

Incentives, Efficiency and Social Justice: the Strange Case of Intellectual Property and Knowledge

Giovanni B. Ramello*

*POLIS - Department of Public Policy and Collective Choices
Università del Piemonte Orientale 'Amedeo Avogadro'*

Abstract: The main rationale for intellectual property relies on the thesis of the incentive to create. Creators and inventors are economic agents attracted by the returns they expect from their effort. This depiction is practical, but does not give due weight to the complexity of knowledge production.

This work does not contest the potential benefit of the opportunity for creators and inventors to reap some profit from their work. Rather, it considers the idiosyncratic nature of knowledge, which is simultaneously input, output and productive technology, and is closely linked to the social dimension. This provides further insight into the production process and suggests a significantly different framework for policy.

More specifically, because of the increasing returns governing creative technology, the efficiency criterion used to guide the economic choice calls for weak intellectual property rights, thus preserving wide access to knowledge. A stronger appropriation regime would significantly impair the total outcome of the creative processes.

Interestingly, this appears to apply equally from a social justice perspective, perhaps in an effortless solution to the age-old trade-off between economic efficiency and social justice.

JEL classifications: D63, D61, O31, O38, D78

Key words: intellectual property rights, knowledge production, increasing returns, knowledge sharing, productivity, social justice

* contacts: giovanni.ramello@sp.unipmn.it .

1. Introduction

Property rights have been a powerful device for promoting trade development, market existence and efficiency through human history. What is not owned cannot be traded. Hence, a well-defined set of property rights is central to the existence of trade.

In addition, commonly held resources cannot be fragmented without a specific set of rules assigning the various fragments to individuals. Thus, the market as we define it today cannot exist without property rights. On the other hand, a system of allocating goods that does not rely on market exchange—such as war, theft or gift—seems unable in most cases to warrant the attainment of maximum welfare through the allocation of a scarce resource to the one who most values it. Therefore, as confirmed by a long tradition of economic theory, a well defined set of property rights can play a crucial role in promoting the efficient allocation of scarce resources and social welfare¹.

Further, in Western culture private property has been the cornerstone of the capitalist society, to the point of being considered to some extent the necessary condition for the freedom of its citizens and the existence of the market, hence an irrefutable component of individual liberty. These premises are quite inarguable, and the beneficial role of property rights should be duly acknowledged.

However, the converse cannot be equally endorsed: recognizing the virtues of property rights should not mechanically translate into a blank check giving them the status of universal remedy for any issue.

From the perspective of demand, even when promoting productive efficiency, the market order can be (and very often is) unable to serve the criterion of social justice, and there is no denying that under many circumstances it leaves basic needs unsatisfied for a significant number of individuals. This in turn puts serious limits on the exercise of individual liberty².

¹ Since Coase, there have been several streams of economic literature dealing with property. For references, see Ramello (2007) and the rest of the book in which that article is published.

² Today, such instances permeate the core of economic debate. In corporate social responsibility, for example, aspects directly concerning efficiency seem to merge with those concerning social justice.

From the supply standpoint, too, property rights do not always translate into the attainment of efficiency, mainly because productive milieus present idiosyncratic features requiring different regulatory frameworks. Property rights are “genetically” conceived to manage economic resources for which excludability plays a significant role in regulating their use or avoiding their depletion, as in the case of private goods or commons (a fishery stock, a pasture, etc.). By contrast, they do not apply in the same way or produce a similar result in domains with distinct characters where excludability can directly influence productivity.

This chapter is an attempt to gain further insight into one of these cases, i.e. knowledge, a distinctive entity that deeply characterizes human relationships and the semantic sphere of human groups. Knowledge relies heavily on the sharing process, long governed by exchange mechanisms different from the market—mainly communication—and is now broadly “colonized” by the market paradigm through intellectual property rights.

The main rationale for justifying the change and the appropriation of this resource relies on the widely held belief that intellectual property rights promote efficiency by providing the owner/creator with the proper economic incentive for producing the optimal level of new knowledge and knowledge-intensive products. Noticeably, along the lines described above, this stance neglects the specific feature of knowledge and the consequences of the newly enforced excludability on its production.

Although not contesting the incentive effect provided to the owner by intellectual property rights, this essay discusses the consequences of this oversimplified assumption on knowledge. Using a selection of literature drawn from the disciplines focusing on knowledge, it attempts to expose some of the shortcomings of traditional economic theory as applied to intellectual property and to elaborate an alternative economic model from which policy implications can be drawn.

The main findings support the thesis that while limited appropriation via weak intellectual property rights can indeed provide some incentive for knowledge production, overly extensive appropriation by way of strong intellectual property rights will likely produce an adverse outcome

for the total amount of knowledge feasible and for overall efficiency. Thus, it is crucial to preserve wide accessibility to knowledge in order to promote efficiency in this domain. Interestingly, this prescription seems to serve social justice equally well, once again confirming the idiosyncratic nature of knowledge as economic resource.

The paper is organized as follows: section 2 introduces the standard thesis justifying intellectual property. Section 3 discusses the idiosyncratic nature of knowledge, which is simultaneously output, input and productive technology, and thus calls for a different analytical paradigm. Section 4 tries to systematize this assertion by means of a simple descriptive model that illustrates the effect of varying the strength of intellectual property rights on knowledge. Section 5 argues that the paradigm is equally serving the goal of social justice, and section 6 concludes.

2. Knowledge, Intellectual Property and Markets: the Role of Exclusion

Generally speaking, the traditional thesis advocated by the scientific literature depicts intellectual property rights as devices designed to encourage creative and inventive activity. From this perspective, patents and copyrights—but also trade secrets and trademarks, although with different flavors³—are essentially viewed as incentives to create, in accordance with the utilitarian tradition summed up in this well-known quote from Bentham (1839, p. 71):

“[...] which one man has invented, all the world can imitate. Without the assistance of the laws, the inventor would almost always be driven out of the market by his rival, who finding himself, without any expense, in possession of a discovery which has cost the inventor much time and expense, would be able to deprive him of all his deserved advantages, by selling at a lower price.”

³ In the case of trade secrets appropriation is pursued by protecting the secrecy of the discovery, while in the case of trademarks the incentive is to produce information that does not represent per se the product—at least in the original rationale—but an ancillary device to the market and competitive process (see Ramello, 2005a).

