Three methodological errors in the economics of authors' rights and their consequences

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Abstract:

Using a realistic and holistic approach, this theoretic contribution corrects three main assumptions of the economic theory of copyright and explains why they hinder the proper understanding of its role. First, authors' pieces of work are like a public good that needs the protection of copyright to overcome the free rider problem. However, a piece of work can be spread only with a medium good or service. Such a pair might not possess the properties of a public good like non-excludability and nonrivalry. The second assumption that copyright enables authors to charge the price above marginal costs was rejected as too simplistic because the copyright affects different markets with pairs "a piece of wok + medium" variably and moreover, it ensures for authors a non-market revenue. The complexity of copyright also explains why the third assumption that copyright can be modelled as a single index is meaningless. A new framework for optimisation behaviour of authors is offered.

Keywords:

authors' rights, copyright, public good, markets for protected pieces of work

JEL Classification:

D230, Z110, O340

Introduction

The aim of this theoretical contribution is to identify the main methodological errors of the current economics of authors' rights and to reformulate the basis for the economic analysis of authors' rights using a holistic approach. The text brings a correction of the three methodological errors of the roots of economics of authors' rights and a setting of a new framework for the analysis of the process of the creation and dissemination of pieces of work, not only by authors but also by users, respecting the complexity of authors' rights.

This text is based on a wide range of literature[1] of economics of copyright as nowadays, the relevant literature is oriented mainly towards the Anglo-Saxon system of copyright and thus ignores its differences from the continental system of authors' rights. Both systems work currently almost identically, although the legal science distinguishes between the two of them. Each country might exhibit differences in the application of authors' rights or copyright as standardised by international treaties (eventually by EU law) and these differences are given by a specific historical development. This analysis is based on the Czech Act No. 121/2000 Coll. on Authors' Rights. As the principles for the functioning of authors' rights and copyright are close to each other, the presented results are valid for the environment of copyright as well. The literature devoted to the economics of copyright is sufficiently relevant also for studying the economics of authors' rights from the perspective of this text.

The literature serving as a starting point for most researchers neglects the complexity of the process of creation, dissemination and consumption of pieces of work and uses models with too unrealistic and restrictive assumptions. Using a holistic approach leads to a necessity to reformulate the following three assumptions:

1. Author's piece of work is a public good, and marginal costs for any additional copy are close to zero.

2. Authors' rights enable authors setting the price above the marginal cost and thus gaining revenue for recovering the cost of creation.

3. Protection of authors' rights can be aggregated into one index, and their duration is a representative measure of the strength of the protection.

The basic premises of the economic theory of copyright as summarised in three above mentioned methodological errors are used across relevant literature. The contributions of Plant (1934a, 1934b), Hurt (1966), Novos and Waldman (1984), Landes and Posner (1989), Besen and Raskind (1991), Boldrin and Levine (2002), Varian (2005), Posner (2005), Lunney (2012), Watt (2014) and Kinukawa (2016) have the same methodological basis for analysing the authors' rights: balancing the increment in costs and benefits[2] using the welfare economics so that the positive

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[1] See http://www.serci.org/rerci.html; http://www.copyrightevidence.org/ or Handke (2012).
[2] There is a basic precondition that the authors' rights are a key incentive for authors to create and thus it indirectly causes the increase in the utility from perceiving newly created works. The empirical and theoretical studies do not provide a clear answer to a question what is the mutual relationship of authors' rights and creation of new pieces of work (Towse, 2008, p. 251). The economists counted among costs of copyright the deadweight loss caused by the

externality generated by pieces of work would be internalised and the social welfare would be maximised. A critical approach of Austrian economic school stands against this utilitarian view. Austrian school perceives authors' rights as an artificial institutional setting that emerged due to the rent seeking process and that generates artificial scarcity (Šíma, 2005).

European system of authors' rights did not present itself as a mean for attaining the maximal social welfare. Its reasoning was always different, it should serve to protect the rights of an author as his natural claim for the product of his or her labour (Hurt, 1966, p. 421). The utility and cost of authors and utility and cost of users and consumers is not possible to easily find out, measure, aggregate and mutually compare. The cash flows generated due to authors' rights are given arbitrarily, hence, because of the information asymmetry, they cannot reflect individual cost and utility. Searching for the optimal setting of authors' rights using economic theory of welfare is inherently impossible, therefore, this text strictly uses methodological subjectivism and individualism.

