Structural alternatives of Intellectual Property Rights Protection & Antitrust balancing[1]

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Antitrust policy and intellectual property rights (IPR) protection policy play a significant role in the promotion of technological development. At the same time, differences in approaches and goals of these two branches of economic policy may lead to conflicts and produce unexpected and complicated outcomes. The authors of this work considered the issue of interaction of antitrust policy and intellectual property protection policy through the lens of discrete structural alternatives assuming not only opportunities for different regimes of IPR protection but for antitrust too. Obviously, part of the story leads directly to issues which are urgent for emerging markets economies, which are often marked by a low level of property rights protection in general and a low efficiency of law enforcement. However, it is even more difficult and important issue for the dynamic choice (or evolution) of a particular set (IPR regime; antitrust regime) with inferior starting point. The result of the analysis shows that a straightforward application of standard antitrust instruments under such a weak IPR protection regime may impede the development of new markets and prevent innovations. At the same time the choice of a particular road map for a set (IPR regime; antitrust regime) rebalancing is a complicated political issue not only due to fact of divergent interests. This is so also due to comparative advantages of discrete structural alternatives of the set mentioned taking into account opportunities for competition both among legal producers and with counterfeiting .

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1. MOTIVATION

Market competition is strongly associated with innovations. Nowadays, innovations are largely the result of intellectual action, and some of these results are protected within the framework of different regimes as objects of IPR. Protecting IPR often provides special conditions for the holder of these rights. From the point of view of antitrust authorities, such conditions may be qualified in terms of market power and/or market dominance. That is why the discussion on balancing competition, innovations, and market power considerations is among the most popular and urgent topics of contemporary industrial organization studies This search for a balanced economic policy, and equally balanced regulations, can strongly affect incentives for innovation, and, as a consequence, sustainability of economic development in terms of the flow of innovations (first of all, product and technological innovations).

In this paper we consider the relationship between antitrust policy and IPR protection through the lens of different sets (antitrust regime; IPR regime) as discrete structural alternatives – one of key element of research mode within the New Institutional Economics .

The approach proposed is an important step to study much more difficult and larger problem: interrelations between competition and competition policy, on the one side, and property rights protection (including contract enforcement), on the other side. We assume that competition policy contains two branches: defensive (hard core antitrust and deterrence of unfair competition) and active (creation of new markets, decrease of barriers by reform of regulation, reforms of industries with natural monopoly component etc.) Here we concentrate only on the antitrust hard core "defensive" part of competition policy, which is aimed at the protection of competition by means of mergers and acquisitions control, prohibition of market dominance abuse, and anticompetitive agreements [Avdasheva, Shastitko, 2010], which may be in conflict with IPR protection. Specific features of intellectual property objects – in particular, the informational nature of literally all of them – seek for specific approaches to antitrust policies taking into account opportunities to choose a particular set (antitrust regime; IPR regime) within the number of discrete structural alternatives.

2. REVIEW OF LITERATURE

The issue of IPR and antitrust balancing is not only specific by nature but also is very practical. That is why different approaches are already fixed in national legislations and antitrust practice taking into account some specific features by default. The U.S. Department of Justice ("DOJ") and Federal Trade Commission ("FTC") provide special antitrust regulations for cases connected with intellectual property rights. In 1995 they introduced "Antitrust Guidelines for the Licensing of Intellectual Property." Later publications by DOJ and FTC [US DOJ & FTC, 2007] confirm that principle points from that document have become crucial policy cornerstones in the context of intellectual property and antitrust.

The Guidelines include several important points. Firstly, "the same general antitrust principles" are applied to the intellectual property as to any other property, and intellectual property does not "create market power in the antitrust context" by itself. Secondly,, intellectual property has some distinguishing characteristics, "such as ease of misappropriation," which give place to a special approach. Thirdly, special considerations may arise in the context of particular conditions of licensing agreements: some of them may be potentially harmful for competition but the ease of misappropriation of intellectual property "may justify the use of such restrictions." The Guidelines even proclaimed the antitrust "safety zone" for licensing arrangements. This means, fourthly, that licensing restraints generally will not be prohibited and persecuted. Fifthly, substantial feature emphasized by FTC and DOJ is the ambiguity of intellectual property boundaries, i.e. the insufficiency of knowledge on the real scope of property rights even for rights holders themselves. In fact it means a rise of particular issues of IPR specification as well as protection and attenuation of IPR.

The European Union adopted a new Regulation in the area of antitrust and intellectual property in 2004.[3] The general sense and goal of this new Regulation is to provide a "safe harbor" for intellectual property licensing agreements in order to promote innovation. It replaced Technology Transfer Block Exemptions ("TTBE"), which were in action since 1996. TTBE had the same function: to create specific exemptions from antitrust legislation in the area of intellectual property.

The U.S. DOJ agreed that those new European rules followed "economic effects-based approach," as to the U. S. Guidelines.[4] Former EU regulations had followed a structural approach and were more legalistic[5].

The nature of antitrust policy, its priorities, and its peculiarities depend on the established institutional environment, including characteristics of property rights protection in general. The development of information technologies and the growth of intangible assets' share in the assets of economic entities have attracted attention to the area of IPR protection. Balancing between antitrust policy and intellectual property rights protection is especially urgent for developing economies when considering their transition to an innovation-based path of development.

A policy of IPR protection is also of great importance for specific spheres, including research and development in general, as well as industries with great intellectual value added, such as IT, pharmacy, entertainment, mass-media, research and development in general.

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[3] Commission Regulation (EC) # 772/2004 of 7 April 2004.

[4] http://www.justice.gov/atr/public/speeches/203228.pdf.

[5] The Russian Law "On the protection of competition" (as an example for emerging market economy) also includes several points (articles 10, 11 and 13) referring to particular attitudes towards the context of intellectual property rights. These points provide specific antitrust exemptions too. The problem with the Russian laws (as well as for other emerging market economy) lies in the relative novelty of legislation on IPR protection. The IVth part of the Civil Code of Russian Federation (devoted to regulation of relations in IPR area) was adopted only in 2008. Intellectual property rights are still a weak point of the Russian institutional environment, which was especially acute in the context of the Russia's WTO accession [Katz, Ocheltree, 2006; Cooper, 2008]. According to the annual *Global Competitiveness Report* of the World Economic Forum, Russia was ranked 125th out of 144 countries by "Intellectual property protection" (and 133rd by "Property rights") [World Economic Forum, 2012, pp. 388 – 389]. Such a low result is not surprising: nearly the same conclusion may be applied for a considerable number of emerging market economies, even if intellectual property is formally (in terms of intentions of legislator) well protected. The lack of enforcement and supporting informal institutions undermine the efficiency of legislation and provide the ground to consider sets (antitrust regime; IPR regime) in wider context.