Consistently with this argument, intellectual property rights are held to address a specific market failure: the underproduction of knowledge because of the lack of profitability for inventors/authors. Variations on this theme abound (Ramello, 2005a).

The previous interpretation is highly convenient for economics theory, as it likens knowledge production to a standard manufacturing process. In this vein, the creator is represented as an economic agent aiming to maximize her/his utility under the assumption that “he who has no hope that he shall reap, will not take trouble to sow” (Bentham, 1839, p.31). Hence, the pecuniary incentive obtained thanks to intellectual property rights is needed in order to pay the opportunity costs of inventive and creative activity. Finally, the production process is treated as a typical manufacturing function with knowledge as the standard output⁴.

All in all, if this stylization is valid, intellectual property rights are a good thing and the main critical concern is the exclusion from consumption of a number of individuals because of market power and consequent above-cost pricing. The latter implies that the exclusion from knowledge enforced by intellectual property rights is a necessary condition of the newly devised economic mechanism. This point requires further discussion. Since Arrow (1962), the economic nature of knowledge has been identified with that of a public good. Once an individual is part of a human group, he/she cannot be excluded from the collective sharing of knowledge and his/her access to it is not rival⁵. Accordingly, from the standpoint of allocative efficiency, no-market is the optimal solution.

Therefore, market can be introduced in order to promote the attainment of productive efficiency, since, to borrow Bentham’s words again, “without proper assistance of the laws” a suboptimal quantity of knowledge would be produced. This, at least, is the thesis supported by the

⁴ The same criticism has been raised by other scholars. Among them, Weitzman (1998, p. 332) asks whether “[...] production of knowledge [is] a process that can be modeled by analogy with fishing new ponds or discovering new oil reserves.” and answers “[...] that something fundamentally different is involved here.”

⁵ If the individual is excluded, this means that he/she is no longer part of the human group. This happens for instance when he/she dies.

incentive-to-create argument. Nonetheless, once the market is shaped, a positive price translates into exclusion of those consumers not able to pay it.

However, since in the knowledge domain the marginal cost of reproduction is close to zero, in perfect competition this would essentially mean no or very low exclusion. Unfortunately, as discussed further below, perfect competition is not the market structure likely to arise within intellectual property domain, because the proper working of the incentive mechanism requires market power, which in turn produces the exclusionary effect.

It is worth noting that although the mere existence of intellectual property rights, as with ordinary property rights⁶, does not necessarily confer significant market power to the right-holders per se—so rationing via above-cost-pricing is not always found—the success of a given item of knowledge on the market and its exclusive exploitation is likely to produce market power, hence exclusion. This is consistent with the reward mechanism set up by the intellectual property rationale. In fact, most knowledge protected by intellectual property rights must necessarily be difficult to replace, otherwise, there would be no need to set up such a complex system of incentives. If the protected fragments of new knowledge were near or perfect substitutes for one another—as would be necessary to cancel out market power—then the intellectual property system would make no sense, because it would be easier and cheaper to provide direct incentives to only one (or a few) inventors and creators. This notion is thus consistent with the concept of the welfare-enhancing effects of variety in ideas, but implies imperfect substitutability and consequently market power⁷.

Also, in order to be effective, the incentive to create demands a profit and therefore above-cost pricing. In general this profit has been likened, since the earliest writings (Nordhaus, 1969), with the concept of quasi-rent. If this were not the case, the outcome would be exactly the same as that of a market without intellectual property rights and as Scherer (1980, p. 444) puts it (on the subject of

⁶A land owner has an exclusive right over his/her parcels, but this does not imply that he/she is monopolist. Neighboring parcels can be almost perfect substitutes.

⁷ As it is well known among economist, the imperfect substitutability is the feature that permits to raise price above cost.

patents), “If pure and perfect competition in the strictest sense prevailed continuously [...] incentives for invention and innovation would be fatally defective [...]”⁸.

Further, the possibility for above-cost pricing brought about by intellectual property rights is easy to observe in the real world, where mark-ups on such property are significant. This is the case for example of trademarks and fashion, copyrights and music, patents and pharmaceuticals. Taking that latter example, the exclusionary effects and tragic consequences of uniformly enforcing patent laws have been widely debated with reference to antiretroviral drugs and HIV/AIDS in South Africa, and clearly illustrate the extent of the problem (Attaran & Gillespie-White, 2001; Scherer, 2004).

On the whole, above-cost pricing and the consequent exclusionary effects are the outcome of the intellectual property rights system, but are also a major policy concern when it comes to distributive and egalitarian principles. Nonetheless, if the above justification holds, intellectual property rights are necessary and the exclusionary effects on knowledge can be to a great extent likened to those involving private property and restricted access to protected resources such as food, land, and water⁹. Knowledge is a valuable, scarce resource—although being a public good, it is scarce in production and not in consumption—and requires that enclosures be built to avoid free-riding and thus promote productive efficiency. This brings up the usual trade-off between efficiency and social justice, but the topics up for discussion seem, at first glance, not to differ from those pertaining to private property in general¹⁰.

⁸ In accordance with antitrust literature and practice, intellectual property rights per se do not in fact confer any market power, as affirmed by the European Court of Justice (*Deutsche Gramophon GmbH v. Metro-SB-Grossmärkte GmbH*, 78/80, June 8, 1971, ECR 487) and by the US FTC and DOJ (*Antitrust Guidelines for the Licensing of Intellectual Property*, 1995). Intellectual property right-protected information, if not successful, will not allow the legal monopoly granted by intellectual property rights to translate into an economic monopoly. However, it is the prospect of securing supraprofits (and therefore market power) that constitutes the incentive to create, since a perfectly competitive market would deliver no extra profits and therefore zero incentive. The logic behind intellectual property rights is thus to reward successful ideas with market power: to provide a monopoly, to a greater or lesser extent, as a private benefit in exchange for the creative effort/investment. For an in-depth discussion see Ramello (2005a).

⁹ Of course, in the case of private property, prices are exclusionary in the competitive regime as well because they must cover significant costs. By contrast, in the knowledge domain competitive pricing would imply prices close to zero since marginal costs are very low. It is the incentive mechanism that requires pricing above marginal cost.

¹⁰ For an economist’s perspective on property and hunger see for instance Sen (1988). For general theory on property see, among others, Munzer (1990).