1. Author's piece of work is a public good, and marginal costs for any additional copy are close to zero

The literature assumes that a piece of author´s work is a very specific good. Its nonrivalry and non-excludability lead to its classification as a public good and serves as a justification of authors' rights as a mechanism for securing the provision of a public good that overcomes the free-rider problem.

The attempts to modify the perception of pieces of work like a public good brought Yoo (2007), Conley and Yoo (2009), and Lunney (2009). Yoo (2007) and Conley and Yoo (2009) consider the optimal provision of a piece of work as a public good concentrating on its key characteristic: indivisibility (stressed also by Samuelson, 1954). According to them, each consumer demands not a specific quantity (a specific number of units) of a public good, but the public good as a whole. Yoo (2007, p. 706) considers pieces of work to be mixed goods and models its provision using the spatial competition model. The contribution of Lunney (2009) distinguishes between continuous and discrete public goods. The continuous public good can be provided in different scales (different intensity, different quantities – like national defence and mosquito control), whereas a

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monopoly, transaction costs, expression costs, the opportunity costs (i.e. social costs) and the costs caused by inefficiency stemming from the fact that the copyright compensates some authors more and others less than is optimal.

discrete public good exists always in a quantity of one unit and in a given scale. He generally treats pieces of work as discrete public goods. With a numerical example using the game theory approach, he describes the conditions for their provision. Neither Lunney nor Yoo and Conley take into account different markets through which a piece of work is spread, instead they unrealistically assume that a particular piece of work is traded only in one market.

A piece of work in a real world never behaves like a pure public good. It does not spread on its own (like the light of a street lamp that simply shines on every passer-by), but only in connection with another good or service (a medium). And it is this combination that is decisive for classifying a piece of work like a public good. The only case when a piece of work exists without any medium is its deposition into human mind – only this case could be fully classified as a public good. It has a specific implication: a piece of work is an intangible good that moves it away from the cases of typical public goods from textbooks like lighthouse or public defence. The difference is obvious, bare thinking of the light of a lighthouse or the national defence does not contribute to the production and provision of such a public good at all. Whereas once a piece of work is in the mind, it can be principally mediated (provided) to other people.

A necessity to use a medium for spreading pieces of work reduces the inability of authors to fight the free-rider problem and to internalise a positive externality generated by their pieces of work. The problem of authors to obtain a revenue for using their pieces of work does not stem from the fact that their pieces of work would be a public good. It stems from the fact that in some cases, the users are able to spread the piece of work instead of the author himself, because some media possess the undesirable properties of nonrivalry and non-excludability. Not a piece of work, but certain pairs "a piece of work + medium" might behave like a public good. Once such a risky pair is circulating among economic agents, the author might not be the only one who provides the given piece of work. The good becomes *de facto* non-tradable or hardly tradable. Nevertheless, as evident from the following example, it is not the case for every pair "a piece of work + medium", some of them are, on the contrary, very successfully tradable.

Example A: 1931, Czechoslovakia, a jazz musical composer Jaroslav Ježek just composed for a play Don Juan & Comp. of the Liberated Theatre a prelude Bugatti Step. His composition is used in three ways: every time a play is repeated (50 times per year), then it was recorded on the gramophone plate (1000 pieces sold yearly), and the music part was published (1000 pieces sold yearly as well). These numbers include the impact of competitors as the system of authors' rights

is not present in this model example[3]. The remuneration for the author from the users for the permission to use the composition depends on sales that are generated by monopolistically competitive markets. In this model example, the authorised users and the author have identical interests. The revenue of Jaroslav Ježek and the number of the media sold by him or by authorised users is influenced by the pairs "a piece of work + medium", that are spread by competing users. Their impact as regards individual ways of using the composition is as follows: No one else play the play Don Juan & Comp. as the Liberated Theatre is the only and irreplaceable original. Therefore, there is no impact on the revenue from using the composition in the theatre. Half a year after the publication of the original gramophone plate, another pianist decided to record his own performance of Bugatti Step. 400 of these gramophone plates are sold, but for lower price. Without this competing edition, 1200 of originals would have been sold and for higher price (as Ježek might have enjoyed greater monopoly power). The overall impact of the entrance of a competing user is decline of revenues to 80 % of the level with no competition. Also, the music part is spread by competitors. The composition is so popular that everybody wants to play it at home. The competitors benefit from the great demand and due to their activity, the revenue of Ježek decreased to 60 % of the level with no competition. The competitors sold their 1000 copies (for lower price); without them, Ježek would have sold 1500 copies (for higher price). The prospective impact of greater awareness among people about Bugatti Step, that might have increased the demand for the tickets to the theatre is not included, even though it might have led to greater price for tickets, greater revenue for the theatre and consequently for Jaroslav Ježek.

