dp_{bm}}{dp_m} > 0, \frac{d^2 p_{bm}}{dp_m} < 0 \text{ and } p_m^* = \text{argmax}(p_{bm}). \tag{2}$$

The function is shaped as in Figure 2, where the function of black market value of paintings $p_{bm}$ is represented. On the horizontal axis, there is the first-best value of the painting. On the vertical axis, there is the dollar gain for the thief of stealing.
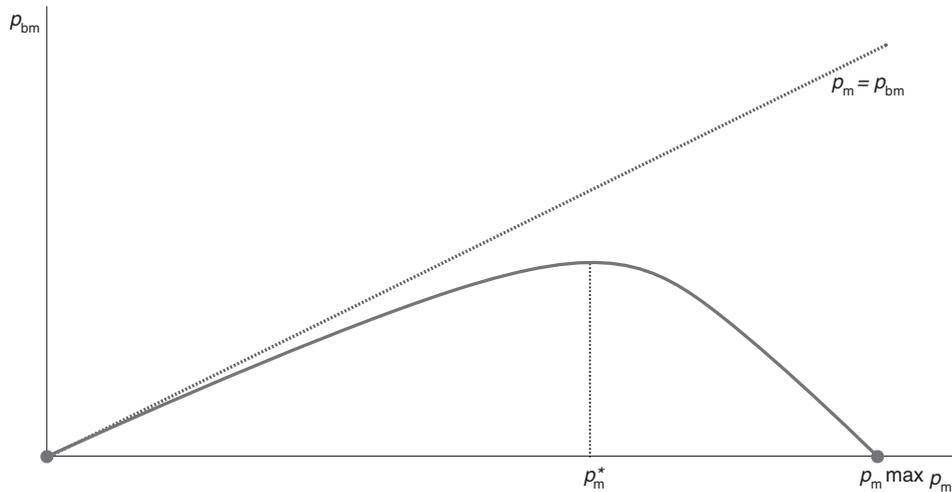
**Figure 2.** *The function of black market value of paintings $p_{bm}$*

Given the function $p_{bm}$, low levels for $p_{bm}$ coincide with low values of $p_m$: trivial paintings, that even we could paint, have a very high resaleability, but they nevertheless have little value for the thief too. When $p_m$ rises, $p_{bm}$ follows accordingly. There is a range of intermediate values of $p_{bm}$ which outline paintings of positive value but not very much known, for which $p_{bm}$, although less than $p_m$, is very significant and will command the majority of the thefts. Where the $p_{bm}$ slope turns downwards, the corresponding area includes very famous paintings, for which the thief may not be able to extract a good resale price due to the risks and the limited utility the potential owner may have from the stolen painting.

### 3.2. The Thief Objective Function

We assume that thieves are individuals who invest their effort in taking the paintings from their legitimate owners and profit from reselling the painting on the black market. We assume thieves' utility to be a (linear) function of the price they manage to negotiate on the black market:

$$u = U_T(p_{bm}) \tag{3}$$

We assume that the thief invests an amount $e \in [0,1]$ of effort in the theft, and this effort translates into the probability of a successful robbery. Effort is costly and these costs are given by $C(e)$ where $C' > 0$ and $C'' > 0$. Suppose the thief observes the value $p_m$ of his target and decides the amount of effort to invest accordingly:

$$\max_e(\pi_T) = ep_{bm} - C(e) \tag{4}$$

The optimal level of effort $e*$ is given by the argmax of Equation 4, which is obtained for

