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## **Knowledge and Information Economy, Welfare and governance: the economic nature of Intellectual Property Rights**

*This paper will study the different conceptions about economic nature of (Intellectual) Property Rights, and the implications in regard to Welfare. This analysis may be applied in various fields concerned with intangible components: ecology, cultural goods, knowledge and information production, internet economics, for example. In regard to the complexity of these types of intangible capital, I will show the limits of the private negotiation inspired in Coase's approach, and underline the opposition between this approach and the Williamson's one.*

*Keywords: Transaction costs, Information Economy, Intellectual Property Rights, Governance, Welfare.*

This paper intends to study the analytical relationship between the Intellectual Property Rights (IPR) economic nature and the concrete governance modalities used to manage these IPR. This problematic may be extended to the economic analyze of Property Rights (PR) in general, and is related to various social fields: the environmental components, the cultural goods and services, the knowledge production and the digital economy, for example.

In a first part, from stylized facts, I will show how the market private logic translates high transaction costs, i.e. transaction costs generally higher than the ones produced by other governance mechanisms. Then, from the opposition between Pigou and Coase, I will study the different conceptions of the PR economic nature, and of the market regulations recommended. In a second part, I will point out, in regard to the goods and services *complexity*, the private negotiation limits, i.e. the coasian approach limits; for that purpose, I will use amply Williamson's theoretical instrumental to demonstrate that the market logic translates a high level transaction costs, and I will formalize some of these economic relations: I will show why the private negotiation may be inefficient, in regard to traditional maximization process, to technological cost and to free-rider behavior.

### **I) Some stylized facts: the different interpretations**

#### **1) *The IRP economic nature***

##### **1.1 *Some tendencies***

From the 80 until today, we can observe that there doesn't exist positive correlation between the patents deposited quantity and the R&D expenditure (Lebas, 2002, p. 252). Consequently, it is possible to affirm that the extension of DPI doesn't correspond to an incitement to

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develop the technological innovation; so, there is, in the contemporaneous capitalism, *a IPR economic nature and function modification*.

The different firms practice a patents portfolio strategy which may be characterized by the following elements:

i) The patent is not any more conceived as a way to appropriate temporary rents related to technological innovation (Idem, p. 254), the secret is preferred to the divulgation. The secret is related to important size firms.

ii) The patent function consists to prevent the potential outsiders entrance on the market: the patents systems doesn't constitute a mean to divulgate the innovation in a cheapest way, but a mean to increase the firms market power which have reached a critical size. The entry barriers instauration translates by a competition decrease, to the extent that IPRs are related with *process and not with products*.

The outsiders are object of a hold-up strategy, from the insiders: these insiders constitute a closed network in which they exchange their respective IRP; by this way, they construct entry barriers to protect their differential vantages, in regard to outsiders firms.

Moreover, such market structures imply in an *increased uncertainty in regard to patents valorization*: the firm A patent depends of the B and C patents, and of B and C possibilities to prevent A patent registration. This situation is characterized by a oligopoly or games theories, in the way that A strategy depends of A anticipations about B and C strategies. The dynamical efficiency isn't verified inasmuch there is not more incitation to innovate; the static efficiency too isn't verified inasmuch the technology costs increase means a social welfare decrease.

### 1.2 *The structures markets implications*

The patent value depends of the anticipated product that the innovation may produce for the rights holder. Until the 80, when patents were related with specific products, it was quite easy to anticipate patents revenues. The patent utility depended of its industrial and commercial applications, which were identifiable.

Today, patents are related with discoveries, and not only with inventions: in fact, they are related with process and not only with identifiable inventions: it means that property rights are conceded to *generic process virtual applications*. By nature, it is impossible to anticipate these future applications. The firms constitute patents portfolios: an increasing part of their assets is constituted by this kind of *intangible capital*.

This must be interpreted as an important market power extension: the property rights new systems permits a power monopole more important, inasmuch this power is related with scientific and/or technological generic principles whose concrete applications aren't identifiable.

In these markets, the externalities produced by the technical progress are internalized within closed or semi-closed networks: these entry barriers limit the social appropriation of these

externalities and the technical progress cumulative character. This kind of strategies and the Property Right fragmentation may be interpreted as market failures (see the formalization of this mechanism in the last section).