With these hypothetical numbers, it is possible to express, how much the competition destroyed the revenues of Jaroslav Ježek. The numbers about transactions in the whole market and those, where the author or authorised users were one of the trading parties, determine the rate of tradability of all pairs "a piece of work + medium" offered in the individual markets by the author. In the above described example, the rate of tradability is (50/50 + 1000/1400 + 1000/2000) / 3 = 0, 738. It is determined as the average of the ratios of transactions realised by the author (or authorised users) and all transactions within the specific market with a unique pair "a piece of work + medium" (assuming that all markets generate the same revenue that means equal weights for all ratios).

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[3] In reality, the Act was approved in 1926.

Because of the competition, the revenue of Jaroslav Ježek reached only (1 + 0,8 + 0,6) / 3 = 80 % of the maximum (i.e. if Ježek was in the monopoly position). Again, all markets are weighted equally. It is obvious that the revenue is lower comparing to the case when the author has 100% control over all the markets for media spreading his composition, at the same time the author did not lose all the revenue. His success depends on the rate of tradability on different markets with different media spreading his piece of work.

Exemple B:

2017, the Czech Republic. The band of local enthusiasts composed together a song X. This song will be interpreted only in the live performance during local ball. The remuneration consists of the refreshment during the event. The rate of tradability in this case is 100 %, the revenue reached 100 % of the maximum (as the ball is only once a year and the band does not want to perform the song in other events). The revenue of authors in example B is substantially lower than in example A, however, in example A, the authors totally controls the markets with media spreading their composition.

The examples show that even without protection of authors' rights, there exist possibilities how to get the revenue, and the situations when authors are not endangered by competition at all. It is possible thanks to the fact, that an author can produce and supply pairs "pieces of work + medium", that possess such characteristics, that the competitors are not able to spread them. In the case of Ježek´s composition, this was the case of the theatre play, when all free riders are easily excludable and when the rivalry is represented by the limited number of seats in the theatre. In example B, such an easily tradable medium is the ball.

The argument that the costs for copies of a piece of work are close to zero (e.g. Kinukawa, 2016, p. 3, following Landes and Posner, 1989) that drives the price on a competitive market to zero, does not make sense in an environment, when authors supply their pieces of work with help of media on different markets. Some media possess the properties of increasing marginal costs (for other concert in a year, the musicians might demand higher wages, similarly as the employees of the theatre with higher frequency of performances). This argumentation is totally in accordance with proposals of Varian (2005, p. 134), but with the emphasis on the explanation of the role of public and private goods in the process of provision pieces of work of authors.

2. Authors' rights enable authors setting the price above the marginal cost and thus gaining revenue for recovering the cost of creation

It is too simplistic to assert that authors' rights only enable authors to raise the price for individual copies above the marginal costs. As already pointed by Kitch (2000), the monopoly (exclusive) right to use their pieces of work does not make from an author a monopolist. Such simplification omits the real practical functioning of the system of authors' rights. The assumption n. 2 would be correct if the authors' rights were possible to interpret as a single rule: only the author can disseminate all copies of his or her piece of work. But in that case, there would be no reason for the Czech Act on Authors' Rights to have 118 paragraphs. The key for understanding the functioning of the legal rules is to distinguish different roles of users (those who spread the piece of work) and consumers (those who perceive it). Another important aspect is to recognise that making copies is only one way of using a piece of work, among many others. The crucial role of the authors' rights is to regulate the behaviour of users, not the consumers. Simply, it regulates any activity when a piece of work is spread with any medium.