Undoubtedly, the role of intellectual products (product created with IPR use as well as objects of IPR as such) grows everywhere but some areas, including the above mentioned, are traditionally more sensitive to IPR protection.

Specification of IPR—exclusive rights to the results of intellectual activities—provides a considerable advantage to the holder of such rights over other competitors. In cases of an absence of substitutes, the holder becomes the single supplier in the market—the monopolist. IPR protection combined with the contract freedom rule may be a factor of market monopolization. However, that is not a universal way: as M. Ganslandt notes, usually the IPR enforcement does not restrict competition because of the presence of numerous competing products [Ganslandt, 2008, p. 2]. At the same time, the capture of a monopolistic position or dominance in the market is not uncommon; it occurs if an innovative product is unique or IPR protection is so large-scaled and comprehensive that market entry is impossible without a violation of IPR [Sellers, 2004].

The goal of antitrust policy is to smooth such monopolistic effects. As such, this kind of policy usually represents a cluster of regulations aimed at the attenuation of property rights and excluding them from a freedom of contracts rule. These restrictions exist also in the framework of IPR protection. The basic idea: restrictions should attenuate IPR to prevent market power abuse which is directly related to hard core of antitrust. That is why antitrust is potentially a main source of defence in patent infringement cases.

There is a large, refined discussion on the question of whether effective IPR protection positively affects social welfare and economic growth [Carlton, Gertner, 2002; Motta, 2004; Anderman, 2007; Encaoua, Hollander, 2002; Vickers, 2009; Dumont, Holmes, 2002]. Or is it more rational to break these rules? Participants in and observers of this discussion often dispute about the collision between the concepts of strongly motivating property rights protection, on the one hand, and free competition efficiency, on the other, for existing objects of IPR as well as for effects for new objects creation through the lens of Arrow's replacement effect [Arrow, 1962] vs. efficiency effect.

As J. Vickers notes, "The orthodox (and often correct) position is that stronger IPRs, including laissez-faire competition policy towards the exercise of IPRs, are good for innovation" [Vickers, 2009, p. 13]. He emphasizes that this position may be proved by a single-period model. At the same time, competitive struggle is no less important as an impetus to innovate. It may be said that both policies have the promotion of competition as their goals [Ganslandt, 2008, p. 9]. IPR protection contributes to the development of competition before the occupation of a specific innovation-based market niche (*ex ante*), and antitrust policy is aimed at promoting competition in the framework of established market structure. Despite sharing their goals, however, the directions use fundamentally different, even contradictory, instruments. This leads to obvious disagreements, especially if a legal holder of IPR obtains a significant degree of market power [Ganslandt, 2008, p. 8; Encaoua, Hollander, 2002, p. 11].

Researchers show that it is possible to find an efficient compromise (the best among available balances) between these two branches of policy with respect to specific problems, industries, and types of institutional arrangements; in particular, in industries where unreasonably excessive IPR protection may impede innovations (e. g. in case of sequential, cumulative innovations built on previous achievements or effect of efficiency as a ground for "patent shelving" explaining cases of monopoly sustainability) [Green, Scotchmer, 1995; Vickers, 2009, pp. 16 – 20; Taumann, Weiss, 1986]. However, the main direction of research is mostly connected with the modification of the legal regulation of intellectual property, and not with the application of current intellectual property rules in the context of antitrust policy.

The focus of the discussion substantially shifts if we introduce into our analysis a possibility of opportunistic behavior (in wide sense – related both to absolute and relative property rights [Furubotn, Richter, 2000]) that breaks the current laws on intellectual property and violates contract rights, especially in form of hidden actions.

Such a context is especially urgent for emerging market economies with relatively weak market institutions. First, there will be less policy experience with respect to competition protection and private IPR enforcement that can be called upon to make the most efficient decisions for the development of concerned markets. Second, IPR protection in those countries is usually weaker.

However, the case of antitrust investigations against Microsoft in the United States and the European Union shows that the problem has also not lost its urgency for developed economies, especially if we take into account the opportunity to use antitrust regulations as a "weapon" in a competitive struggle. A large critique of the decision on the Microsoft case (which expired only in 2011),[6] and of the process itself, shows that opinions on antitrust regulations at the cutting edge of current technologies may be quite controversial. Researchers following the process noted the division between the economics of the question, on the one side, and the litigation and its results, on the other side—partially because of the inconsistency of the theory itself at the time, and partially because of the reluctance of legal system to face them [Economides, 2001; Brennan, 2001]. Other difficulties of the litigation, namely its complexity, length, and expensiveness, were multiplied due to the active role of regional authorities, often lacking resources and expertise and acting under conditions of deformed incentives [Posner, 2004; Hahn, Layne-Farrar, 2003].

The difficulty of IPR protection even in developed economies, and in relationships between large and famous companies, is again emphasized by recent patent wars in the smart phones and tablet computers markets. Apple, Google, Microsoft, Samsung, HTC, Motorola, RIM, and another dozen of well-known market players have been involved in intellectual property litigations in a wide range of countries: Japan, the United States, Australia, Germany, and others. Such an intensity of trials may be considered as the evidence of using "patent weapons" against competitors.[7] Regardless, the abundance of expensive and time-consuming litigations show the ambiguity of IPR, which cannot be defined automatically even in developed economies with strong enforcement of property rights.

However, unlike developed economies, developing countries are usually distinguished by an insufficient level of property rights protection in general, along with a low efficiency of law enforcement, let alone the problems of defining a balance between the use of antitrust instruments and the protection of intellectual property rights. The issue of balancing is even more important: measures for active competitive policy are more required but not necessarily easily feasible, which, in its turn, creates risks of antitrust modification to the economic regulation by the nature [Shastitko, 2012].

There are other particular features of emerging market economies connected with the framework of competition policy.[8] The existence and the intensity of competition can depend on

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[6] NY Times, *Did the Microsoft Case Change the World?*, *available at* http://www.nytimes.com/2011/05/15/opinion/15sun2.html.
[7] http://www.firstpost.com/fwire/samsung-tablets-banned-in-australia-106640.html; http://www.reuters.com/article/2011/09/22/us-google-oracle-idUKTRE78L72I20110922; http://www.computerworld.com/s/article/9219161/Continuing_coverage_Patent_wars
[8] Detailed investigations may be found in: [Lahouel, Maskus 1999].

entry barriers. The general attitude to intellectual property in the U.S. Guidelines is based on the assumption that objects of intellectual property usually have close market substitutes. This condition may not be true for developing economies, especially for countries in transition with "low density of IPR objects". Sometimes these countries maintain partial isolation from global markets, high entry barriers for domestic as well as foreign newcomers, and only a modest potential of commercially viable technologies inside the country. These conditions lead to higher levels of market concentration and make it even more difficult for antitrust authorities to make reasonable, economic effect-based decisions.