The anti-commons (Heller et Eisenberger, 1998) appear when knowledge is fragmented between various Property Rights holders. We can consider a technological process constituted by two complementary segments *a* and *b*. If, for example, there are two PR holders, A and B, and if A decreases its price, A and B demand will increase, although B doesn't decrease its price. So, the PR price necessary to use the technological process will be higher in this case, in relation to the situation where there is only one PR holder. These *externalities demand*<sup>1</sup> will produce coordination failures, and will result in a Welfare decrease corresponding to the higher price, in regard to the competitive price. This situation is characterized by *sub-additive costs* and may be compared with the monopoly traditional analyze, inasmuch, in certain conditions, the monopoly price is the lowest one.

Finally, when there is an indivisible public good, a common good in a determined community (common knowledge, ecological components, etc.), private appropriation modalities may prejudice the whole collectivity: the result may be a decrease of the stock available for the other agents and, in regard to the cumulative character of the production, a decrease of the total production growth. Applied to scientific and technological production, a such predatory behavior may conduce to a production innovation growth decrease; inasmuch, the privatization of the Scientific and Technological knowledge may produce a such result<sup>2</sup>.

### 1.3 IPR and new property forms

The digital economy development is characterized by a double movement: the transformation of the goods and services economic nature, and a transformation of the IPR forms.

On one hand, more part of these goods and services are public goods, whose principal characteristics are the non exclusion and the indivisibility. The economic dynamic consists in internalizing the network externalities that appear on these markets. In regard to such specificities, it is not possible to maximize microeconomic profit function equaling marginal cost and marginal product (Herscovici, 2008): these markets aren't walrasian ones, and its dynamic doesn't consist in selling private goods on the market, but to negotiate the access modalities to the networks, to "capture" the consumers/users, and to differentiate the public in regard to the different groups propensity to pay (Idem).

On the other hand, these goods are *experience goods* (Varian, 2003): so, the price system cannot transmit all the necessary qualitative information for the consumer. Other social mechanisms must do it, to compensate the system price failure: institutions, communities on line in regard to digital economy, and so on.

These new strategies consist in developing, in a first time, free, or quasi free services for the consumers: this mechanism permits to create the network and the externalities corresponding, and to divulgate the necessary information that the prices system hides (Akerlof and the lemons market, 1970). There are various examples which illustrate this kind of strategy:

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<sup>1</sup> They are close to the externalities of demand defined by Mankiw.

<sup>2</sup> In this sense, Nelson (2003) underlines the danger of such system, in regard to the Bayle Dole Act, in United States.

- i) Various software producers turn available, during a limited period, a determinate software.
- ii) Some economic studies determine the piracy level which is able to maximize the producer's profit.
- iii) All the free software (as Linux, for example, but Google, too) are other examples.
- iv) Finally, in regard to the immateriality of the diffusion support, in the case of the peer to peer networks, more particularly in the musical sector, it is not possible any more to control and to limit the piracy (Herscovici, 2007).
- v) Finally, new collective IPR forms appear: the various kinds of copy-left may be interpreted as *collective property form*. The same phenomenon is observed with the creative commons.

We observe a contradictory movement about the IPR system structuring. On one hand there is a relaxation of the IPR system, with the development of collective forms of property, and with the development of the piracy. This movement can be explained from the economic nature and market dynamic evolution, as the result of new competitive forms emergence.

But, on the other hand, there is a considerable extension of the private IPR system: (a) the IPR system is applied to new social fields: biotechnologies, scientific knowledge, software algorithms and pollution rights (b) with the Bayle Dole Act, public institutions may negotiate the product of scientific researches (c) these rights are negotiated within a private logic, on the base of market mechanisms (Coriat, 2002). In fact, we can observe a privatization of part of immaterial and scientific production, in the sense they aren't not any more directly administered by institutions. In this way, part of these productions is conceived as private goods, and no more as patrimonial goods (Herscovici, 1997).

## **2) Externalities and Intellectual Property Rights: Pigou versus Coase**

### **2.1 IPR economic specificities and pigouvian approach**

IPRs are a mechanism which permits to turn endogenous the externalities produced by some types of commodities like Knowledge and Information. In the case of industrial commodities, because of their economic characteristics, it is relatively easy to implement a property right mechanism, to implement price exclusion mechanisms and divisibility. For instance, in regard to Knowledge and Information, the problem is quite different: these commodities are characterized by no rivalry, by non exclusion and by their cumulative character.