As discussed in the following sections, however, this is not the case. Intellectual property rights concern an idiosyncratic domain where the typical exclusionary effects they create are amplified in a way that affects not only the static efficiency, in the manner with which we are familiar—i.e. by excluding those who are not able to pay the price for a good—but also the productive process (by causing the underproduction of a public good and the depletion of production technology). This, it will be argued, affects not only efficiency but also social justice.

3. The Idiosyncratic Nature of Knowledge

The standard economic argument about intellectual property rights works if we envision knowledge as a typical private good or a sum of private goods. As we will see below, however, this is actually not the case, and such a perspective is also misleading when it comes to setting policy. Rather, in the knowledge domain, it will be argued, criteria of both efficiency and social justice require substantial access to knowledge, which is only possible if intellectual property rights are weak.

3.1 Knowledge as a Social Entity

Indeed, while property exists in almost all human groups—although in distinct configurations—intellectual property is essentially a peculiar institutional outcome of Western culture, and the recent proliferation of the literature justifying intellectual property rights demonstrates that even in this specific legal culture, the concept behind it is not as trivial as it may seem. Rather, the design of a particular legal category for appropriating knowledge suggests that we are dealing with an idiosyncratic milieu, and what is standard elsewhere is not automatically transferable here. If one looks at the variety of intellectual property rights and the differences in design, one can infer that knowledge is so different from the typical property subject matter that it requires distinct paradigms for its appropriation, which must be finely tuned in order to obtain the expected outcome. In

particular, the nature of knowledge and the specificity of its productive process must be duly taken into account.

Nonetheless, a detailed description is not a trivial task. Knowledge is not just an intangible good or resource, defined and delimited like standard goods produced and exchanged on the markets, but a dynamic entity and a cognitive tool pertaining to social groups that is crucial to both the individual and to social action¹¹. Knowledge essentially belongs to the collective context in which it is created. It is brought to fruition in the symbolic and semantic sphere defined by society, and renewed through sharing among individuals, which is thus an indispensable feature for creative activity.

Anthropology and social sciences have long generalized knowledge as such: knowledge is public because meaning is, and obviously there can be no knowledge without meaning. Accordingly, there can be no meaning without a human group to share it. Therefore, although knowledge fragments are often created by individuals, this can only happen embedded within the broader context of the collective semantic space to which the knowledge fragments are inextricably tied¹².

Romney (1999, p.104) provides some enlightening insight into this idea: “knowledge, found mostly in humans, arises from human inventions, is learned and handed down from one generation to the next, and usually varies from one society to another. [...] it is shared among relevant participants and [...] it is learned as part of our social heritage. [...] In short, careful reflection

¹¹ It is worth noting here that I avoid the term “information” and the related “information goods” in favor of “knowledge,” in accordance with extensive economics literature (for a survey see Carlaw et al., 2006). Although the two terms are sometime used interchangeably, they refer to distinct concepts. An item of information is a message containing structured data, while knowledge addresses the cognitive context of economic agents (Cowan, David & Foray, 2000). It bears the expanded meaning commonly associated with “the state or fact of knowing,” and corresponds to the more general definition of “the sum or range of what has been perceived, discovered” (American Heritage Dictionary of the English Language, 4th edition, 2000). It is dynamic in nature, and can therefore never be entirely encoded or commodified as a whole. Although fragments can be encoded and somewhat appropriated, it is only an attribute of a collectivity of individuals (Cowan, David & Foray, 2000; Rooney, 2003; Ramello, 2005b). In effect, the dynamic character arising from the process of communication is necessary not only for the existence of knowledge, but also for the sustenance of human groupings (see Polanyi, 1966).

¹² There is extensive literature on this point. One of the most illuminating is Geertz (1973).

reveals that the very notion of [knowledge] involves sharing of ideas, concepts, behaviors, etc., by more than one person.”

On the whole, the above demonstrates two important features of knowledge: knowledge is both input and output as recognized though not developed by selected articles in economics¹³; and the sharing process is necessary in order to make any creative effort effective, constituting from this perspective a sort of production technology (Weitzman, 1998; Rooney et al., 2003; Ramello, 2005b).

Consistent with its social and dynamic nature, knowledge presents another puzzling feature not possessed by ordinary commodities: its “indivisibility,” which implies two orders of nuisances somehow connected to one another: first, the definition of what can be appropriated by an intellectual property right is not trivial; and second, the appropriation of a part always entails the whole entity (Rooney et al., 2003).

The first such concept, according to 19th-century English legal scholar Augustine Birrell, is easily explained: while it is simple to draw the boundaries of a physical asset—a leg of a mutton, in Birrell’s example—it is altogether impossible to determine (for example) how much a book truly belongs to an author, because any creative endeavour contracts a significant and indissoluble debt with its precursors, and with the context in which it is generated (Goldstein, 1994). This of course is consistent with the nature of knowledge as a public good.

Hence, the atomization process enforced via copyright, and via intellectual property rights in general, is just a rough approximation of the division of physical assets—land, cattle, etc.—while any appropriation in the knowledge sphere will be more extensive than in physical property domain, generally appropriating parts that are socially owned or that have been created by someone else.

¹³ There are few economics papers that take this feature into account. They generally emphasize appropriability over accessibility, with one notable exception being Arrow, who in his seminal paper (1962) warned that if this is the case, then private appropriation procured by intellectual property rights may seriously compromise the incremental accrual of knowledge and, consequently, the collective well-being. Unfortunately, Arrow does not follow up on this observation. More recently, Landes & Posner (1989) stressed that when enforcing copyright, there are two opposite effects: an increase in the supply of new works brought about by the statutory economic incentive, versus a decrease in supply brought about by the exclusionary effect of copyright. The resolution of this trade-off is the key to determining what the overall consequences of copyright will be. Nonetheless, they rely on some specific assumptions considering that the first effect will always prevail.

The second implication, again linked to its nature as a public good, is that because knowledge is a collective and dynamic entity, appropriation cannot concern only a specific number of bits, but also the process itself.

Taken together, these two notions can easily lead the intellectual property rights system into what can be termed a 'hyper-appropriation', where the typical exclusionary effects generated by property rights are amplified since they simultaneously affect "the product and the process."