Violation of IPR primarily means counterfeiting—sales of intellectual property objects without necessary formal settlements with legal holders of property rights. Widespread occurrence of such practices is motivated by a variety of intellectual property features: high costs of access, high fixed costs, and minimal variable costs [Gilbert, Weinschel, 2007]. These properties produce several factors, which directly contribute to incentivizing counterfeits:

- the crucial importance of intellectual activity for the production of a huge amount of goods and services;
- high costs to make an appropriate substitute of an object of intellectual property;
- minimal direct costs of copying, including counterfeit production; and
- negligible expected penalties for commercialization of counterfeit goods, especially with respect to the high costs of monitoring the enforcement of IPR.

Large-scale production and sales of counterfeit goods (i.e. goods produced with the illegal use of someone else's intellectual activities) considerably change goals and constraints of antitrust authorities, as well as legal producers.

The technology of antitrust control in the framework of the hard core of antitrustincludes not only the qualification of market players' behaviors and their consequences, but also the qualification of their market position in the context of market structure and competition intensity in the market.

A correct determination of an agent's market position is an important element of avoiding errors of I and II types in the enforcement of antitrust legislation [Joskow, 2002, Shastitko, 2011], i.e. a crucial condition not only for identifying monopolistic practices and assessing possible consequences of mergers and acquisitions, but also for justifying penalties and regulatory decisions concerning mergers and acquisitions.

Determining a market's geographic and product boundaries is a necessary component of the qualification of a firm's market position. This is why countries with an established structure of antitrust legislation adopt special rules to determine those boundaries. However, determining the product market for intellectual property objects may involve specific difficulties [Encaoua, Hollander, 2002, pp. 6 – 8].

Under conditions of poor property rights protection, counterfeit substitutes (goods which can potentially be substituted for legal original goods) may exist in many markets. It can be difficult to judge whether one good constitutes a real substitute for another; it is necessary to clarify consumers' opinions as to whether legal and illegal copies of equivalent products may be substitutes in practice. In other words, whether transactional features of goods does matter along with transformational features. It is also important to note that official statistical data can hardly be relevant because of the absent (or unreliable) information on illegal copies' sales.

The problem of a correct determination of product markets for the purposes of antitrust law enforcement in the context of piracy has not yet been comprehensively studied. However,

there are several detailed investigations for specific countries [Sellers, 2004], which may be associated with studies in Law and Economics.

3. MODELING

3.1. "Model 1"

To clarify and to aid further analysis, we propose a simple market model. In this market goods are produced with the intensive use of intellectual activities. We shall explore the influence of different variants (discrete structural alternatives) of regulation sets (antitrust regime; IPR regime) on the final results of market interaction and surpluses of specific market players.

We assume that the entrepreneur needs to make a decision concerning the investment in the creation of an intellectual property object in an amount of X in the "zero" period. In the case of a positive result[9] he becomes a producer of legal copies of the product in the "first" period. Simultaneously, copies of the product may be produced by other agents ("pirates"), also in the first period, but without having to make any preliminary fixed investments. It means there are no blocks to get information (we reduce the issue to information access) about manufacturing technology

If the entrepreneur invests, he obtains a patent and becomes the single holder of IPR for the production and sales of copies. Pirates can reproduce and sell copies only if intellectual property rights are not protected. In fact it is an assumed insignificance of non-patented part of the relevant result of intellectual activity.

Also we make an assumption that the product made by the entrepreneur has no close substitutes from the point of view of antitrust legislation. So, the entrepreneur is the single agent that is able to legally produce and sell the product. That is why the antitrust regulatory body will consider him as a monopolist (in legalistic terms, a dominant economic entity, whose market share equals 100 percent).

If the market falls under the effective (strict) antitrust regulation then the entrepreneur will not be able to sell his goods at prices that considerably exceed competitive prices.[10] We suppose that the upper limit is equal to average costs, including the value of the investment made in the "zero" period.

Table 1 represents a taxonomy of situations (discrete structural alternatives), which may occur under different characteristics of the institutional environment:

Table 1: Discrete structural alternatives of market regulations for objects of intellectual property

	Effective antitrust policy is present	Effective antitrust policy is absent
Intellectual property rights are protected	1	2
Intellectual property rights are NOT protected	3	4

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[9] Here we assume no randomization of results of investment and no discounting
[10] In practice these prices may be determined using the information on comparable markets. But that may be difficult for absolutely new markets.

Market demand is specified by the equation $P = a - bQ$ (P is market price, Q is quantity of sales), production costs of each copy equal c. Each consumer purchases only one copy of the product. We assume also that consumers can make a difference between legal and counterfeit copies but only a limited number N of consumers can switch between these two segments (i.e. legal and counterfeit goods are substitutes only for N consumers). The other consumers will always buy legal copies. It means there are consumers with lexicographic preferences on the bundle of properties (transactional; transformational).

Table 1 represents four possible situations.

A. Situation 1: Intellectual property rights are effectively (not just on paper) protected and antitrust policy is present

In this case, the seller's price will be established on the basis of economic costs (they form a "price ceiling," and a rational entrepreneur will fix prices at the level of this ceiling). The price of a copy will equal P_I, and quantity sold by an entrepreneur will equal Q_I, in such a manner that

$$P_I = c + \frac{X}{Q_I}$$

where X is a value of initial costs of elaboration in the "zero" period.

The advantages of this situation are expressed in a relatively low level of market price. It will exceed the competitive price by a value of the investment component $\frac{X}{Q_I}$. This component is positive, but the final level of market price in Situation I will not reach the monopoly price or exceed it (indeed, the opposite would mean that even the permission for establishing a monopoly will not guarantee the payback of the project). Correspondingly, the quantity of sales generally will be lower than the competitive output but higher than the monopoly output.[11] If the value of sales is considerably higher than the initial investment then deadweight losses will be modest. But the profitability of the producer will be limited although the guaranteed level of book profit (excluding the case of prohibitively high initial costs) will assure the implementation of the project and the creation of the intellectual property object.

B. Situation 2: Intellectual property rights are protected, antitrust policy is absent

In this situation the entrepreneur will act as a monopolist, price P_{II} and quantity Q_{II} will be equal to the monopoly level:

$$P_{II} = \frac{a + c}{2}; Q_{II} = \frac{a - c}{2b}$$

The profit of the entrepreneur will be:

$$\Pi_{II} = \frac{(a - c)^2}{4b} - X$$

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[11] To simplify, we do not present here detailed formula of prices and quantities.