$$p_{bm} \equiv C'(e*) \tag{5}$$

From the above, we can infer that a thief is better off by stealing mid-range value works *vis-à-vis* high valuable pieces of arts. Moreover, he will invest more effort and therefore will be more successful in this range of values. The course of the fame induces the thief to prefer less famous and easier-to-sell paintings. In Figure 3, the cost function for the thief is measured over the value of the paintings to be stolen. On the horizontal axis, there is the first-best value of the painting.
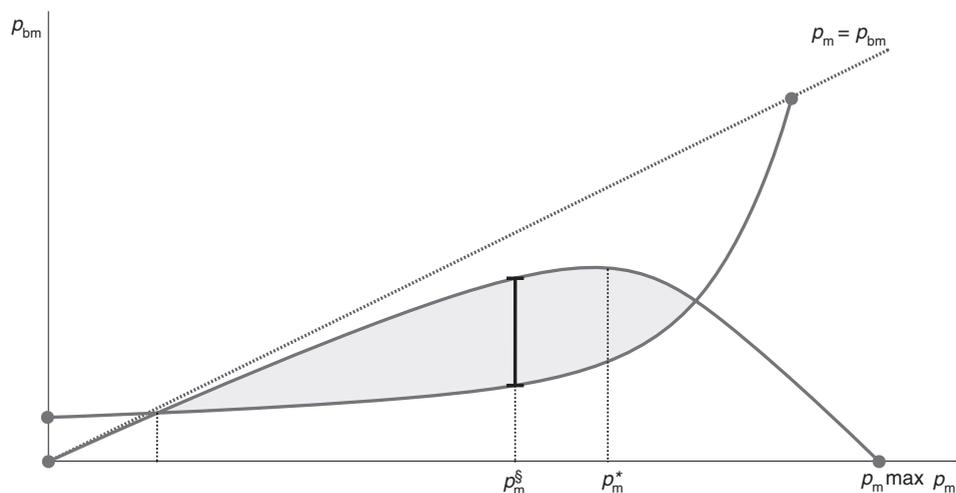
**Figure 3.** *The profit function of the thief*

On the vertical axis, there are the thief's dollar costs of gaining possession of it. The function $p_m^\S$, which is lower than $p_m^*$.

## 4. The Owner's Dilemma

Owners of valuable works of art are exposed to crime and thus take measures against theft (Throsby, 1994). To be sure, in a world where property rights were fully enforced, there would be no reason to undertake private measures against theft. Conversely, extra costs sustained to enforce owners' property rights represent a dead loss for society and they decrease the first-best value of the property to its owner (Allen, 2002).[15] We assume that owners of works of art can make substantially three different choices in order to protect their property: (1) the first one concerns a typical investment in precaution, which increases the *ex ante* costs of the theft, (2) the second one may take the form of an investment in reducing the *ex post* value of the work of art stolen and (3) the third one considers insurance and it is discussed in Section 5.

### 4.1 Raising Thieves' *Ex ante* Costs of Stealing

The owner's investment in precautions may take the form of iron bars, safes, electronic control equipment and the like.[16] All these devices are aimed at deterring the thieves' action by increasing their *ex ante* costs $C(e)$ up to $C_O$ where $C_O$ are the costs that dissipate all the profits of the theft and thus the owner should spend an amount aimed at reducing thieves' profit $\pi_T$ to zero.

However, with asymmetric information on the value of the assets to be stolen, any increase in precaution expenses by an owner may have a perverse effect of signalling to thieves. The higher the level of precautions, the higher is the expected value for thieves of the assets to be stolen. Thus, precautions, while increasing the costs for thieves, may also increase the probability of theft.

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[15]From an efficiency point of view, some authors have questioned whether a theft is *per se* an inefficient outcome (Shavell, 1991). We believe that a theft is always socially inefficient unless a price is paid to the original owner equal to his opportunity cost to alienate the good, that is to say, unless a liability rule is enforced. And still, this may be suboptimal for a number of reasons including the endowment effect (Kahneman and Tversky, 1984), the possibility of undermining *ex ante* commitment and trust that drives investment and the limited substitutability of unique goods such as the works of art (Ayres and Talley, 1995).