The main reason for this outcome is the atomization procedure enforced by economic analysis representing human activities, which cancels from view all that resides in social relationships and which cannot be directly attributed to single individuals and pertains instead to human groups. In particular, this procedure of atomisation, according to its critics, has the effect of cancelling from view all that which cannot be directly attributed to single individuals, and which resides instead in the relationships between them (Granovetter, 1985)¹⁴. On the whole, this over-simplification leads to a misrepresentation of knowledge viewed as a sum of discrete bits of information, thus neglecting the social dimension and its role in the productive process.

3.2 *Codified and Tacit Knowledge*

We can elaborate on the above by adopting the analytical framework introduced by Polanyi in his seminal work *The Tacit Dimension* (1966), which mainly addresses the role of knowledge in the scientific domain but is widely referenced in the literature for its accurate description of the multifaceted nature of knowledge¹⁵.

Polanyi represents knowledge essentially as a dyadic structure, made up of two distinct but complementary components: 'codified knowledge', which can be articulated and encoded; and an immanent form of knowledge, thus defined 'tacit knowledge', which does not lend itself to articulation or codification but which is nevertheless communicated, and therefore exists in

¹⁴ This representation of human action' "disallows by hypothesis any impact of social structure and social relations on production, distribution, or consumption" and thus produces a poorly descriptive picture (Granovetter, 1985, p.483).

¹⁵ For a survey on economics literature see Cowan, David & Foray (2000).

interpersonal relations¹⁶. The former is a fragment of knowledge encoded in any one of the various media made available by society such as language, writing, reproduction technologies, and so forth. Because it can be encoded in discrete units (e.g., a book, a CD, etc.), it can also be commodified, appropriated by means of intellectual property rights and exchanged, giving rise to knowledge markets. Note that through the encoding process, knowledge becomes a static entity, and can be more or less likened to traditional private property such as a parcel of land or a can of beer¹⁷. After all, the very purpose of the label “intellectual property” is to bring appropriated knowledge into the realm of property.

On the other hand, the tacit form of knowledge is by nature a dynamic entity, and as such can never be entirely encoded and commodified. Consequently, as we shall see below, it cannot be produced and directly exchanged on the markets, thus giving rise to specific property rights on it, but depends instead on interpersonal relationships for its production and dissemination¹⁸. This is supported by various studies on technology transfer, which have stressed the difficulty of transferring the tacit portion of knowledge as compared with its codified portion, due precisely to the necessity of moving individuals as well as physical goods (i.e. of establishing ad hoc social relations), while demonstrating the inevitable need to promote both types of transfers if the policy is to have a favorable outcome (William & Gibson, 1990; Takii, 2004)¹⁹. In effect, tacit knowledge grows out of the dynamic sphere of the communication process, which is a prerequisite for the very existence of knowledge, as well as for the sustenance of human groupings.

¹⁶ For an overview see Cowan, David & Foray (2000). The fact that tacit knowledge is physically held by individuals does not negate its social nature, since, generally speaking, there is no such thing as a physical entity called “social relationships.” In other words, individuals are the “bearers” of this type of knowledge, but the expression and transmission of tacit knowledge nevertheless requires interaction between individuals to take place.

¹⁷ Interestingly, Thomas Alva Edison used the term “canned sound” to discuss the possibility of recording sound in a wax cylinder thanks to his 1877 invention, the phonograph (Silva & Ramello, 1999).

¹⁸ The dyadic nature of knowledge is also recognized by von Hayek (1945, pp. 521-522), who distinguished the portion of scientific knowledge that can be encoded as “unorganized knowledge [...], the knowledge of the particular circumstances of time and place,” which is essentially inalienable and demands the participation of several individuals in order to be exploited.

¹⁹ This assertion does not deny that in specific cases, intellectual property rights can play some role in transferring both codified and the related tacit knowledge by facilitating contracting and interpersonal interaction. However, this can be seen as more an exception than a rule and strengthens the argument that in intellectual property, a more conscious balance should be considered between various effects (Arora & Merges, 2004; Ramello, 2005c).

It is worth noting that in view of the dyadic structure, the knowledge set encompasses the sum of codified knowledge fragments and their exchange does not *per se* imply the transmission of the tacit dimension. Given its nature, tacit knowledge can only be transmitted within a context of social interaction. This explains, for example, the rationale behind typical educational systems: books are generally used to provide information, but the presence of a teacher is necessary to impart learning, and in general to communicate those aspects of knowledge that cannot be statically encoded. Accordingly, Nelson (2003, p. 917) asserts that any “classroom equipment [...] [is a] complement not a substitute for an effective teacher working with students.” What is missing, in fact, is the imparting of that tacit knowledge which books alone are unable to convey²⁰.

On the whole the above has serious implications for knowledge production: tacit knowledge and the related social relationships are not only an important part of knowledge, but also a crucial determinant for the productivity of the creative process²¹. In other words, the existence, transmission and development of knowledge, all at once representing the productive technology require as a necessary condition the social interactions which in the knowledge domain are called ‘sharing’, what elsewhere has been termed as “some kind of cumulative interactive process” (Weitman, 1998, p. 332). This is tantamount to asserting that knowledge, when construed as a technology, presents increasing returns in the access

Several studies in fields as diverse as medical sciences, organizational sciences and economic growth essentially confirm this claim²².

4. Access to vs. Exclusion from Knowledge: a Simple Descriptive Economic Model

Further to the above, the effects of intellectual property rights are various and all should be properly taken into account in order to evaluate the overall outcome. In particular, considering the

²⁰ Nelson & Winter (1982, p. 78) further argue that “[...] a trait that distinguishes a good instructor is the ability to discover introspectively, and then articulate for the student, much of the knowledge that ordinarily remains tacit”.

²¹ Nelson & Winter (1982) explicitly introduce the productive role of tacit knowledge

²² Willison & MacLeod (2002), Liebeskind et al. (1996), Romer (1990), Weitman (1998). The adoption of specialized knowledge such as judge-made law governed by an open access model is essentially rooted in the need to preserve the collective dimension of creation, and can be interpreted in the same vein (Harnay & Marciano, 2007).

joint nature of knowledge as an output, an input and a productive technology, the appropriation set up by intellectual property produces three categories of consequences. First, there is the pecuniary incentive that can play the useful role of attracting individuals to the inventive process; this is not challenged here *per se*. Of course, for anyone who has to earn a living, expecting economic benefits to exceed opportunity costs thanks to specific property rights can make knowledge production an attractive endeavour. This is not the only feasible incentive, but is certainly an important one²³. Secondly, as pointed out by Arrow (1962) and more weakly by Landes and Posner (1989), the incentive mechanism will likely increase the cost of knowledge as an input. Hence, the total incentive effects will be discounted by the increase in production costs. Finally, the exclusion enforced via intellectual property rights will impair the sharing process and according to what discussed, thus the productivity of knowledge as a technology.