The advantage of this situation is expressed in the higher level of the entrepreneur's profit. Consequently, he will have stronger incentives to create intellectual property object.[12] However, the project may not be implemented; necessary preliminary investments in the "zero" period will be too high. But unprofitability, even in the case of monopolization, means the inefficiency of the project *a priori* (at least, in terms of private costs and benefits), so the failure of such a project will not bring losses to the social welfare.

Monopoly is the main shortcoming of the Situation 2. Obviously, it will lead to considerable overpricing and lower quantities of output.

C. *Situation 3: Intellectual property rights are NOT protected, antitrust policy is present*

In Situation 3 pirates enter the market in the first period. They do not pay to create the intellectual property object; entry barriers for them (in this case of an absence of intellectual property protection) are negligible; they actively compete among themselves. Besides, they cannot, according to the model assumptions, pass off their copies as legal. Under such conditions they supply copies at a price c, equal to their marginal costs.

At the same time the antitrust authority does not take into account the market share of pirates while analyzing the market to provide price regulations. First, pirates' operations cannot be quantified precisely. Second, the state body responsible for the protection of competition should avoid the recognition of pirates' operations because, as a general rule, illegal sales are outside the legal framework and, consequently, they cannot be used in decision-making by state authorities. Here the conflict between legal regulations and the real state of affairs may be the most noticeable.

Then the fixed price will be equal to the price ceiling from Situation 1:

$$P_I = c + \frac{X}{Q_I}$$

But the real quantity of sales Q_{III} will be lower because of pirates' market share. The price of pirates' copies is *a priori* lower in comparison with legal copies. As a result, those consumers, who are ready to switch to counterfeit copies, will do so. According to the above-mentioned assumption, pirates' quantity of sales is fixed, it equals N. That is why the entrepreneur will only sell $Q_{III} = Q_I$-N (see Graph 1) at a fixed price P_I, while pirates will produce and sell N copies at a price c.

If the entrepreneur does not have information on the scope of piracy, he will make his decision on quantities produced with respect to market demand, the real quantity produced by him will be Q_I, and the excess of goods produced (crowded out by pirates) will not be sold. Then the economic profit of the entrepreneur will be specified by the following expression

$$\Pi_{III}^{(A)} = \left(c + \frac{X}{Q_I}\right) Q_{III} - X - cQ_I = c(Q_{III} - Q_I) + X\left(\frac{Q_{III}}{Q_I} - 1\right) < 0$$

If the entrepreneur can assess a scope of piracy N, his quantity produced will equal his real sales Q_{III}. But in this case his economic profit will also be negative:

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[12] It is important to note that there are models proving that, under certain conditions, companies-competitors may have stronger incentives to innovate in comparison to monopolists. But in our example we consider the case of a new market creation.

$$\Pi_{III}^{(B)} = \left(c + \frac{X}{Q_I}\right) Q_{III} - X - cQ_{III} = X\left(\frac{Q_{III}}{Q_I} - 1\right) < 0$$

Graph 1: *Situation 3—Prices and quantities of the entrepreneur and pirates*
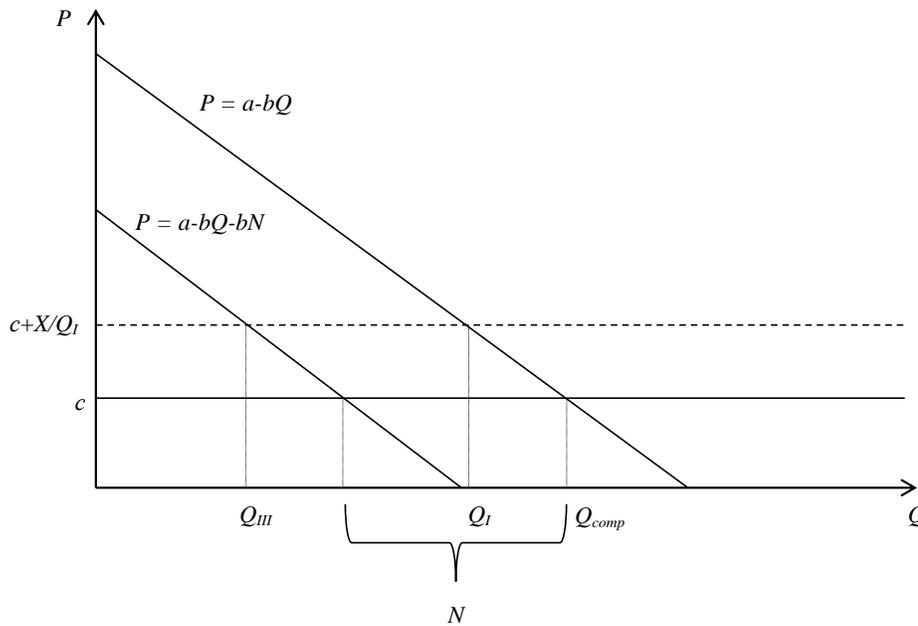
Situation 3 is considered to be the worst from a social welfare point of view. At first sight, it seems that things are not so bad: total quantity of copies sold reaches Q_I, as in Situation 1 (with good protection of property rights and the effective antitrust policy), and the existence of pirates leads to the lowering of prices for certain consumers and, consequently, to the partial redistribution of surpluses in favor of consumers.

But in Situation 3 the entrepreneur suffers losses summarizing the results of two periods ("zero" and "first"). Consequently, he loses any incentives to invest in the "zero" period. As a result, the object of intellectual property will not be produced at all, and a discussion of profits, prices, and quantities has no sense in the absence of the market.

D. *Situation 4: Intellectual property rights are NOT protected, antitrust policy is absent*

In Situation 4 the entrepreneur will also share the market with pirates. But the absence of antitrust regulation (in fact, price regulation in the model) will give him an opportunity to remain a monopolist on a residual demand. It is specified by the following equation:

$$P = a - bN - bQ$$

In this situation pirates will sell N copies at a price c, as in the previous case. The quantity of the entrepreneur's sales, his price, and profit will be expressed by the following expressions:

$$Q_{IV} = \frac{a - c}{2b} - \frac{N}{2}; P_{IV} = \frac{a + c}{2} - \frac{bN}{2}; \Pi_{IV} = \frac{(a - c - bN)^2}{4b} - X$$

Situation 4, despite a seemingly low level of institutional development, can lead to favorable consequences. Total volume of market sales will be:

$$Q_{IV} + N = \frac{a - c}{2b} + \frac{N}{2}$$

This quantity is less than the competitive level,[13] but it exceeds the production of a monopolist. Market demand is partially satisfied by pirates at a competitive price, and the price of the entrepreneur, who acts as a monopolist on the residual demand, is higher as compared to the competitive level but lower than the monopoly level. Finally, the profit of the entrepreneur may be positive or negative depending on the value of the initial investment. As in Situation 2, it may be concluded that an *a priori* inefficient project will not be implemented, but the criteria of efficiency in the Situation 4 will be stricter because the profit of the entrepreneur in the "first" period is less than the monopoly profit.