[16]We assume that these are all observable precautions (see Shavell, 1991).
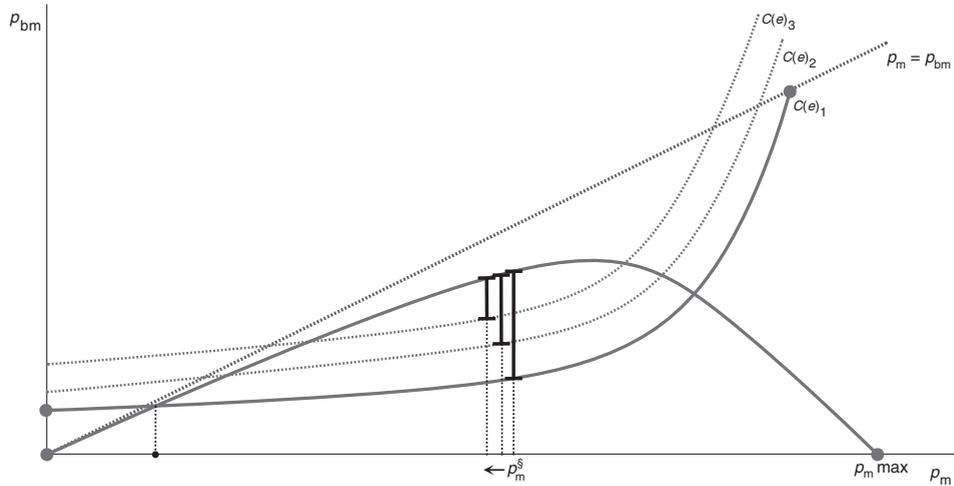
**Figure 4.** *Change in thief's profit as a consequence of the upward shift of costs due to owners' investments in precaution*

Moreover, as Shavell (1991) emphasised, if the individual owner raises his prevention costs individually, the thief will probably look for different $p_m$ paintings in the neighbourhood of $p_m$ (diversion effect), which guarantees lower costs of effort, more profits and a higher probability of success. Individually, then, the owner may have achieved his goal by shifting the "attention" of the thief to the next owner. However, if all owners raise their prevention levels simultaneously, things look different and the sum of individual efforts will simply increase the average costs of stealing without any diversion effect. As a consequence, raising *ex ante* thieves' costs might result in individual and social dissipation without any significant effect on deterrence (Figure 4).

### 4.2 Raising Thieves' *Ex post* Costs of Resale Above the Black Market Value

There is another way for the owner to protect his property. He can decrease the post-theft value of stolen assets $p_{bm}$ in such a way that the thief will have more trouble in selling the painting on the black market. How can the owner achieve this? We have shown above that $p_{bm}$ critically depends upon the resaleability of the paintings. In Figure 1, the family of curves $R$ are affected by the parameter $k$, which we assume is within the control of the owner of the work of art. By investing in the degree of famousness of his property, the owner affects the degree of resaleability of those assets on the black market and that will decrease their second-best value for the thief. In terms of the profit function of the thief this could be represented by the following:

$$\max_e(\pi_T) = \alpha[ep_{bm} - C(e)] \tag{6}$$

where $\alpha \in (0,1)$ is a measure of the impact of owners' investment in decreasing thieves' ability to resell. The new profit function is maximised by

$$e^{**} = \operatorname{argmax}\{\alpha[ep_{bm} - C(e)]\} \tag{7}$$

which is resolved for $p_{bm} \equiv C^*(e^{**})/\alpha$. This means that thieves will under-invest in efforts to steal, as $e^{**} < e^*$, which in turn implies a lower probability of making a successful theft.