Naturally, the net balance of the three effects is not obvious and must be properly considered when setting policies. In particular, the last feature is crucial for understanding the overall consequence of exclusion, and provides an important new argument for preserving extended access to knowledge in view of efficiency. This, in turn, suggests a convergence between the promotion of efficiency and the pursuit of social justice in the knowledge domain, as further investigated in the next section.

The model shown below tries to capture this view by proposing a bridge between standard economic reasoning and the hypothesis concerning the idiosyncratic nature of knowledge. Figure 1, helpful for positive purposes, highlights the consequence of neglecting the nature of knowledge as a productive technology. It starts from a standard representation of the “incentive to create,” then introduces the changes occurring once the effect on the production side are considered by overlapping a number of different pictures corresponding to varying levels of appropriation via intellectual property. Figure 2 presents the final model once all the knowledge features are considered, and is useful for normative purposes.

²³On an in-depth discussion of different incentives see for instance Nelson (2003).

Let us imagine, for the sake of simplicity, that the production of new knowledge depends only on a variable θ representing the strength of the intellectual property right and thus negatively affecting access to knowledge²⁴. In other words, θ measures the degree of appropriation permitted by an intellectual property right. Let us assume $0 \leq \theta \leq 1$, though this assumption will be more practical in Figure 2. Thus, $\theta=0$ means no intellectual property rights; $\theta=1$ implies the strongest level of appropriation and, in accordance with incentive theory, should stimulate greater revenue for the owners of the rights.

The value of θ depends on several variables such as the right duration (time span) and scope (breadth of appropriation), the strength of law enforcement (hence the infringer's likelihood of being caught), the extent of fines and criminal sanctions, the selectiveness of entitlement criteria, the extension of spill-over spaces intended as derogation of appropriation, and so forth²⁵. Consequently, while the definition of θ is easy in abstract, it is difficult as a matter of practice, meaning that it is simple to talk about weak or strong appropriation is but hard or even impossible to define a precise (e.g. optimal) level. This observation, as discussed further below, is useful for policy prescriptions.

(FIGURE 1 ABOUT HERE)

The F_i curves with $i=1,2,\dots,n$ in Figure 1 represent a set of knowledge production functions—roughly speaking, productive technologies—such as $q=F_i(\theta)$ where q is the level of knowledge produced and $q^*=F_i(0)$, with $q^*>0$, the level of knowledge freely produced in a given state of nature. The latter value is easily demonstrated by the observation that knowledge production exists throughout human history and societies, even in their absence. It takes into

²⁴ Remember that the exercise of the exclusive right granted by intellectual property rights, as discussed in section 2, implies above-cost pricing and by consequence exclusion.

²⁵ The strength of appropriability is linked to the design of the law and other law enforcement variables. For a discussion of distinct intellectual property rights and references to further literature see Ramello (2005).

account that for any given human group there is a certain level of knowledge sharing and productivity.

The slope of F_i production functions is a consequence of the increasing production costs, as explained above: the stronger the appropriation, the higher the cost of knowledge as an input. Accordingly, the incentive effect along a given curve (e.g. F_1) diminishes with the increase in θ .

Nonetheless, it has been argued that the productivity of knowledge will also be affected by appropriation, decreasing in θ due to the negative effect on the sharing process. Hence, a significant increase in θ will negatively impact the creative technology; this can be taken into account by the shift from a given production function, say F_1 , to another to the left, say F_2 , where any given level of θ will generate a lower level of q .

This impairment process will go on as long as appropriation is strengthened, and for certain level of θ , the effect will become totally negative and the production function will be downward sloping, as in the case of F_n thus always undermining q^* .

This contradicts the standard incentive theory, for which the production of knowledge is always positively related to appropriation; hence the production function should not change. The idea behind the incentive rationale is therefore that if one raises the level of θ , q will likewise increase. For a low intellectual property right strength, say θ_1 , the production function in a given time will be described, for instance, as F_1 and the level of knowledge produced will be q_1 which is greater than q^* . Hence, intellectual property rights have the desired incentive effect on the production of knowledge.

By this reasoning, a stronger appropriation regime θ_2 should thus produce a higher quantity of new knowledge, say q_{2a} , and accordingly exclusion will always enhance the welfare.

As discussed above, however, this does not actually happen if we introduce the idiosyncratic nature of knowledge. Expectations will be only partially fulfilled because the stronger intellectual property right regime will negatively affect the sharing process, hence productivity.

In Figure 1 this effect causes for instance the shift from F_1 to F_2 , the new production function characterized by lower productivity. Consequently, there will be significantly less new knowledge, since $q_{2b} < q_{2a}$.

Nevertheless, in this case the incentive still seems to work as the quantity of knowledge still increases in θ . Things change when θ grows even stronger, up to θ_n for example, the production function will continuously shift to the left: let us assume this has become F_n . Clearly, in this case the knowledge produced will be less than in the absence of intellectual property rights, because $q_n < q^*$.

Taking this to an extreme, when intellectual property right strength is high enough, the quantity of new knowledge produced will tend toward zero, meaning that the entire sharing process will be impaired, that is to say tacit knowledge will be erased, and creative activities will come to a halt. This outcome is essentially the effect of an excessive appropriation of intellectual property on knowledge as a technology and corresponds to an extreme situation ($\theta=1$), which is difficult to verify since no law yet designed permits total appropriation²⁶. In a sense it represents the upper boundary of appropriation.

The pattern for productivity described above can be further clarified by linking all the points corresponding to different pairs of (q, θ) — q^* , A, B, C, etc.— as shown in Figure 1. The outcome will be curve presented in Figure 2.

(FIGURE 2 ABOUT HERE)

It is straightforward to note that q increases with appropriation at lower levels and decreases when appropriation is greater. In particular, the figure shows that below a certain level $\underline{\theta}$,

²⁶ The best example of the described outcome is brought by what happens when all the individuals belonging to a specific culture die. It is possible to preserve objects and relics, cultural products and literary texts, i.e. codified knowledge, but the elements pertaining to interactions among individuals are lost and no new knowledge is produced.

corresponding to weak appropriation, intellectual property rights indeed produce a positive effect on knowledge production; though for higher levels the overall effect will be negative.