Therefore, each of the situations described has its benefits and shortcomings. They may be briefly described as follows:

In Situation 1 market equilibrium may be pretty close to the competitive state. At the same time, risks for the entrepreneur are modest but his profitability is at a low level, corresponding to zero economic profit (summarizing for two periods). In Situation 2 market equilibrium will be equivalent to the equilibrium of a monopoly. This will negatively affect consumers' surplus, the entrepreneur will bear low risks, and his profitability will be maximized. In Situation 4 parameters of market equilibrium will range between competitive and monopoly levels; as in Situation 1, risks of the entrepreneur will be high but he will have a chance to obtain positive economic profit. Situation 3 is the most problematic from the point of view of social welfare: the economic profit of the entrepreneur will be negative, investments will not be made, and the market itself will never be created.

This summary presents a question: How can the economy (the market) move from the Situation 3 to any other situation? From our point of view, there are three alternative solutions:

A. *Solution 1: To provide protection for intellectual property*

The implementation of this solution permits a move from Situation 3 to a more favorable Situation 1,[14] which corresponds to the high standards of institutional environment in developed economies. But providing intellectual property rights protection involves considerable costs and is a long-term process, especially for those developing economies that have significant problems with property rights protection in general. In particular, difficulties with property rights protection are typical for countries rich in natural resources [Tambovtsev, Valitova, 2007]. Consequently, solution 1 may be a priority in the long term but it can hardly be realized in the short term.

B. *Solution 2: To avoid qualifying the entrepreneur as a monopolist when producing and selling intellectual property objects and to drop price regulations*

Realizing Solution 2 will permit a move from Situation 3 to a more favorable Situation 4. In fact, there is no retreat from the antitrust policy as a whole. There is only the recognition of competition from pirates, which automatically leads to the change of qualification of the entrepreneur's market position. This solution is less costly but it can confront principle and well-grounded (according assumptions used) objections from the antitrust authorities.

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[13] Of course if pirates are unable to satisfy all the market demand, i.e. $N < \frac{a-c}{b}$

[14] Or to the Situation 2, which is less probable because the sense of refusal from antitrust policy is not obvious in the case of strong protection of intellectual property rights.

C. Solution 3: To take into account the real market share of the entrepreneur with respect to the existence of piracy

In this case Situation 3 is nominally conserved but, in fact, it is considerably modified. Recognition of significant pirates' sales by an antitrust authority means (in terms of the model) the recognition that real sales of the entrepreneur are limited. That is why the entrepreneur needs to adjust prices upwards to cover fixed costs (initial investments). In this case the entrepreneur will obtain zero economic profit (and normal book profit). As in Situation 1 it will give him an opportunity to make initial investments under low risk and low profitability. But, in comparison to Situation 1, market supply will be lower, and the entrepreneurs' prices will be higher. However, pirates will sell their illegal copies at a low, competitive price, which will weaken the pressure on consumers' surplus.

In the short- and mid-term timelines, Solutions 2 and 3 seem to be more realistic. Both require recognizing counterfeit sales as significant factors affecting the regime of antitrust law implementation. It means that the choice of an optimal regime of antitrust policy depends on the established characteristics of property (in this case, intellectual property) rights protection.

If intellectual property rights are poorly protected, and it is impossible to rapidly strengthen this protection, then the implementation of antitrust regulations without taking into account counterfeit production may have strong negative consequences on intellectual property investments. A comprehensive implementation of such legalistic measures in markets without attention to their real features may lead to the suppression of innovative and investment activities.

Undoubtedly, this model has a number of restrictions and cannot be directly applied to real markets but it represents a useful analytical framework in which to form socially efficient antitrust policy.

3.2. "Model 2"

Direct price control is often applied to the monopolized industries (e. g. natural monopolies), being, to speak more precisely, the instrument of *regulation*. At the same time, the analysis of other antitrust instruments in non-monopolized markets of intellectual property objects leads us to similar conclusions.

Here we turn to a more IPR-specific instrument: compulsory licensing. As it was in the previous model, we assume that antitrust measures may be applied or not, and the level of IPR protection (in the models it is approximated by the existence of piracy) may be high or low. Consequently, we will have 4 possible situations again.

In the following model it is assumed that

(1) there is a market for intellectual property objects ("products");

(2) two incumbents legally compete a la Cournot in the market, each incumbent invests a fixed amount X in the elaboration of its version of product (those versions are perfect substitutes);

(3) a number of pirates may enter the market in the case of a poor protection of IPR, pirates – illegal incumbents or entrants – may produce exactly N units of product (pirates' products and official products are perfect substitutes too) and sell them at a price equal to marginal costs of production;

(4) the 'first' firm-incumbent may invest in the creation of an innovation a fixed amount M in order to obtain, as a result, a decrease in marginal costs of production from c to c_1;

(5) the 'second' incumbent will get no access to this innovation until the 'first' incumbent gives (sells) a license, which may be given only under the regime of compulsory licensing optionally introduced by the law;

(6) pirates will automatically get access to the innovation if they act in the market.

In fact the first firm is a technological leader while the second firm is a potential follower. Here we don't use an assumption on competition between two firms on patent randomizing the return for investment. The question is similar to the question pointed in the previous model: what institutional regime will be more productive for the implementation of the innovation, i. e. when the 'first' firm will most likely take the positive decision on innovations and what will be the outcomes of each possible regime.

As it was in the previous model, market demand is specified by the equation $P = a - bQ$, marginal costs of production equal c *in the case without an innovation and* c_1 *in the case of the realization of innovation* $(a > c, c > c_1, a > 0, b > 0, c > 0, c_1 > 0)$.

Basic Situation (No innovation, no piracy).