- i) The non rivalry may be explained by the consumption *indivisibility*: the good does not "disappear" in the consumption process. It may be consumed, in its completeness, in a simultaneity, by other consumers.
- ii) The non exclusion means that it is impossible to control the various appropriation modalities of the service provided by the commodity. In other words, the commodity produces, intrinsically, *externalities* which benefit either the agents who don't contribute for its production.

iii) Finally, the production is cumulative in the way the actual production depends of the initial stock of knowledge available today. This dimension outlines the interdependency between the different producers, and the dangers of a “closed” IPR system (Neslon, 2003).

The IPR mechanism applied to this kind of goods will be specific, in function of these economic specificities; in this regard, Arrow (2000), outlines the retro-ingenerie process which characterizes this kind of commodity. The efficiency of the IPR system depends of the possibilities it offers to turn endogenous these externalities.

In fact, it is possible to distinguish two concepts of externalities: the first one may be called pigouvian, and comes from Pigou’s analyzes. In this perspective, the externalities are not transferable from an agent to other one; in this case, the endogeneization is implemented out of the market, based on an “administrative” mechanism. Two remarks are important: first, the externalities are, by nature, technological, as they don’t appear on the market (Benard, 1985); secondly, in regard to this characteristic, they cannot be negotiated on the market. So, they will be negotiated within an *institutional mediation*.

This institutional mechanism consists in taxing the agent who produced the negative externality, to compensate the disutility of the agents victims of this externality. It is possible to establish rules to end with the externality cause. In this perspective, externalities are conceived as *market failures*, which result from the divergence between private and social interest. The optimal pollution level is that one which equalizes the marginal profit of the polluter with its marginal cost plus the pigouvian tax.

This approach is based upon the collective interest primacy: the existence of pure public goods translates the fact that a private appropriation of these public goods produces negative externalities; in this case, some agents have to support negative externalities, and the situation is not any more Pareto optimal. These public goods are patrimonial goods (Herscovici, 1997), and the social interest consists in limiting its private appropriation modalities: the urban laws, the environmental regulations or the arts laws are based on such principles. The internalization modalities lead to institutional interventions to neutralize the effects of the private appropriation.

The Pareto criterion is used to guide these interventions; one state may be called Pareto superior ( $S_1$ ) when no agent prefers the anterior state  $S$ , and at least one agent prefers  $S_1$ . This criterion corresponds to distributive goals, in regard to utility and to income distribution. Finally, the transaction costs related with the public or institutional administration are ignored; the coasian approach will focus this point to elaborate his critic.

## **2.2 The coasian Social Cost Theory**

The new institutionnal school, inspired in Coase’s analyze, use other hypothesis an other axiomatic:

First, it doesn’t exist divergences between private rationality and collective welfare. On the contrary, when externalities appear, the most efficient regulation consists in a Property Rights (PR) private negotiation between the agents. The externality is not conceived any more as a

market failure but, on the contrary, as the result of the absence of a market mechanism, i.e. the absence of private negotiation. In opposition with Pigou's analyze, the externality is the result of PR failure. The solution consists in extending the market logic to social activities which can be negotiated in a private way, and which can be patented (Berg 2003, Brousseau 2003, Guerrien 1999).

This implies that (a) the PR are transferable (b) the PR system may be clearly defined and that (c) the agents rationality may implement a substantive rationality. The first criterion implies that the PR are negotiable on a market, and that it is possible to quantify them; the second that the object of PR may be defined without any ambiguity. The third criterion means that there is not uncertainty about the asset value and about the other agents' behavior; in regard to agents' behavior, all the types of information asymmetries constitute a limit to the concrete realization of a substantive rationality (Saussier Yvrandre Brillon, 2007, Williamson, 2002); in other words, *in Coase's approach, the contracts are complete, in relation with the hypothesis of substantive rationality.*

The PR are conceived as the possibility to use one specific production factor, and to produce the negative externalities which result from this use (Coase, 1960, p. 22). The PR are defined in terms of availability, and no more in terms of property (Kirat, 1999, p. 65), in the traditional sense.

The efficiency criterion is different of the one s used by the pigouvian economy: it incorporates the production or utility maximization, and ignores the income distribution implications.

In this regard, Coase affirms that “« Pigou is, of course, quite right to describe such actions as « uncharged disservices ». But he is wrong when he describes these actions as « anti-social » » (1960, p. 18).”. This means that Welfare is conceived only in regard to total production and/or utility. The criterion used is the Kaldor-Hicks'one. If A realizes a profit equal at 100, but if this activity produces a disutility equal a 30, and if A pays 30 to B, this situation is a Pareto optimal one. On one hand, neither agent prefers the anterior state; on other hand, the total utility net growth is equal at 70. However, in this situation, there are no transaction costs.