In other words, appropriation by means of intellectual property, similarly to what happens with trade tariffs or taxes, acts as a sort of tax on the production of knowledge: a certain level of appropriation has positive effects on productivity up to a given threshold, after which the effects will be negative.

At this juncture, the next logical step for economists would be to find the optimal level of appropriation by means of the usual mathematical tools, which in Figure 2 happens to be $\underline{\theta}$. Unfortunately, this is easy to do in theory and almost impossible in practice, because the model presented above indicates just the essence of what happens in the real world. Considering the high variability of creative and inventive environments, the differences in knowledge produced by different intellectual property rights and the number of all variables defining θ , the search for this figure could be fruitless.

Nonetheless, from a qualitative perspective the previous result has an important consequence in terms of normative implications. Indeed, at least one important policy prescription can be inferred: the total appropriation of knowledge will never lead to an efficient outcome. Accordingly, the general rule that emerges is that weak intellectual property rights will likely have a more efficient outcome than strong ones.

All in all, if intellectual property can do some good, this will occur in a region of limited appropriation which implies of course lower productive costs for follow-on creators, wider access to knowledge, and the possibility of free-riding, understood as unpaid access to knowledge for a considerable number of individuals²⁷. Stated differently, efficiency in the knowledge domain requires the preservation of broad access.

²⁷ To put it differently: “[a] culture could not exist if all free riding were prohibited within it” (Gordon, 1992, p. 167). This is consistent with a significant stream of literature claiming the central role of free-riding and knowledge spill-over in its production.

5. Social Justice Meets Efficiency

The policy-setting concept described above has another interesting feature, as it also serves the aim of social justice with regard to the provision of a range of welfare rights outside the sphere of income and the satisfaction of basic needs, regardless of individual merit (Stapleton, 1998)²⁸.

As economic theory broadly attests, entitlement to property rights affects the distribution of resources and is essentially geared toward promoting efficiency. The idea is that property rights attempt to achieve the optimal allocation of scarce resources in order to enhance the social welfare, roughly interpreted in the Pigouvian tradition as the maximum production of wealth. In other words, the only distributive principle in economics asserts that a given resource should be allocated by the most efficient user, regardless of other individuals or fairness.

From an egalitarian perspective, however, the concept of social justice demands that the distribution of scarce resources preserve the equal right of individuals to “the most extensive total system of equal basic liberties compatible with a similar liberty for others” (Rawls, 1971).

Clearly, although both principles deal with the allocation of scarce resources, they are guided by distinct and somewhat divergent goals. While the former essentially aims to determine the optimal use of a given (scarce) resource in order to achieve a higher level of wealth, no matter who benefits, the latter hinges on the principle of equality among individuals, and thus specifically takes into account the distribution of that resource and the provision to every individual of a range of welfare rights (Barry, 1989; Munzer, 1990).

In other words, while economic theory trusts in the mere assignment of rights and in the power of the market to produce efficient outcomes, completely disregarding the issue of distribution, the social justice rationale focuses on distribution and on the asymmetries created by economic mechanisms, possibly recognizing the need for an authority to take action on distributive matters.

²⁸ Of course the concept and the definition of social justice have been disputed and questioned ever since Plato’s Republic. I am endorsing here the modern thesis that social justice “has less to do with individual conduct than a ‘fair’ distribution of material benefits and burdens in society and in this perspective it represents a major function played by states”(Stapleton, pp. 468-469).

Generally speaking, the two principles produce a trade-off that can be solved only on the basis of political considerations. This is the typical dilemma raised, for instance, by the general equilibrium theory, where most efficient solutions (almost) never meet the criterion of social justice²⁹. What's more, economic theory is totally unequipped to deal with this³⁰. Given the considerable number of efficient solutions lying on the contract curve, economics, has no guiding principle for choosing a specific solution. Even a very asymmetric distribution of resources—e.g., one party has all and the others nothing—is acceptable on the grounds of efficiency.

Social justice sets a different condition: the choice should be guided by the achievement of a common level of “wellbeing,” i.e. the satisfaction of basic needs, regardless of personal merit, that are deserved simply because one is a human being living in a given society (Rawls, 1971; Miller, 1976). This principle relates neither to the claim of an identical level of material resources, nor to a minimal standard of living, nor to the goal of efficiency. Rather, it concerns “the willingness to recognize the rights and liberties of others and to share fairly in the benefits and burdens of social co-operation” (Rawls, 1971, 60-61).

Obviously, then, the creation of new property rights for a social entity such as knowledge addresses the concept of social justice, since it impacts not only the distribution of knowledge and rights over knowledge but also the social relationships, communication processes and self-expression that access implies. All in all, appropriation and the resulting exclusion conflict with social justice.

It is worth noting that the feasibility of a higher level of knowledge does not imply an increase in social justice. Referring to Figure 1, for instance, the q_I quantity of knowledge produced is in economic terms better than q^* . However, since it is achieved by increasing the property of a few individuals and consequently prejudicing access to knowledge by a large number of individuals, it

²⁹ For a survey on general equilibrium theory see any textbook on microeconomics.

³⁰ Naturally, this assertion refers mainly to the mainstream neoclassical tradition and does not consider the heterodox perspectives that attempt to solve the conundrum. Thus far, however, there is a widespread idea that the needs of many, if not most, individuals are unmet in the market order and in the theoretical representation of it (Stapleton, 1998).

can negatively affect distribution, increase exclusion and thus hinder social justice. This effect is more likely when the level of appropriation θ is higher.

When appropriation is excessive, the outcome is a reduction in the total amount of knowledge that is socially feasible ($q < q^*$ in Figure 2). This of course renders the impairment of social justice more likely as it significantly reduces the total amount of resources.

It also violates social justice from an inter-temporal perspective, because appropriation by a given generation depletes the resource for the next generation, again, now accessing a stock of knowledge $q < q^*$. It is intuitively clear that from an economic viewpoint, the society in time t produces an externality over $t+1$ and subsequent generations. Accordingly, extended appropriation at time t not only impairs social justice for the current generation, but can prejudice the attainment of it for any future generation. Indeed, the egalitarian principle embedded in social justice dictates that no generation has a greater right to a given resource, so “each generation accepts the dual role of beneficiary and trustee” (Frischmann, 2005, 464-465). This means that individuals are prohibited from compromising the interests of future generations in a given resource, intended as their right to inherit the resource in at least the same conditions as previous generations have had³¹.