In the case of 'ordinary' practice without innovations the outcomes are consistent with the traditional Cournot model (*Situation 0, or Basic Situation*):

$$q_1^0 = q_2^0 = \frac{a - c}{3b}; Q^0 = \frac{2(a - c)}{3b};$$

$$P^0 = \frac{(a + 2c)}{3};$$

$$\pi_1^0 = \pi_2^0 = \frac{(a - c)^2}{9b} - X; \Pi^0 = \frac{2(a - c)^2}{9b} - 2X,$$

where: q_1^0, q_2^0 – quantities produced by the two firms in the standard Cournot model without piracy, Q^0 – total quantity produced, P^0 – market price, π_1^0 and π_2^0 – profits obtained by the two firms, Π^0 – total profit of the two firms concerned.

Situation I (Innovation, no compulsory licensing, no piracy).

In the situation labeled '*I*' we assume that the 'first' firm invests M into an innovation and obtains the economy on marginal costs from c to c_1, while marginal costs of the second firm remain unchanged. Following the interaction a la Cournot with this change, the results will be:

$$q_1^I = \frac{a + c - 2c_1}{3b} > q_1^0; q_2^I = \frac{a + c_1 - 2c}{3b} < q_2^0; Q^I = \frac{2a - c - c_1}{3b} > Q^0;$$

$$P^I = \frac{a + c + c_1}{3} < P^0;$$

$$\pi_1^I = \frac{(a + c - 2c_1)^2}{9b} - X - M; \pi_2^I = \frac{(a + c_1 - 2c)^2}{9b} - X < \pi_2^0;$$

$$\Pi^I = \frac{(a + c - 2c_1)^2 + (a + c_1 - 2c)^2}{9b} - 2X - M.$$

We are able to note that the total quantity produced is higher, and the market price is lower in comparison with the *Situation 0*. It means that the *Situation I* is more preferable for

consumers. However, the second firm suffers losses in terms of profit, as well as in terms of quantity produced.

At the same time, here, without additional assumptions, we cannot say whether the new profit of the 'first', innovative, firm exceeds its profit in the basic situation a la Cournot. To provide a benchmark for future comparisons, we introduce a $\bar{M}$ as a threshold – the maximal amount M that the first firm can invest to obtain positive result from the innovation in terms of profit. Obviously, the investment will be made if the profit of the first firm in the case of innovation (*Situation I*) will exceed its profit in the case without innovation (*Basic Situation*).

Solving the inequation:

$$\pi_1^I > \pi_1^0;$$

$$\frac{(a + c - 2c_1)^2}{9b} - X - M > \frac{(a - c)^2}{9b} - X,$$

we obtain the following result:

$$M < \frac{4(c - c_1)(a - c_1)}{9b}.$$

Consequently,

$$\bar{M}^I = \frac{4(c - c_1)(a - c_1)}{9b}.$$

The threshold level for M is directly related to (1) absolute amount of marginal cost decrease, (2) distance between market demand reserve price and the new level of marginal cost, (3) sensitivity of market quantity demanded on price $(\frac{1}{b})$

Situation II (Innovation, compulsory licensing, no piracy).

In the situation labeled *'II'* we suppose that the regulator decides to prevent possible abuse of market power by the first firm, to correct market outcomes and to promote the diffusion of innovation using the mechanism of *compulsory licensing*. In this model it means that the first firm must give its innovation to the second firm. As a result, marginal costs of the second firm will also decrease from c to c_1. The second firm gives to the first firm, in exchange, a fixed sum of money F, presumably set by the regulator. Obviously this amount is not necessarily exogenous and might be result of (1) cost verifiability (M), (2) skills of the firm to defend these cost before regulator, (3) opportunities for the second firm to influence on the regulator's decision appealing to existing norms of legislation.

The firms continue to remain in the framework of Cournot model. When the changes described above are introduced in it, we obtain the following outcomes for the *Situation II*:

$$q_1^{II} = \frac{a - c_1}{3b} > q_1^0; \; q_1^{II} < q_1^I; \; q_2^{II} = \frac{a - c_1}{3b} > q_2^0; \; q_2^{II} > q_2^I; \; Q^{II} = \frac{2(a - c_1)}{3b} > Q^0; Q^{II} > Q^I;$$

$$P^{II} = \frac{a + 2c_1}{3} < P^0; \; P^{II} < P^I;$$

$$\pi_1^{II} = \frac{(a - c_1)^2}{9b} - X - M + F; \pi_2^{II} = \frac{(a - c_1)^2}{9b} - X - F;$$

$$\Pi^{II} = \frac{2(a - c_1)^2}{9b} - 2X - M.$$

Here it may be noted that the total quantity is higher, and the market price is lower than in the previous cases. The *Situation II,* including compulsory licensing, is more favourable for consumers in terms of their surplus. The shift to the compulsory licensing (from the simple innovation in the *Situation I*) expectedly involves gains for the second firm and losses for the first firm in terms of quantity produced. Obviously, changes in profits will depend on the amount F.

To compare the incentives for the innovation for the first firm under such a standard of regulations, we can compare profits in the *Situation II* and the *basic Situation* (i. e. Cournot model *before* the innovation).

Solving the inequation:

$$\pi_1^{II} > \pi_1^0;$$

$$\frac{(a - c_1)^2}{9b} - X - M + F > \frac{(a - c)^2}{9b} - X,$$

we obtain the following result:

$$M < \frac{c_1^2 - c^2 + 2ac - 2ac_1}{9b} + F = \frac{(c - c_1)(2a - c - c_1)}{9b} + F.$$

Consequently,

$$\bar{M}^{II} = \frac{2(c - c_1)(a - \frac{1}{2}c - \frac{1}{2}c_1)}{9b} + F.$$

To compare $\bar{M}^I$ and $\bar{M}^{II}$ we should introduce some measure of F.

For example, if $F = 0$, i. e. there is no compensation for the license, then always:

$\bar{M}^{II} < \bar{M}^I$;

$$\frac{2(c - c_1)(a - \frac{1}{2}c - \frac{1}{2}c_1)}{9b} < \frac{4(c - c_1)(a - c_1)}{9b},$$

for $\left(a - \frac{1}{2}c - \frac{1}{2}c_1\right) < (a - c_1)$ (we remind that $c > c_1$).

Of course, in the case of voluntary licensing F could be set by the firms in the process of bargaining. However, here we concentrate the attention on compulsory licensing, involving antitrust policy. We base on the assumption that the antitrust body *a priori* takes the decision to conduct the policy of licensing and cannot build its policy upon expected voluntary behaviour of firms. As Acemoglu and Akcigit note, "there may or may not exist feasible voluntary license fees that the follower and the leader can bargain to (such voluntary agreements may be infeasible even if compulsory licensing is beneficial, since consumers also benefit from licensing)" [Acemogly, Akcigit, 2012 p. 35]. It may be shown that, in the framework of the model considered, there is a condition, which makes voluntary licensing available, i. e. if $\Pi^{II} > \Pi^I$, so that licensing increases the total profit obtained by two firms, and they can find an opportunity for a mutually profitable voluntary deal: $(2(a - c) - 3(c - c_1) > 0)$. However, if the condition is not satisfied, there will be no voluntary licensing, which does not correspond to the antitrust policy approved.