However, the existing models of economics of authors' rights usually simplify their role into one manner they influence the market: it limits the number of copies that are produced by pirates, ignoring other way of using than making and disseminating copies. The literature overlooks the fact that a piece of work is not supplied on one single market, but on more different markets: e.g. when the music is used in advertisement (E15, 2013), when hotel guests have opportunity to perceive pieces of work thanks to a TV in their room (Aktuálně.cz, 2016; OSA, 2015) or when customers listen to the radio in a shop (OSA, 2017). All these examples have one thing in common – they are often the subject of legal litigations. On each of these markets the functions of supply and demand behaves differently and specifically depending on how strongly a specific pair "a piece of work + medium" behaves like a public good, i.e. how strongly it exhibits the properties of nonrivalry and non-excludability. Is it easy or costly for authors to conclude voluntary market transactions (in other words the question of tradability rate)? What is the shape of the marginal costs curve? These are questions that cannot be answered for one piece of work uniformly. Contrary, every single market for a medium carrying a piece of work has its own set of parameters; and one piece of work could be spread by a wide range of different media.

Authors' rights affect every single market with a medium variably and specifically. E.g., it is very costly to enforce the absolute respect of the ban of making copies and spread them on the internet. In comparison with it, overseeing using a melody in a musical is not relatively so costly. The impossibility to model the impact of authors' rights uniformly complicates the realistic expression of its functioning by formal mathematic apparatus, as suggested by Landes and Posner (1989) or Kinikawa (2016). Nevertheless, its effect is basically twofold: First, it prevents competitors from supplying specific pairs "a piece of work + medium" instead of author himself. The more successful is the system of authors' rights in enforcing the duties of users, the more monopoly power is conferred to an author. On each individual market with a specific medium, an author behaves like a firm in the monopolistic competition whose monopoly power (ability to set a price) is given by the strength of authors' rights and by his or her ability to realise with consumers voluntary market transactions. It contradicts the traditional view of the literature where an author becomes a monopoly firm operating in a single market where nobody else is allowed to supply additional quantities (i.e. copies) of a piece of work.

The second effect is that it enables authors to gain a nonmarket revenue. The markets with pieces of work are modified by a government intervention, that brings into its functioning nonmarket elements, especially due to the activity of collecting societies or, in other words, collective administrators of authors' rights. The transactions between authors and users that are necessary to realise because otherwise the law would be broken are classified as nonmarket. If there were no authors' rights, the users would not be motivated to contact and bargain with authors. Once a piece of work appears on a medium that can be disseminated to consumers, the users would do it freely, enjoying the benefits stemming from intangible and nondepletable character of pieces of work. According to Lunney (2009, p. 32) providing access to a public good is from the economic point of view desirable as the limiting the access causes the deadweight loss. The nonmarket character of transactions between authors and users does not preclude the competition among authors. The users have the possibility not to purchase the permission for using a piece of work or use another piece of work. But due to the fact that the process for obtaining licences is given by the state coercion, this system is only imitation of the monopolistic competition (contrary to the markets with pairs "a piece of work + medium", that are traded voluntarily based on free consumers' decisions).

The nonmarket character of the revenue generated by the functioning of authors' rights is well visible while analysing the related institutions, especially collecting societies, whose activity causes economic inefficiency (Šíma, 2005). Limiting the role of the free market and employing administrative and arbitrary decision-making in the remuneration of authors leads to weakening the function of market prices to equalise marginal opportunity costs for producing a good (in this case, individual pairs "a piece of work + medium"), or in other words the marginal rate of transformation will not converge. Because administratively determined levies for users cannot respect the marginal rate of substitution of users of pieces of work, the royalties for authors blur the price signals and thus limit the process of equalising the marginal rate of substitution and marginal rate of transformation. Therefore, authors do not base their decisions about the production on the revealed preferences of consumers purchasing different combinations of a piece of work and a medium voluntarily on the free market but they calculate also with the revenue from nonvoluntary nonmarket transactions. The tendency of markets to reach the production efficiency and distribution efficiency is lost. The prices do not help to allocate scarce resources.

3. Protection of authors' rights can be aggregated into one index, and their duration is a representative measure of the strength of the protection

Novos and Waldman (1984) or Landes and Posner (1989) in their models on impact of authors' rights on the creation of pieces of works represent its strength as a single variable (i.e. breadth). Kinukawa (2016) considers in his model two dimensions: length and breadth. Some contributions concentrate only on defining optimal length of the protection[4]. It is important to analyse not only how long the protection lasts but also what does it practically entails: who is entitled to acquire the nonmarket revenue, who and how collects the levies, how are the proceedings redistributed, who has the duty to deal with the authors or with their representatives and whether each author receives a nonmarket revenue which is equivalent to the frequency and to the commercial success of using his or her pieces of work. Considering these features results in unsurmountable methodological problem for creating a single measure (or only two measures) of the strength of authors' rights.