On the whole, the social justice rationale argues again although on different grounds for as little appropriation as possible. As discussed in section 4, this is also valid from the perspective of efficiency: given the idiosyncratic nature of knowledge as a dynamic entity, its existence requires the preservation of sufficiently wide accessibility, while extensive appropriation impairs the resource and its productivity. When increasing returns in the number of users do matter, as in case of knowledge, the scarcity concept is simply reversed (Ramello, 2005b). Then the exhaustion of knowledge is caused by under-exploitation, which calls for weak propertization. Hence, in the knowledge domain, efficiency seems to shake hands with social justice.

³¹It goes without saying that this concept should be equally applied to other resources such as the environment. However there is a significant difference in the case of knowledge relying on the concept of scarcity, again highlighting its distinctive nature: while in the former, depletion of the resource stems from its overutilization—this is the typical case of commons that exhibit diminishing returns with a growing number of users—in the latter, depletion is caused by underutilization since the creative commons present increasing returns with number of users. For an in depth discussion of this point see Ramello (2005b).

The earliest structure of intellectual property rights appeared to be consistent with the enounced rationale, as the rights were originally conceived to give individuals incentive and entailed marginal private appropriation. This feature kept the impact on the public dimension and the sharing process as low as possible. Copyright, for example, was originally drafted to expire 14 years after the publication date. The fair use doctrine, again concerning copyright, permitted several exceptions to the exclusive right granted to the owner. In science, wide swaths of public domain were recognized in order to preserve the basic tools of research.

The current extension of copyright to 70 years after the author's death, the progressive erosion of fair use space, and the possibility to copyright and patent an increasing number of subject matters is now changing the entire framework, with apparent disregard for the original criteria.

6. Concluding remarks

The main rationale for justifying intellectual property relies on the thesis of the incentive to create. Creators and inventors are economic agents attracted by the returns they expect from their effort. This depiction is practical and widely endorsed by law and economics theory, but does not give due weight to the complexity of knowledge production.

This work does not contest the potential benefit of the opportunity for creators and inventors to reap some profit from their work. Rather, it considers the idiosyncratic nature of knowledge, which is simultaneously input, output and productive technology, and is closely linked to the social dimension. This provides further insight into the production process and suggests a significantly different framework for policy.

More specifically, because of the increasing returns governing the creative technology, the efficiency criterion used to guide the economic choice calls for weak intellectual property rights, thus preserving wide access to knowledge. A stronger appropriation regime would significantly impair the total outcome of the creative processes.

Interestingly, this appears to apply equally from a social justice perspective, perhaps in an effortless solution to the age-old trade-off between economic efficiency and social justice.

References

- Attaran A. and Gillespie-White L. (2001), 'Do Patents for Antiretroviral Drugs Constrain Access to AIDS Treatment in Africa?', *Journal of the American Medical Association*, 286, 1886-1892.
- Barry B. (1989), *A Treatise on Social Justice* (London: Harvester-Wheatsheaf).
- Bentham J. (1839), 'A Manual of Political Economy', in (1962) *3 Works of Jeremy Bentham*, Jay Browning.
- Carlaw, K., L. Oxley, P. Walker, D. Thorns and M. Nuth (2006), 'Beyond the hype: intellectual property and the knowledge society/knowledge economy,' *Journal of Economic Surveys*, 20, 633-690.
- Cowan, R., David P.A. and Foray D. (2000), 'The Explicit Economics of Knowledge Codification and Tacitness', *Industrial and Corporate Change*, 9, 211-253.
- Frischmann B. (2005), 'Some Thoughts on Shortsightedness and Intergenerational Equity', *Loyola University Chicago Law Journal*, 36, 457-467.
- Granovetter M. (1985), 'Economic Action and Social Structure: The Problem of Embeddedness', *American Journal of Sociology*, 91, 481-510.
- Geertz, Clifford (1973), *The Interpretation of Cultures* (New York: Basic Books).
- Goldstein P. (1994), *Copyright's Highway* (New York: Hill and Wang).
- Gordon W. (1992), 'On Owning Information: Intellectual Property and the Restitutionary Impulse', *Vanderbilt Law Review*, 78, 149, 167.
- Hardin, G. (1968), 'The Tragedy of Commons', *Science*, 162, 1243-1248.
- Harnay S. and Marciano M. (2007), 'Intellectual property rights and judge-made law: An economic analysis of the production and diffusion of precedent', in Porrini D. and Ramello G.B. (2007) (eds) *Property Rights Dynamics. A Law and Economics Perspective*, (London and New York, Routledge.
- Landes W.M. e Posner R.A. (1989), 'An Economic Analysis of Copyright Law', *Journal of Legal Studies*, 18, 325.
- Langlois R.N. (2001), 'Knowledge, Consumption and Endogenous Growth', *Journal of Evolutionary Economics*, 11, 77-93.
- Liebeskind J.P., Lumerman Oliver A., Zucker L. and Brewer M. (1996), 'Social Networks, Learning, and Flexibility: Sourcing Scientific Knowledge in New Biotechnology Firms', *Organization Science*, 7, 428-443.
- Miller D. (1976), *Social Justice* (Oxford: Clarendon Press).
- Munzer, S.R. (1990), *A Theory of Property*, Cambridge: Cambridge University Press.
- Nelson, R. R. and Winter S. G. (1982), *An Evolutionary Theory of the Economic Change* (Cambridge, Mass: Belknap Press)
- Nelson, R.R. (2003), 'On the Uneven Evolution of Human Know-how', *Research Policy*, 32, 909-922.
- Nordhaus W.D. (1969), *Invention, Growth and Welfare*, MIT Press, Cambridge Mass.
- Polanyi, M. (1966), *The Tacit Dimension*, New York:Doubleday
- Ramello G.B. (2007), 'Property Rights Dynamics: Current Issues in Law and Economics' in Porrini D. and Ramello G.B. (2007) (eds) *Property Rights Dynamics. A Law and Economics Perspective*, (London and New York, Routledge.
- Ramello G.B. (2005a), 'Intellectual property and the markets of ideas', *Review of Network Economics*, 4, 68-87.
- Ramello G.B. (2005b), 'Private appropriability and Knowledge Sharing: Contradiction or Convergence ? The Opposite Tragedy of Creative Commons', in L. Takeyama L., W. Gordon & R. Towse (eds), *Developments in the Economics of Copyright*. Cheltenham (UK) – Northampton (MA, US): Edward Elgar.
- Ramello G.B. (2005c), 'Property Rights, Firm Boundaries and the Republic of Science', *Industrial and Corporate Change*, 14, 1195- 1204.