The problem is different when we introduce transaction costs: if, for example, in the last example, the transaction costs are equal at 80, there are two solutions:

- i) If the compensation is realized, the total utility (or production) reduction is equal at 10.
- ii) If the compensation isn't realized, the production increase is equal at 70. However, the inequalities are more important between the polluters and the polluted. And the situation isn't any more a Pareto's optimum. The inequalities become more and more important; the Kaldor-Hicks' criterion *only considers the PR allocation efficiency and its impact on production level.*

This kind of allocation of PR is possible only if the following hypothesis are verified:

- i) The different agents' PR are totally identifiable and have a monetary equivalent

- ii) They are transferable from one agent to other one.
- iii) The different opportunist behaviors are controlled, and don't imply in high transaction costs.

The market solution is, naturally, considered as the most efficient one: this means that the transaction cost are less high than they would be in an "institutional" situation, and that the situation is efficient, in regard to the criterion chosen.

## **II) The coasian approach limits: an other institutional alternative**

### **1) Complexity and private mechanism limits**

We can point out various limits to the coasian analyze, in regard to the hypotheses related to the commodities economic nature and to the behavior agents:

- i) The goods can't be specific, in Williamson's sense: if the goods are specific, the transaction costs level necessary to contain the uncertainty may be high (Williamson, 2000). In other words, when the assets are specific, the market does not constitute, systematically, the more efficient mechanism to internalize the externalities. For the same level of assets specificities, it is necessary to compare the transaction costs level which characterizes each kind of governance: the private one, the intra-firm integration, the public (or institutional) one, the hybrid ones, and all forms of community governance.

The specificity may be defined from the following characteristics: (a) the irreversibility asset, in the way it cannot be the object of multiple uses; the investment represents irreversible costs and cannot be used to produce other types of goods (b) the relationships between supply and demand are highly individualized; there is a bilateral dependency between buyers and sellers. In regard to IPR, in function of the production cumulative character, it is possible to speak in *multilateral dependency*. These specificities explain the behavioral uncertainty which characterizes these markets.

- ii) Part of the goods are experience goods; the prices system does not transmit, freely, the qualitative characteristics. The uncertainty related to these qualitative characteristics must be compensated by other mechanisms: a brand name strategy, share information communities, and so on. This kind of mechanism, necessary to the market coordination, translates some type of transaction costs related to the differentiation strategies, to the formation and coordination of share information communities, or to monitoring activities<sup>3</sup>. These markets are no walrasian ones, in the way that the transaction costs are positive, in the way that the prices system does not transmit, in a free way, all the information necessary to implement the transactions.

- iii) The agents' behavior is characterized by various types of information asymmetries: on one hand, the relationships between producers and consumers don't permit to evaluate the good utility or the asset marginal product. The prices system is noisy and can divulgate false

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<sup>3</sup> The communities on line development, for example.

information related to quality (Akerlof, 1970). Consequently, it is not possible to maximize microeconomic utility or profit functions, neither to determinate the precise extend of PR.

On the other hand, these goods are, at least partially, non exclusive and non rival. The opportunist behavior possibilities appear. The club operating may be prejudiced by the free rider behaviors<sup>4</sup>; it is a form of moral hazard. Finally, the producer can use the system price to transmit false quality informations (idem).

Differently from walrasian approach (the central auctioneer), or from rational expectations theory (continued market clearing hypothesis), for the new institutional economy, the central problem is that one related with market coordination mechanisms, in the way the walrasian natural adjustment does not work anymore.

We can observe two positions: Coase maintains the substantive rationality and the non specificities goods hypothesis, and advocates the market mechanism market to negotiate the PR. This means, in ultimate instance, that the contracts are complete and that, in this universe, there is no uncertainty; in this way, *he maintains a relationship with the neoclassical framework*. On the contrary, Williamson's analyze constitutes a rupture in regard to the neoclassical/walrasian construction, in the way he does not adopt the substantive rationality and the ergotic hypothesis: the agents' rationality is limited and the contracts are intrinsically incomplete.

Finally, we must examine the causal relationship between assets and goods specificities from one hand, and opportunist behaviors and coordination mechanisms, from other hand. From the perspective developed in this paper, it is possible to affirm the economic nature of the goods and services modifications implie in market mechanisms transformations, in new behaviors and an new coordination modalities.