Again, if only the owner of a given work of art of value $p_m$ invests in famousness, then the thief simply tries to steal a work of art $p_m$ in the neighbourhood of $p_m$. The owner is individually better off; however, this has merely shifted the attention of the thief to other owners. However, if all
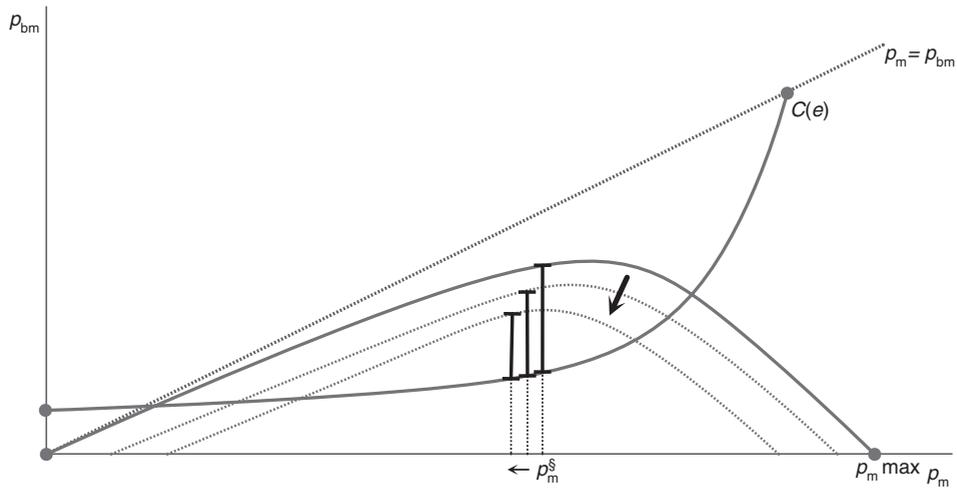
**Figure 5.** *An investment in famousness also causes a reduction in thief's profits*

owners invest in famousness, we can predict, along with decreasing profits, effort and probability of success, also a shift in focus of the thief towards paintings of lower value $p_m$. This is easily predictable by looking at the shape of the $p_{bm}$ family of curves. The owner has thus another way to enhance the protection of his property: he can discourage theft by affecting the second-best value of it to the thief. Investing in publicity, advertisement and public knowledge of the works of art achieves the same results as investing in precaution devices. The owner must evaluate the trade-offs between the *ex ante* investment in precaution or instead an *ex post* investment in lower resaleability; between securing the first-best value of its property or rather decreasing its second-best value. In Section 6, we will show how this trade-off is solved efficiently by museums owning masterpieces (Figure 5).

## 5. Why Not Simply Insure the Paintings?

The owner has another option besides the ones examined in previous sections. He may also insure the painting against theft. For the sake of simplicity, we assume here that such an insurance covers at least partly the value of the painting as determined by its market value $p_m$ but does not cover other damages derived by the theft such as revenue losses in the case of museums and exhibitions as well as property damages of any kind. The damages paid by the insurer to the owner will thus be $\mu p_m$ where $0 \le \mu \le 1$ and where $\mu$ is a function of the insurance premium agreed upon between the owner and the insurer. Let us suppose that the painting is insured for its entire value so that $\mu = 1$. Once stolen, the insurer needs either to pay damages or to try to recover the work of art. In other words, the insurer becomes a potential fence; arguably it becomes the best potential buyer on the black market. This is because it is willing to pay a sum quite close and possibly equal to $p_m$[17] and it has an amount of cash ready for that.[18]

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[17]The insurer may be indifferent between paying $p_m$ to the museum for the damages or $p_m$ to the thief in order to recover the painting. It is arguable that the insurer may seek a discount over $p_m$ in bargaining with the thief, leveraging on the limited outside options of the counterpart. For the sake of simplicity we here assume that the insurance will pay the thief an amount as close as possible to $p_m$.