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[4] E.g. Liebowitz, Margolis (2003) or Pollock (2007).

The system of authors' rights is so complex institutional setting, that increase in the protection by a mere change in the legislature (e.g. setting more severe sanctions in the law) might not bring to authors higher revenues – simply because of simultaneous increase in enforcement costs. There might be only increase in the transaction costs but the level of protection is not elevated. The strength of the protection cannot be quantified simply according to the wording of the law, because the conditions of the real world are even more important. These real-world conditions include (but are not limited to) the positions of collecting societies, how high levies are demanded from users, whether the collecting societies are successful in their enforcement and, of course, decisions of courts. The influence of informal rules in the society as a full-fledged institutional framework should not be omitted as well as it contributes to forming the general opinion about the acceptance of copying on the internet. The level of available technologies is for the strength of authors' rights also decisive.

All that considerations have an important implication: The influence of authors' rights on individual authors is differentiated, depending on which combination of media for spreading his or her piece of work the author chooses. But e.g. the model of Kinukawa and many others are based on an assumption, that all uses (i.e. making and spreading copies, creating a derivative work, using a music in a movie etc.) are equal. But it is a nonsense to model all uses uniformly and approximate all uses to creating copies. The system of authors' rights regulates both these situations: performing a song on a concert by a musician, or listening to the song in a radio by a hairdresser and his customers. But its impact on the two users is different. As many other economists, Kinukawa overlooks the differentiation of markets with the media carrying a piece of work. This differentiation makes it impossible to interpret the strength of authors' rights for all these markets s by a single aggregated measure. Contrary, it is necessary to take into account that every piece of work is spread by a specific mix of media.

4. Marginal analysis for differentiated markets with a piece of work

The marginal analysis as a tool for studying the markets was so far used inappropriately due to the fact that economists so far overlooked the differentiation of markets with pieces of work and their media. The piece of work is considered to be a public good, which effective provision is possible when following condition is met (Yoo, 2007, p. 668):

$$\sum_i MRS^i_{\frac{Pc}{Pv}} = MRT_{\frac{Pc}{Pv}} \tag{1}$$

The optimal production of the public good should reach such a level where the sum of marginal rate of substitutions of the public for private good of individual consumers i (that is the ratio of the price for the access to the private (Pv) good and the price for the access to the public (Pc) good) equals the marginal rate of transformation for the production of the public (Pc) and private (Pv) good. What the society as a whole gains should be equal to what it sacrifices. It is necessary to reject a thesis that the scope (a size) of a piece of work could be quantified by the level of costs for its production (Yoo, 2007). The marginal analysis is meaningless here as a piece of work is only one, unique and it is not possible to extend it by any units (quantity is given) while using another input. The Bugatti Step of Jaroslav Ježek is a perfect example showing that every additional note would be redundant. Lunney (2009) comes to a similar conclusion thanks to distinguishing continuous and discrete public good.

The formal expression of the conditions for optimal provision of pieces of work offered in this text differs from approaches offered e.g. by Yoo (2007). The difference lies in respecting the existence of differentiated markets for media arising from one piece of work and in respecting that marginal analysis for a piece of work as such (in Lunney´s view discrete public good) is inappropriate. The optimisation behaviour takes place on each market separately. A piece of work is created when total economic costs for its creation are equal or lower than total expected revenue.

$$TC \leq TR \tag{2}$$

The piece of work exists by itself and it spreads only in connection with media. The costs for creation, once a piece is created, are given. The piece is a unique intangible unit, this is the reason why marginal analysis in this first step is not relevant. The optimisation behaviour of authors is a matter of their subsequent actions on markets with individual media. The authors in further steps maximise their profits on individual markets with different media. The sum of these profits from m markets is equal to TR and the analysis should focus on the process of profit maximisation on these individual markets. In accordance with principles of methodological individualism and subjectivism, the profits here represent the outcome of voluntary market transactions with consumers, in other words the interaction of supply and demand, according to the Austrian School, the only reliable representative of preferences. Otherwise, the analysis would be only a comparison of incomparable subjective categories that would contradict the methodological basis of this text.