How is-it possible to define this *complexity*? This concept is a multidimensional one:

i) in regard to the production knowledge cumulatively, the complexity may be defined by the uncertain economic valorization: hold-up strategies are commons and result in uncertain valorization.

ii) The PR concept was extended to process and is not any more limited to inventions. It is nearly impossible to identify all the possible applications of a determinate process; consequently, it is impossible to anticipate the marginal product of this asset, and to identify all these possible applications, as shows the juridical conflicts in sectors intensive in knowledge (software and pharmaceutical industry, for example).

iii) In regard to consumption, the complexity and the quantity of information and knowledge embedded in theses goods, are so important that is not possible any more to evaluate ex-ante, the utility. Moreover, this utility depends on the social consumers' differentiated tacit knowledge.

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<sup>4</sup> See Herscovici 2007.

The theoretical and empirical consequences are the following ones: the agents rationality is, intrinsically, bounded. These limits can be explained by the products complexity.

i) The universe is characterized by uncertainty. Some authors speak in behavioral uncertainty (Saussier Yvrandre Brillon, 2007), in function of the uncertainty which characterizes the impossibility to anticipate the agents' behaviors. At this respect, the theory games shows that the equilibrium is not a Pareto's one. This uncertainty is too an epistemic one and looks like the strong uncertainty in the post-keynesian definition. This uncertainty is related too to the economic valorization asset and so, to its marginal product.

ii) The contracts are incomplete, in regard to this complexity, in the way it cannot anticipate all the possible "states of the universe", may be in terms of agents' behaviors, may be in terms of capital marginal product.

In fact, it is possible to affirm that the goods and services complexity is a permissive condition in regard to opportunist behavior development. Moreover, the impossibility to implement an efficient IPR system amplify this tendency; finally, the coordination problem are fundamental, as show the communities on line different economic studies (Curien N., Fauchart E., Laffond G. and Moreau F., 2005).

This complexity concept looks like Williamson's assets specificities, as I shall show it. *The "neoclassical" approach only considers production costs, i.e. doesn't consider the transaction costs related with market mechanisms; this analyze can't be applied to complex goods as IPR.*

## **2) The Williamson's alternative**

### **2.1 Transaction costs and governance**

The question is, for Williamson, to establish, inside the market rules, a positive relation between the assets specificities and the amount of transaction costs (Williamson, 2002). Opposite to the standard neo-classical analysis<sup>5</sup>, Williamson' work asserts that the market rules defined by Walras don't produce, *systematically* a *first best*, in so far as they don't surely lead to a Pareto efficiency. Williamson establishes that each type of assets, according to its own level of specificity, is related to a specific type of regulation which minimizes transaction costs: "*Transaction costs economizing is the unifying concept* (Williamson, 2000, p. 180).

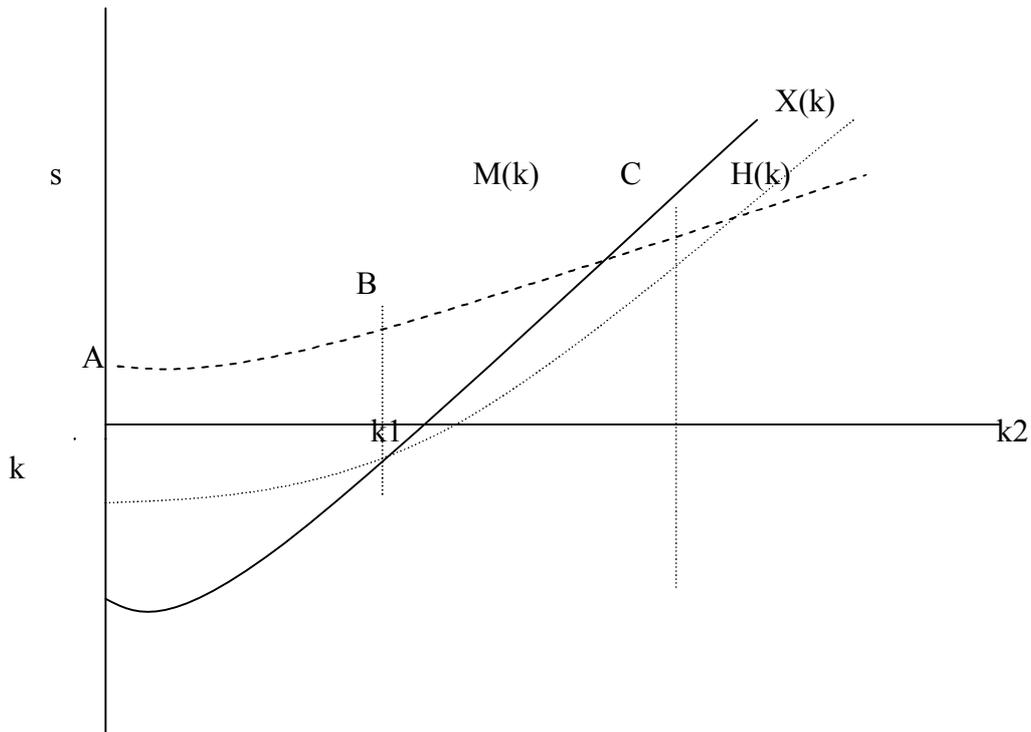
Specific assets present an irreversible feature : these costs are irreversible in so far as they can't be the object of multiple uses (Saussier, Yvrande-Billon, 2007, p. 18). Opposite to the neo-classical market, which main feature is to deal with anonymous supply and demand, concerning this type of transactions, the agents relationships are strongly individualized (Williamson ,2002, p. 176 ). A *bilateral dependence* arises between buyers and sellers, in so far as their relationships are defined in a contract compatible with the IPR system in force.