We assume that F is set by the regulator on the basis of its own consideration of 'fair pricing'. Presumably, it might be based on expenses on the innovation undertaken by the first,

innovative, firm. In the case of two incumbents in the market it is probable that division of these expenses by two will be considered as 'fair pricing', without the abuse of market power.

If $F = M/2$, then

$$\bar{M}^{II} = \frac{4(c - c_1)(a - \frac{1}{2}c - \frac{1}{2}c_1)}{9b} < \frac{4(c - c_1)(a - c_1)}{9b} = \bar{M}^I.$$

So, even compensation in an amount of one half of 'innovation expenses' leads to a less favourable outcome in terms of innovation. In this case the 'innovation investment ceiling' is lower than in the *Situation I*. It means that the sum of investment that the first firm could put into the development of innovations diminishes under such a set of rules, other things being equal.

However, there is a level of compensation F, which can make the *Situation II* more favourable for innovations, when compared with the *Situation I*. It may be found by solving the inequation:

$$\bar{M}^{II} > \bar{M}^I;$$

$$\frac{c_1^2 - c^2 + 2ac - 2ac_1}{9b} + F > \frac{4ac - 4ac_1 - 4cc_1 + 4c_1^2}{9b};$$

$$F > \frac{2ac - 2ac_1 + c^2 + 3c_1^2 - 4cc_1}{9b}.$$

But in that case we have:

$$\bar{M}^{II} - F < F; F > \bar{M}^{II}/2.$$

It means that the compensation paid for the license should exceed one half of 'innovation expenses' if it is intended not to lower the incentives for the first firm to innovate.

If such a price is considered too high by the antitrust body (and, most probably, it really is), then compulsory licensing is a less favourable regulative environment for the innovator.

Nevertheless, it does not mean that the *Situation II* is worse than the absence of compulsory licensing. Consumer surplus will certainly grow in comparison with the *Situation I*. The choice should be made depending on specific goals and circumstances[15].

Counterfeit Situation (No innovation, piracy).

Here we observe a poor protection of IPR. In this model we assume that such an environment provokes the entry of pirates. As it was pointed in the previous model, we assume that pirates can produce and sell only N illegal (counterfeit) copies because of particular features of consumers' preferences: only N of them automatically turn to the cheapest, i. e. counterfeit production.

First of all, we look at the initial situation (labeled *'CF'*), before a possible innovation. In this case legitimate firms will act on the basis of residual demand: $P = a - bQ - bN$.

The outcomes are the following:

$$q_1^{CF} = q_2^{CF} = \frac{a - c - bN}{3b} < q_1^0 = q_2^0; Q_{1,2}^{CF} = \frac{2(a - c)}{3b} - \frac{2N}{3} < Q^0; Q^{CF} = \frac{2(a - c)}{3b} + \frac{N}{3} > Q^0;$$

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[15] Costs of administration of regime with compulsory licensing are also a potential constraint for comparative advantages of the structural alternative described.

$$P_{1,2}^{CF} = \frac{a + 2c - bN}{3} < P^0; \ P_N^{CF} = c < P_{1,2}^{CF}$$

$$\pi_1^{CF} = \pi_2^{CF} = \frac{(a - c - bN)^2}{9b} - X < \pi_1^0 = \pi_2^0,$$

where: q_1^{CF}, q_2^{CF} – quantities produced by the two firms in the model with piracy, $Q_{1,2}^{CF}$ – total quantity produced by the two incumbents, Q^{CF} – total quantity produced (including pirates' production), $P_{1,2}^{CF}$ – price of the two incumbents, P_N^{CF} – price of pirates, π_1^{CF} and π_2^{CF} – profits obtained by the two incumbents.

Unsurprisingly, the existence of piracy diminishes quantities produced and profits of the two legitimate incumbents. Since piracy in this model is exogenous it is simply an effect on residual demand for two legal incumbents. At the same time, thanks to piracy, prices of legitimate firms, let alone lowest pirates' prices, go down, and the total quantity supplied to the market goes up.

Situation III (Innovation, no compulsory licensing, piracy).

In the situation labeled *'III'* it is supposed that the innovation takes place. As in the *Situation I*, the first firm pays M for the innovation and, its costs decrease from c to c_1. The second firm (as a legally producing incumbent) has no access to innovation, unlike pirates. Pirates get the access automatically, but the decrease in their costs *does not lead* to the growth of demand for pirates' production. It still equals N.

Model outcomes of the *Situation III* are given below.

$$q_1^{III} = \frac{a + c - 2c_1 - bN}{3b} > q_1^{CF}; \ q_2^{III} = \frac{a + c_1 - 2c - bN}{3b} < q_2^{CF};$$

$$Q_{1,2}^{III} = \frac{2a - c - c_1}{3b} - \frac{2N}{3} > Q_{1,2}^{CF}; \ Q^{III} = \frac{2a - c - c_1}{3b} + \frac{N}{3} > Q^{CF};$$

$$P_{1,2}^{III} = \frac{a + c + c_1 - bN}{3} < P_{1,2}^{CF}; \ P_N^{III} = c_1 < c = P_N^{CF}$$

$$\pi_1^{III} = \frac{(a + c - 2c_1 - bN)^2}{9b} - X - M; \pi_2^{III} = \frac{(a + c_1 - 2c - bN)^2}{9b} - X < \pi_2^{CF};$$

The 'innovative' movement to the *Situation III* from the 'simple pirate model' (*Counterfeit Situation*) resembles to the movement from *Basic Situation* to the *Situation I*. Prices (including pirates' prices) go down, total quantity supplied grows, the second firm suffers from the decline in sales and profits. The results for the first, 'innovative', firm-leader depend on the scope of investments M.

Following previous patterns, we can find the 'innovative investment ceiling' $\overline{M}^{III}$ (the maximal amount M that the first firm will invest) for the situation considered.

To do that, we shall compare its estimated profit in the *Situation III* (after a possible innovative investment) and in the *Counterfeit Situation* (before a possible innovative investment, current institutional environment taken into account).