$$TR = \sum_m \Pi_m \tag{3}$$

TR is the total revenue stemming from a piece of work and Π_m is the profit, which is the result of optimisation on individual markets *m* with a specific medium. On the *m*-th market, the marginal revenue from the sale of the last unit of a certain medium (ticket for a concert, a piece of music part, a purchase on iTunes) is equalised with marginal costs for that last unit (the costs for another concert, the costs for another print, zero marginal costs for a recording available on the internet). There is an assumption that every author operates on markets with character of monopolistic competition with different monopoly power. The monopoly power of an author is given by the rate of tradability (α_m) introduced in the discussion of the first methodological error and $0 \leq \alpha_m \leq 1$. α_m approaching to 1 means that a good is easily tradable and the author in a given market with a medium easily concludes voluntary market transactions with consumers. α_m approaching to zero means that the author has no monopoly power in the market that drives the price to the level of marginal costs (not necessarily to zero). The rate of tradability α_m is one of the factors that determines the ability of an author to set the price above marginal costs for the last unit of medium and therefore the level of mark-up. The profit on *m*-th market is:

$$\Pi_m = P_m^{opt} \cdot Q_m^{opt} - ATC_m^{opt} \cdot Q_m^{opt}. \tag{4}$$

And the author interacts with the demand:

$$P_m = \alpha_m \cdot p_m(Q_m) . \tag{5}$$

P^{opt}_m is an optimal price, Q^{opt}_m is an optimal quantity of the medium, where the author on the *m*-th market maximises the profit. ATC^{opt}_m are average total costs per one medium, but they do not include the costs for creation a piece of work – once it is created, such costs are sunk (Boldrin and Levine, 2002, p. 209) and have no relevance for optimisation on related markets with media. Costs for creation are important only in the first step when the creator considers the creation. The author optimises[5] on the market *m* in a situation of a monopolistically competitive firm when he or she faces downward sloping demand curve and equalises marginal costs and marginal revenue. Coefficient α_m, which is specific for each market, determines whether and how much the demand function will move to the left as a consequence of inability of the author to realise with consumers voluntary market transactions. The case of total non-tradability, where $\alpha_m = 0$, means complete disappearance of the demand for the given medium. It would be typically the case of goods with

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[5] By expressing the function of demand $P_m = \alpha_m \cdot p_m (Q_m)$, total revenue $TR_m = \alpha_m \cdot p_m (Q_m) \cdot Q_m$ and marginal revenue (which is derivative of TR_m with respect to Q_m) $MR_m = \alpha_m \cdot (p_m (Q_m) + p'_m (Q_m) \cdot Q_m)$, it is obvious, that coefficient α_m affects both the demand function for a medium and the marginal revenue function at the same rate.

strong nonrivalry and non-excludability. Conversely, $\alpha_m = 1$ means that there is no movement of the demand curve as a consequence of tradability problems.

The influence of authors' rights has to be added for completeness. The formal expression of its two main effects results in the following changes that capture the amplification of the monopoly power of authors and acquisition of the nonmarket revenue:

$$TR = \sum_m \Pi_m^c + TR^c \tag{6}$$

The total revenue consists of two components: the market revenue (i.e. the sum of all profits Π_m^c from all markets m) and the nonmarket revenue coming from users that comply with duties given by the system of authors' rights TR^c (from collecting societies or from individual licencing). Optimisation on each market is similar to the case without authors' rights, but an author protected by authors' rights has an advantage: the function of demand does not decrease as a consequence of outflow of customers to competitors. Authors' rights affect each market specifically, therefore their ability to keep the demand up is differentiated depending on many factors (technical, institutional). Beside the rate of tradability, the demand function for a given medium is affected by a market specific rate representing the strength of authors' rights γ_m. The rate of effect of authors' rights is able to return the demand curve back from the position from which it was taken by nonrivalry and non-excludability of a specific pair "a piece of work + medium". That is why $\gamma_m \in (1; 1/\alpha_m)$. When authors' rights are ineffective, γ_m is close to 1; when they fully compensate the influence of α_m, it is equal to $1/\alpha_m$. General expression of the demand function that includes the influence of authors' rights is as follows:

$$P_m = \gamma_m \cdot \alpha_m \cdot p_m(Q_m) \tag{7}$$

What if the media will not be supplied by the author himself, but by authorised users that paid for the possibility to use a piece of work? The situation of an author does not change substantially, the equation (6) still holds. However, the weight of different components of the revenue changes. The element $\sum_m \Pi_m^c$ will be close to zero as the author does not supply media on different markets (and users do so, optimising on individual markets m instead of him). The revenue of the author in this case will predominantly consist of licencing fees, i.e. from TR^c.