M represents the market governance, H the hierarchic governance, and X an hybrid form; *s* represents the transaction costs, and *k* the asset specificity. This graphics shows clearly that

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<sup>5</sup> By standard neoclassical analysis, I mean the approaches which use substantive rationality hypothesis and optimal adjustment realized by markets. This conception looks like Favereau's one (1990).

the market governance doesn't correspond, systematically, to a costs transaction minimization. Beyond a certain specificity level ( $k_1$ ), other regulations are more efficient.



Sources: Williamson, 2002.

Figure 1. Assets specificities and transaction costs

Intangible assets specificities are the following ones:

- i) These assets are related to a specific Knowledge that IPR system tries to protect.
- ii) Important investments are realized in specific direction: according to the cumulative feature peculiar to this kind of activities, they can't be used to produce other types of goods or services (*dedicated assets*, Williamson, 2002, p. 176). These types of transactions are, consequently, irreversible.
- iii) Finally, the economic recovery of this type of assets is a random one and implies uncertainty: the strategic or behavioral uncertainty (Saussier, Yvrande-Billon, 2007, p. 20) is coming from asymmetric information relative to the different agents' behavior, ex-post, as well as to the strategies they can develop.

Intangible assets, and IPR above all, are highly specific assets, and thus, submitted to a strong uncertainty : subsequently, actors' rationality is limited and contracts are, naturally incomplete.

## **2.2 The different kinds of governance.**

We must also consider the existing relationship between the nature of contracts, the assets distinctiveness and uncertainty. The more specific are the assets, the more important is the uncertainty related to their economic valorization; a way to reduce uncertainty can consist in arising transaction costs. However, we must consider, more deeply, in what way transaction costs would permit to reduce this uncertainty.

In the framework of a neo-classical analysis, asset is no specific, transaction costs are null and, thus, the market is efficient. On the contrary, when asset is specific, transaction costs are increasing and the best way to minimize these costs consists in developing an intra-firm integration, a public management or an hybrid form ( Williamson, 2000, p604 ). It is interesting to observe that, in case of a competitive market , more important is the uncertainty, higher is the asset price: thus, the asset offer-price incorporates a risk premium (Idem). *Transaction costs are including: safeguard clauses, penalties, asymmetries of information, control systems, and costs related to conflicts resolution by an external authority* (Williamson, 2002, p. 183).

Then, choosing a mode of governance depends on the relation between the price arising, because of a strong uncertainty, and the transaction costs necessary to reduce this uncertainty. If transactions costs are more important than the lost of collective welfare, the competitive market is the best governance solution; if transaction costs remain less important than the lost of collective welfare, then another type of regulation is required. In that way, regulations specific to digital economy aren't systematically those defined by Walras' framework; they require other modes of production and distribution for goods and services : networks, clubs or other types of *community governance*.

## **3) Some formalization**

### **3.1 Coase's theorem and efficiency criterion**

The Coase theorem, in the way it was presented by Stigler, may be formalized in the following way:

$$\text{Capital Marginal Product} \geq \text{pigouvian taxes} + \text{capital marginal cost} \quad (1)$$

$$\text{Pigouvian taxes} \geq \text{disutility} \quad (2)$$

The relation (1) means that the polluter will increase his production until his marginal product be equal to the marginal cost plus the pigouvian taxes; in other words, the capital marginal product is decreasing, and the capital marginal cost is creasing.