- Romer P. (1990), 'Endogenous Technological Change', *Journal of Political Economy*, 98, 71-102.
- Romney, A.K. (1999), 'Culture Consensus as a Statistical Model', *Current Anthropolology*, 40,103-115.
- Rooney, D., Hearn, G., Mandeville T. and Joseph R.(2003), *Public Policy in Knowledge-Based Economies*, Cheltenham-Northampton: Edward Elgar.
- Scherer, F.M. (2004), 'A note on Global Welfare in Pharmaceutical Patenting', *World Economy*, 1127-1142.
- Scherer, F.M. (1980, 2nd ed), *Industrial Market Structure and Economic Performance*
- Schumpeter J.A. (1934), *The Theory of Economic Development* (Cambridge: Harvard University Press).
- Sen A. (1988), 'Property and Hunger', *Economics and Philosophy*, 4, 57-68.
- Silva F. and Ramello G. B.(1999), *Dal vinile a Internet. Economia della musica tra tecnologia e diritti* (Torino: Edizioni della Fondazione Agnelli).
- Stapleton J. (1998), 'Social Justice', in Newman P. (ed.) *The New Palgrave Dictionary of Economics and the Law*, Macmillan, London, Stockton, New York, vol. 3, 468-476.
- Takii K. (2004), 'A Barrier to the Diffusion of Tacit Knowledge', *Review of Development Economics*, 8, 81-90.
- von Hayek, F. (1945), 'The Use of Knowledge in Society', *American Economic Review*, 25, 519-530.
- Weitzman M.L. (1998), 'Recombinant Growth', *Quarterly Journal of Economics*, 113, 331-360.
- Williams, F. and D. V. Gibson (eds, 1990), *Technology Transfer: A Communication Perspective* (Newbury Park: Sage).
- Willison, D.J. and MacLeod S.M. (2002) "Patenting of Genetic Material: Ar the Benefits to Society Being Realized ?," *Canadian Medical Association Journal*, 167: 259-262.

Figure 1

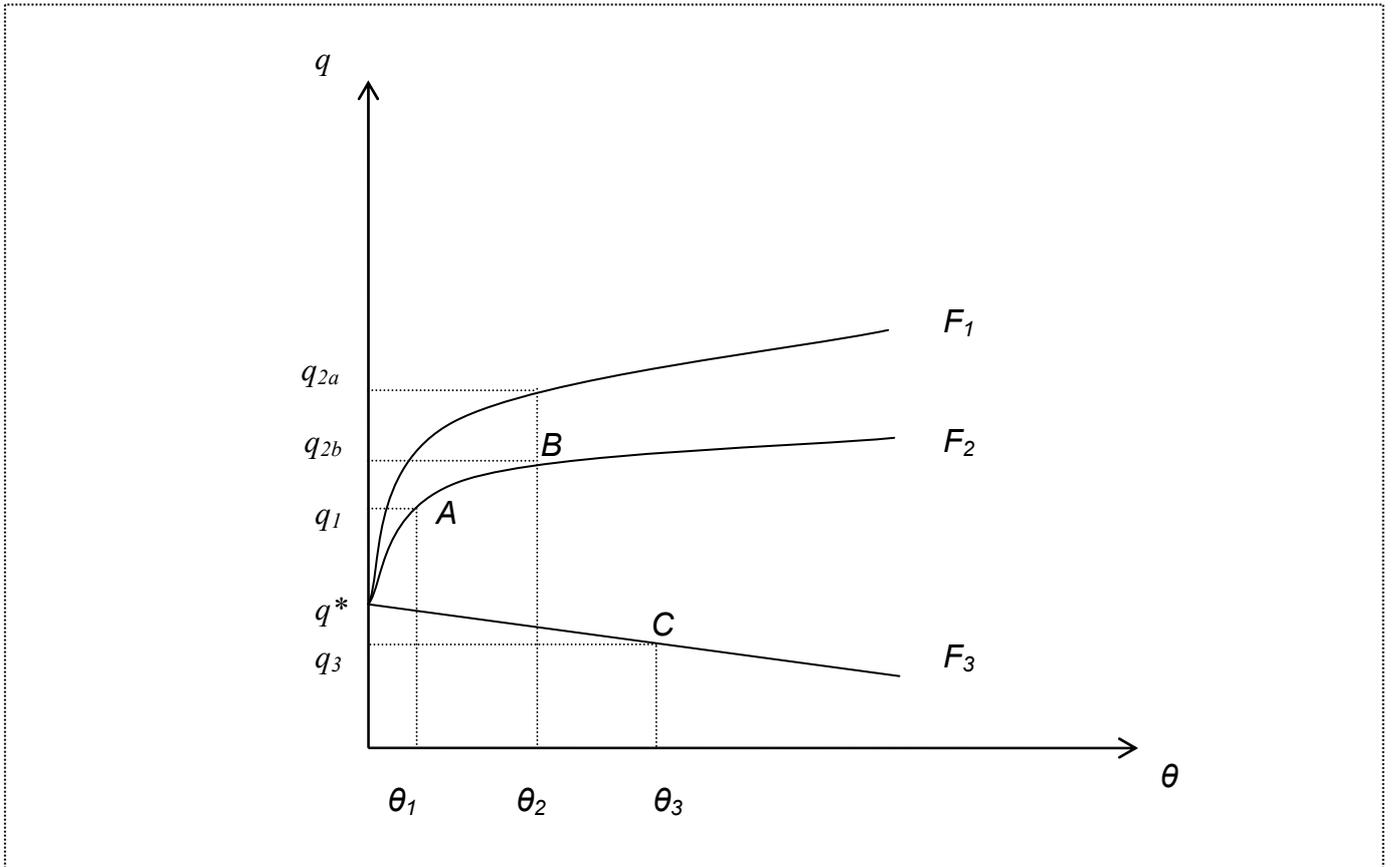


Figure 2