"Supplying the media by himself" cannot be taken literally, as also in artistic world, the division of labour is widely used. Instead it refers to a situation when an author spread his or her piece of work on media by himself or when he or she uses an economic agent with identical interests to prevent the principle agent problem. The mutual relations of authors and users are different – their

interests are in conflict, they are competitors that are able to steal the demand for the media to each other (e.g. when the Bugatti Step is performed in one city during one evening in two clubs). On a specific market with a given media, both the author and the users can supply the pair "a piece of work + medium". Therefore, Π^c_m will be lower (as a part of the demand will be taken by a licenced user), nevertheless, the author is compensated by higher volume of TR^c.

A situation, when the distribution of all media is undertaken only be non-licenced users and the consumers receive the access to a piece of work for free could be in this model explained in two ways: either the piece of work is bundled to a medium with extremely low tradability, that drives the parameter α_m to zero, or authors' rights are not able to tame these pirates (e.g. due to too costly enforcement) and γ_m is equal to one and, moreover, the author is unable get any revenue from selling licences or from collecting societies (zero TR^c). The opposite is the situation when an author is extremely successful on all individual markets with media (he or she gets from all markets m Π^c_m) and, at the same time, he or she gets revenues thanks to the system of authors' rights TR^c.

Conclusion

The first assumption that the authors' rights are a decisive motivation to create due to the fact that authors' pieces of work are like public good that need legal protection to fight with the free rider problem was corrected showing that a piece of work can be perceived only in connection with a medium good or service. As many kinds of such pairs do not behave like a public good, authors can appropriate a certain level of revenue depending on how strongly different pairs "a piece of work + medium" possess properties of non-excludability and nonrivalry. Therefore, authors can participate in voluntary market transactions and their revenue depends on their choice of media through which they provide access to their work. A model example reveals that a suitable mix of media helps to prevent the free rider problem and even if non-authorised users disseminate a work, the revenue of an author does not disappear. It also helps to understand that a piece of work in connection with a medium good or service does not exhibit the property of zero marginal costs.

The second assumption that system of authors' rights enables authors charging the price above marginal costs (that are assumed to be close to zero) was rejected as too simplistic. Actually, the role of authors' rights, as a very complex institution, differs significantly across individual markets with different pairs "a piece of wok + medium". Generally, it brings two effects: it helps to foster the monopoly power of an author in the specific market with "a piece of wok + medium" (thus

securing a market revenue) and it provides income based on the duties of users given by the legal protection of authors' rights (bringing to authors a non-market revenue stemming from non-voluntary transactions). This view strongly contrasts with traditional treatment of authors' rights as a simple rule that forbids making copies.

The variety of markets arising from one piece of work explains why the third assumption that copyright can be modelled as a single index is meaningless. The protection of authors' rights concerning one piece of work affects many markets on which a specific pair "a piece of wok + medium" is traded. The strength of such protection, therefore, varies depending on the specific features of every single market (technical, institutional, economic). This implies that each existing piece of work is protected by an individual level of protection that contradicts existing model approaches using a single variable describing the level of protection that affects all authors and all works universally. In addition, the length of protection should be regarded as equally important as other rules of the system of authors' rights.

A new framework shows that optimisation behaviour and marginal analysis are relevant only with respect to individual markets with a pair "a piece of wok + medium". That means there is no case for marginal analysis in the first step of a decision-making process about creating or not creating a piece of work comparing total economic costs and total expected revenue. As total expected revenue consists of the sum of profits coming from individual markets with pairs "a piece of wok + medium", the optimisation behaviour aimed at profit maximisation should be studied on these individual markets. Authors face the demand for a specific pair "a piece of wok + medium", and the demand is affected by the properties of media as the level of nonrivalry and non-excludability and by the unique (market specific) level of protection of authors' rights. Moreover, the profit of authors is augmented by non-market income from users due to the system of authors' rights.

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