The relation (2) means that the polluted will accept the pigouvian tax as far as this tax is superior or equal to his disutility.

In regard to this approach, in the Coase theorem, the transaction costs are equal to zero.

The choice of a maximization criterion may be expressed by the following relations:

$$MPr = \text{pigouvian tax} + Mc \quad (3)$$

$$\text{Pigouvian tax} = \text{disutility} \quad (4)$$

(with MPr as the marginal product and Mc as the marginal costs)

The Pareto criterion is related *simultaneously*, to (3) and (4): it means that the PR allocation maximizes the total welfare and the income distribution.

On the contrary, the Kaldor-Hicks' criterion only considers (3): if MPr is inferior to pigouvian tax plus MC, the total product won't increase. In this kind of situation, the product will increase only if the MPr is superior to all the costs supported by the polluter firm. For that reason, the pigouvian tax will not be systematically implemented: in that way, the Mpr will be superior to the costs and so, the total product will increase. The fact to eliminate the redistribution problem, by eliminating the pigouvian tax, is the only way to increase total product.

### 3.2 The private negotiation limits: the inefficient situations

3.2.1 Moreover, the necessary conditions to implement a private negotiation are the following ones: it must be possible (a) to evaluate the polluter's marginal product and (b) the polluted's disutility.

I will show why it is impossible to concretely implement a private negotiation:

i) In the way the goods and services are complex, in the sense I defined this concept, the speculative dimension doesn't permit to evaluate, *ex-ante*, the capital marginal product; consequently, it is impossible to evaluate the marginal product and so to maximize the production function.

ii) In a similar perspective, if we consider that the rationality is bounded, in the Simon's sense, it is not possible to evaluate all the negative and positive externalities related to this kind of capital; consequently, it is not possible to evaluate the polluted's disutility;

3.2.2 The maximization mechanism implies that the marginal product must be decreasing (relation (3)). On the contrary, the knowledge production is cumulative: so, its marginal product is increasing<sup>6</sup>, and the traditional maximization mechanism is not any more valid.

It is possible to make the following observations: the Coase's analyzes limits may be explained in regard to the intangible capital economic specificities, which are ignored in this approach.

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<sup>6</sup> This result comes from the endogenous growth theories, or from knowledge economics.

**3.2.3** In regard to complexity and to bilateral (and multilateral) dependency, it is possible to consider the following situation: there are two firms which offer the complementary technological process to use a determinate technology. For example, each firm offers a specific algorithm, and the software production depends of these two different algorithms (it is possible to extend this reasoning to  $n$  firms).

Lets us write the following equations:

$$P_a = p_a \cdot q_a + E_{a/b} \tag{5}$$

$$P_b = p_b \cdot q_b + E_{b/a} \tag{6}$$

$$TC = p_a \cdot q_a + p_b \cdot q_b \tag{7}$$

With  $p$  as the price the firm sells the technology,  $q$  as the quantities sold and  $TC$  as the cost related to the technology acquisition.  $E_{b/a}$  represents the externality produced by A and endogeneized by B,  $E_{a/b}$  the externality produced by B and endogeneized by A.

We can suppose that, in a first time, A decreases its price; in regard to the bilateral dependency, the firm which will buy the complete technological process will have to buy one segment from A and the other one from B. If B maintains its prices constant, and if A decreases its price,  $E_{a/b} = 0$ , and  $E_{b/a}$  is positive; B benefits from the demand externalities produced by A, i. e., benefits of the demand increase produced by A. A produces a demand externality, which benefices to B<sup>7</sup>.

*Coordination failures appear:* the price decrease depends on the A anticipations about B strategy (and vice-versa). The market is not systematically the most efficient mechanism: in 2, 3 and 4, CT is higher than it would be in the case there was only one technology producer. In this case, it is possible to speak in *technological costs sub-additively*. This situation can be explained by opportunist behaviors form B, in the present situation.

Table 1 – Coordination failures

	$\square p_a$	$p_a$ constant
$\square p_b$	1	2
$p_b$ constant	3	4

The situation 1 corresponds to the market efficiency, in the way CT is minimized; all the other situations are sub-optimal, in the way CT isn't minimized.

<sup>7</sup> This is a demand externality, in the sense defined by the new-keynesian analyze.