[18]Dealing with the insurer guarantees for the thief the reliability of the source of cash as opposed to other counterparts on the black market as well as *vis-à-vis* the owners, who may not have cash available or simply may not be willing to buy back again the work of art they own.
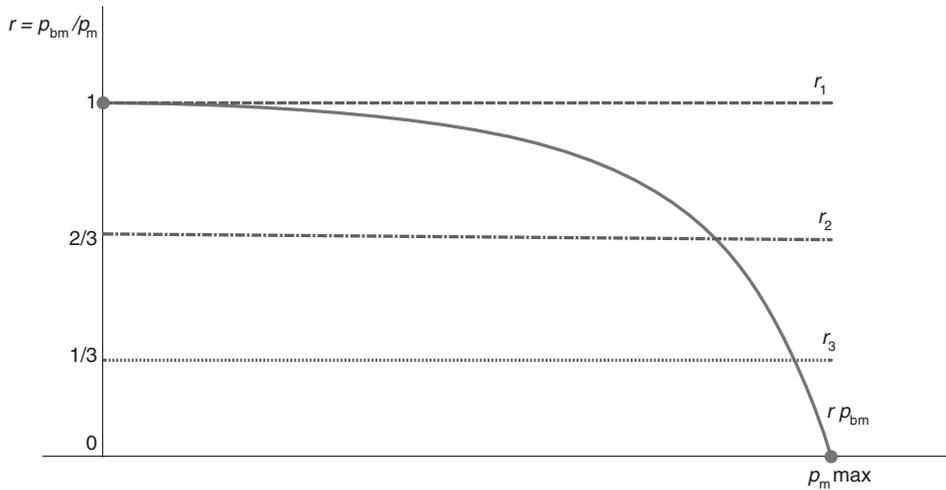
**Figure 6.** *The right-hand graph shows the resaleability measured as $p_{bm}$ over $p_m$ when the painting is insured and pays back $\mu p_m$ (with $\mu = 1, \frac{2}{3}, \frac{1}{3}$ respectively)*
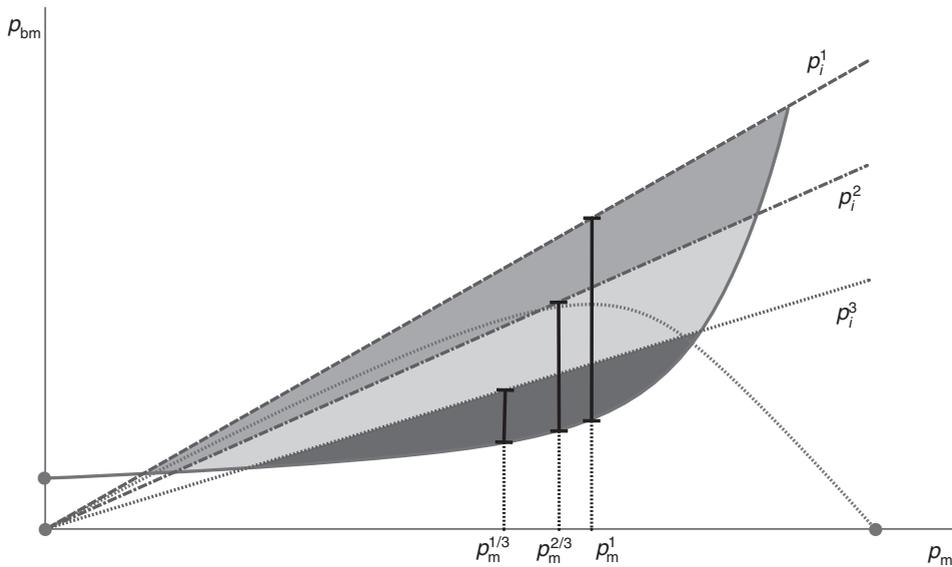


**Figure 7.** *Profit for thieves with insurance*

Figure 6 shows how the introduction of insurance changes the resaleability function $R$ previously illustrated. The function becomes flat as for every $p_m$ the insurer will be willing to pay an amount up to $\mu p_m$.

In Figure 7, three black-market-with-insurance ($p_i^1$, $p_i^2$ and $p_i^3$) functions are depicted according to different levels of $\mu$ and along with the cost function $C(p_m)$. In the diagram $C(p_m)$ and $p_{bm}$ are compared with the new functions $p_i$ (black-market-with-insurance) when insurance is in place

and $\mu$ is equal, respectively, to $1\,(p_i^1)$, $\frac{2}{3}\,(p_i^2)$ and $\frac{1}{3}\,(p_i^3)$. In the presence of an insurance which entirely covers the damages ($\mu = 1$), the price that maximises the thief's utility ($p_m^*$) goes up to $p_m^1$ thanks to the augmented resaleability of the stolen good. The profit functions $\pi p i$ are also depicted and correspond to the area between the cost and revenue functions.

Let us first see what happens when $\mu = 1$. The resaleability of the item is always equal to or higher than the resaleability of the same good without insurance (see Figure 6). The thief can thus extract more profits by blackmailing the insurer. Moreover, $p_m^{max}$ also shifts rightwards ($p_m^1 > p_m^*$), meaning that the presence of insurance induces the thief to target higher value paintings. We have here obtained one of the main results of this paper. Insuring against theft: (1) augments the expected profits for the thief and (2) increases the likelihood that the painting is stolen.