Solving the inequation:

$$\pi_1^{III} > \pi_1^{CF};$$

$$\frac{(a + c - 2c_1 - bN)^2}{9b} - X - M > \frac{(a - c - bN)^2}{9b} - X,$$

we obtain the following result:

$$M < \frac{4(c - c_1)(a - c_1 - bN)}{9b}.$$

Consequently,

$$\overline{M}^{III} = \frac{4(c - c_1)(a - c_1 - bN)}{9b} < \overline{M}^I.$$

The result means that the existence of piracy lowers a possible level of innovative investments, if the question of compulsory licensing is not touched.

It is impossible to compare $\overline{M}^{III}$ with $\overline{M}^{II}$ without additional reservations, because the latter includes the estimation of F, the fee for licensing. If we take F equal to $M/2$, as it has been done in the *Situation II*, then $\overline{M}^{III} < \overline{M}^{II}$, i. e. the situation for the innovator in the case of piracy (without compulsory licensing) is worse than in the case of compulsory licensing (without piracy) if:

$$\frac{4(c - c_1)(a - c_1 - bN)}{9b} < \frac{4(c - c_1)\left(a - \frac{1}{2}c - \frac{1}{2}c_1\right)}{9b};$$

$$(c - c_1) < 2bN,$$

which means a reasonably big scope of piracy in comparison with the economy on marginal costs resulting from the innovation.

Situation IV (Innovation, compulsory licensing, piracy).

The last situation describes the simultaneous existence of piracy and introduction of compulsory licensing by the regulator. Here are combined the conditions of the *Situations II* and *III*.

We have obtained the following model outcomes from the *Situation IV*:

$$q_1^{IV} = \frac{a - c_1 - bN}{3b} > q_1^{CF}; \; q_1^{IV} < q_1^{III}; \; q_2^{IV} = \frac{a - c_1 - bN}{3b} > q_2^{CF}; \; q_2^{IV} > q_2^{III};$$

$$Q_{1,2}^{IV} = \frac{2(a - c_1)}{3b} - \frac{2N}{3} > Q_{1,2}^{III}; Q^{IV} = \frac{2(a - c_1)}{3b} + \frac{N}{3} > Q^{III}; \; Q^{IV} > Q^{II} > Q^I;$$

$$P_{1,2}^{IV} = \frac{a + 2c_1 - bN}{3} < P_{1,2}^{III}; P_{1,2}^{IV} < P^{II} < P^I \; ; \; P_N^{IV} = c_1 < c = P_N^{CF};$$

$$\pi_1^{IV} = \frac{(a - c_1 - bN)^2}{9b} - X - M + F; \pi_2^{IV} = \frac{(a - c_1 - bN)^2}{9b} - X - F.$$

According to the results, the *Situation IV* is the best from the point of view of consumers: the price of the legitimate incumbents is the lowest one among all the situations (pirates' price is the same in the Situation III), and the quantity supplied to the market (including pirates' sales) is the highest one.

At the same time, the situation for the innovator seems to be the worst one. We cannot assess it directly without the knowledge on the level of licensing fee F. However, if we continue

to follow the assumption of 'fair pricing' approved by the regulator, taken from the *Situation II* ($F = M/2$) we could obtain the following 'feasibility inequation' for the innovative firm:

$$\pi_1^{IV} > \pi_1^{CF};$$

$$\frac{(a - c_1 - bN)^2}{9b} - X - \frac{M}{2} > \frac{(a - c - bN)^2}{9b} - X;$$

$$M < \frac{4(c - c_1)(a - \frac{1}{2}c_1 - \frac{1}{2}c - bN)}{9b}.$$

It means that the maximal level of M is lower in comparison with the other 3 ' potentially innovative' situations (*I, II, III*) described above, if $F = M/2$

$$\bar{M}^{IV} = \frac{4(c - c_1)(a - \frac{1}{2}c_1 - \frac{1}{2}c - bN)}{9b} < \bar{M}^{III}; \ \bar{M}^{IV} < \bar{M}^{II}; \ \bar{M}^{IV} < \bar{M}^{I}.$$

The model described above does not give the single worst outcome, as the first model does. For example, the *Situation IV* is the best for consumers but, presumably, the worst for the innovator.

This model is designed to show the danger of a simultaneous attenuation of IPR from the side of pirates and from the side of the regulator if it practices compulsory licensing without taking into account the incentives of the firm-leader. This problem may be smoothened if the regulator sets (or permits to set) reasonably high licensing fees, which even exceed a half of investment in the development of innovations. It is worth to say that the results of [Acemoglu, Akcigit, 2012] confirm the optimality of prohibitively high licensing fees (in case of the simultaneous use of different instruments for IPR protection).

4. CONCLUSION

The search for balance between antitrust policy and intellectual property protection is a matter of high importance for the modern economy. Technological progress is very fast and legal framework often lags behind it. At the same time, the need to stimulate further technological development emphasizes the importance of market structures in innovative areas.

Many researchers show that, despite the presence of common goals, the implementation of antitrust policy may come into conflict with methods of intellectual property protection, and vice versa. Sometimes the interaction may be more difficult, which is confirmed by the two models presented in this article. And sometimes the optimal combination of antitrust instruments and intellectual property rights protection policies may change, depending on specific economic circumstances.

One specific and important case is the interaction of antitrust policy and intellectual property, under conditions of poor property rights protection, and weak mechanisms of law enforcement. In particular, in this case there is the need to take into account counterfeit production when assessing market competition before applying antitrust measures (including sanctions, compulsory licensing and prevention of monopolistic pricing). Counterfeit production is dangerous for the innovation process by itself. But its negative effects may be multiplied if counterfeit production is not recognized by antitrust authorities.

The models developed in this article show that restrictive antitrust policies, such as implicit price control, introduced to prevent monopolistic pricing (Model 1), or compulsory licensing, introduced to prevent different forms of market power abuse and promote the diffusion of innovations (Model 2), may impede the creation of new markets and the emergence of innovations. Such policies lower the expected return on investment in innovations, though these policies could be beneficial for consumers. However, in case of widely spread counterfeiting, the simultaneous pressure on the innovator from the side of regulator and pirates becomes too harsh. Such a strong attenuation of property rights, promoted by both legal and illegal ways, is the worst situation for the innovator (Model 2), which can lead even to the rejection of the creation of a new market (Model 1).

The implementation of antitrust policy under such conditions requires additional attention towards established factors of the institutional environment, the real strength of intellectual property rights protection, and the real conditions under which firms function. Otherwise, innovative and investment processes will slow down.

In order to avoid negative consequences and to promote innovations, the regulator can change the institutional regime for the markets of IPR objects, in particular taking into account the share of pirates' sales (Model 1) during the implementation of antitrust policies and setting reasonably high licensing fees for compulsory licensing (Model 2). In some cases, even the rejection of standard antitrust methods may be desirable.

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