In regard to this sub-optimality, a pigouvian tax implementation permits to neutralize the opportunist behavior (Rosenkranz S., Schmitz P.W., 2006):

$$Pa = pa.qa \quad (8)$$

$$Pb = pb.qb + Eb/a - Tx \quad (9)$$

$$TC = pa.qa + pb.qb \quad (10)$$

(TC as the technological cost, Tx as the pigouvian tax, and  $p$  as the marginal product)

The Tx growth rate must be superior to  $qb$  growth rate to neutralize the positive externality  $Eb/a$ ; such mechanism will incentive B to diminish its prices, and will be able to eliminate free-riders' behavior.

This theoretical result is paradoxical: *the private negotiation, and the market efficiency, cannot be implemented without the Government (or institutional) intervention*. In other words, the market cannot be efficient without institutional intervention; this one is necessary to prevent the opportunist behaviors, and to maintain the social efficiency conditions.

### Conclusion

In conclusion, it is possible to affirm that the IPR (and the PR) private negotiation isn't systematically the most efficient social instance: in regard to the goods specificities and complexity, in regard to the asymmetries information which characterize these markets, the private solution limits appear soon.

The transaction costs level produced by a market regulation is, in various situations, higher than the one produced by other kind of governance modality. The "neoclassical" analyzes limits may be explained from the fact that these analyzes don't consider, or minimize, the transaction costs produced by a private regulation. In regard to the complexity, in the way I defined this concept, the pertinent problematic isn't the one evaluated in terms of production costs and private costs; on the contrary, *the analyze has to consider too the transaction costs and the collective costs related with these mechanisms*.

From Coase's approach limits, this paper underlines the necessity of an institutional component to regulate the market activities, and to specify what is the most efficient governance modality to be adopted. From an institutional perspective, and more specifically from the "old institutional" approach, this means that the market, i.e the IPR private negotiation modalities, can't be conceived as an optimal mechanism and as an auto-regulatory instance.

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**Економіка знань та інформації, благополуччя та державне регулювання:  
економічна природа прав інтелектуальної власності**

В даній статті аналізуються підходи до оцінки економічної природи інтелектуальної власності та її використання з урахуванням економічної категорії благополуччя. Зокрема в статті доведено, що транзакційні витрати використання нематеріальних активів, зокрема прав інтелектуальної вартості значно перевищують витрати пов'язні на їх державне регулювання. Ефективність державного регулювання (ліцензування, обмеження, контроль, власність держави) значно перевищує витрати на переговори між контрагентами по впровадженню інтелектуальних прав власності. В дослідженнях «неокласиків» по просуванню інтелектуальних прав власності враховуються лише витрати на виробництво, проте транзакційні витрати ринкових механізмів не беруться до уваги. В роботі доведено, що підходи неокласичної економічної школи не можуть використовуватися для оцінки таких комплексних товарів як нематеріальні активи.

Теоретичні результати дослідження полягають в тому, що приватні переговори та ринкова ефективність використання прав інтелектуальної власності не можуть бути досягнуті без інституціонального втручання, тобто без державного регулювання, необхідного для підтримки

## **Розділ 2 Інноваційні процеси в економіці**

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*умов соціальної справедливості. Проблема забезпечення ефективності функціонування інтелектуальних прав власності полягає не лише в урахуванні виробничих витрат, а навпаки, необхідно брати до уваги транзакційні та колективні витрати.*

*Враховуючи всю комплексність нематеріального капіталу в роботі показано обмеження теорії Коуза та обґрунтовано її відмінності з теорією Вільямсона для нематеріальних активів. Зокрема, що стосується теорії Коуза, доведено необхідність використання інституціонального посередника та регулятора для досягнення соціальної та ринкової ефективності. Ринкові механізми довели свою низьку ефективність при регулюванні та функціонуванні такої категорії благ як нематеріальні активи.*

*В висновках можна стверджувати, що для інтелектуальних прав власності приватні переговори та ринкові механізми просування зазначених категорій товарів не забезпечують бажаний соціальний ефект, основною причиною ринкових провалів можна назвати специфіку та комплексність нематеріальних активів, неповноту та асиметричність інформації. Проведений аналіз може бути використаний в різних сферах пов'язаних з нематеріальними активами: просування товарів екологічної спрямованості, культурні товари, освітні послуги, виробництво інформації, економіка Інтернету.*

*Ключові слова: добробут, інформаційна економіка, операційні витрати, права інтелектуальної власності, управління.*

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