If $\mu < 1$, things get a little bit more complicated. Reselling to the insurer is more profitable than reselling to other fences only as long as max $P_i$ is at least equal to max $p_{bm}$. In other words, there exists a value $\mu$ of the function $\pi p_i\,(\mu, p_m)$ which sets max $P_i$ to be equal to max $p_{bm}$. With such a $\mu$ value insured, the thief is indifferent between stealing a painting of value $p_m^*$ and seeking fences on the black market, or stealing a painting of value $\hat{p}_m$ and seeking a ransom from the insurer. However, it is evident that the thief's indifference is not shared by society, which sees the theft of a painting of higher value ($\hat{p}_m > p_m^*$).

In accordance with our results, ransom for masterpieces increasingly becomes more difficult to raise as many masterpieces are nowadays uninsured – not only because the cost of insurance premiums would be in some cases prohibitive, but also to signal through a ''commitment'' effect the owners' unwillingness to pay to recover the stolen piece. In the UK, for instance, the famous and valuable works in the permanent collections of national institutions are not insured at all, such as those in the Tate and National Galleries (Youngs, 2004).

## 6. The Efficiency of Museums' Property and Policies for Masterpieces' Protection

Following a definition of the International Council of Museums, a museum is ''a non-profit making, permanent institution in the service of society and of its development, and open to the public, which acquires, conserves, researches, communicates and exhibits, for purposes of study, education and enjoyment, material evidence of people and their environment. (…)''. Thus, a museum property performs a function very distinct from private ownership: it communicates and exhibits evidentiary materials to a wide audience. With respect to our previous analysis, the museum is thus an owner whose mission is exactly that of investing in famousness, besides that of preserving masterpieces for the joy of humankind. Investments in famousness are a pervasive feature of museums and thus do not represent an extra cost of protection, as they would for private owners. In performing its mission, a museum is thus also reducing the costs of protection against theft for masterpieces, reducing the degree of resaleability by thieves and thus the post-theft value of stolen art.

In order for their properties to be efficient, museums should minimise to a given standard investment in precautions and specialise in investing in famousness shifting upward the curves as in Figure 3. Thus, we should expect higher investment in famousness coupled with lower investment in precautions, which is exactly what we observe in museums, and, specifically, at the Munch museum.

At the same time, a credible reduction in the post-theft value of a stolen asset should be accompanied with a policy of not insuring masterpieces of art, so as not to encourage any theft for ransom. Again, this is the behaviour followed by the Munch museum. This shows the efficiency of museums' choice not to invest in precautions over a minimum standard and/or not to insure masterpieces, while spending considerable effort in advertising the uniqueness of their assets (advertising which would be clearly increased in case of theft). Museums do emerge as institutions aimed not only at diffusing knowledge and art but also as institutions minimising transaction costs for protection of famous and unique goods or masterpieces. Of course, this is not without social cost. For any given population of thieves it will not reduce the total amount of stolen art; rather, it will divert thieves to more resaleable assets, according to the crowding-out effect induced by museum property in the black market for stolen masterpieces. This result is consistent with data.

The international police agency, Interpol, reports that the black market in art theft ranks fourth among international criminal businesses, after drugs and arms smuggling and money laundering, for a total amount of about $5bn per year, of which only 5 per cent are generally recovered. However, only 12 per cent of artworks are stolen from museums. In the case of the Munch museum, what we observed was in fact the lowest level of investment in both precautions and insurance. While public opinion has heavily condemned the director of the Munch museum for his apparently irrational protection policy, we argue that the policy followed by the management is fully rational as it minimises the private (and social) costs of protection for masterpieces. Thefts of well-known masterpieces are not evidence of the failure of a museum's ability to protect. On the opposite, the widespread attention raised after famous thefts, reducing the market value of the works stolen, may actually also reduce the probability of future thefts of masterpieces.

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