Chapter 1

INNOVATIONS AND INTELLECTUAL PROPERTY STUDIES

An introduction and overview of a developing field

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Chapter contents:

Abstract: The fundamental role of innovations and their economic and legal aspects are described as a starter before departure into the book. A number of illustrations of close interaction between economic, legal and technological changes related to IP are provided as a contrast to the long-standing separation of economics from law and IP studies, thereby indicating a need for further interdisciplinary research and teaching in the IP field. To help meet this need is the purpose of this book.

A bibliometric analysis is provided, showing that the IP field is rapidly growing, also relative to social sciences in general. US journals and authors dominate the field. Law and economics, with economics catching up from far behind, are dominant disciplines in the IP field but fairly separated, although showing signs of science convergence over time, with economists dominating cross-disciplinary works.

The end of the chapter outlines the book as a whole.

There are three sorts of people in the world – those who can count and those who cannot count.

Once discovered, this joke was novel to the world. Being a joke it is also non-obvious, since otherwise it provides no humour. To the extent that a good laugh enriches life, the joke is also useful. It could then be seen as an invention, even a medical invention to the extent that it prolongs life. The invention becomes an innovation when successfully received by consumers of humour. This innovation then diffuses in society, becomes perhaps widely adopted, retold, modified, improved etc. During this process no real commercial transactions take place. What is more: there is not a single trace of any intellectual property (IP) notions – no copyright, no trade secret, no trademark, no business method patent etc. Still, a good joke could be claimed to fulfil requirements of being novel, non-obvious in relation to prior art, and useful. This teaches us that intellectual property rights (IPRs) are not (yet) everywhere, despite their pervasiveness, ancient historic tradition and current popularity.[1] Thus there are exchanges in the economy that are driven by special remunerations without involving trade and property rights. In fact, much exchange of information in general takes place in this way. However, as soon as costs of creating new information, data or knowledge become substantial or the benefits therefrom become substantial, adequate provision of new information and innovations in general is endangered. IPRs then constitute one out of several available approaches of private or public provision of costly or valuable innovations. The IPR approach is not perfectly tailored and by far does not fit all situations, however. It does not come free of charge, distortions and side-effects. Neither do other available approaches. Innovations are simple to welcome but difficult to invite. Attempts to do so involve a large portion of muddling through and scholars of innovation must count on uncountable difficulties. *Innovatio non-jocus est*.

[1] This is not to say that the whole area of jokes and humour is an example of an area of human needs free from any IP notions and commercial considerations. The comedian Bob Hope allegedly ran almost factory-like operations for joke production and built a large inventory (database) of them, and the comedian W.C. Fields became involved in a lawsuit with a submitter of joke ideas.

1.1 Innovations, Laws and Economies in Interaction

1.1.1 Innovations and progress

Innovation is usually defined as something novel and useful – be it technological, organisational, financial, institutional, cultural or whatever under the sun. Thus, innovation more or less by definition is the basis for progress in all areas of human endeavour. If progress is sought, it is then of central concern to find means to stimulate a proper flow of innovations, neither too few for desirable progress, nor too many for smooth adaptations. However, economic systems, regardless of type, have difficulties in generating such a flow of innovations. It is simply difficult to tailor proper incentives for individuals and organisations that are capable and willing to move ahead as innovators, and to find a scheme for sharing the accruing advantages of the innovations between innovators and others. Sometimes early mover advantages are so weak compared to late mover advantages that prospective innovators are better off awaiting the moves of others, resulting in a waiting game. Sometimes it is the other way around and individuals engage in a race to become first with an innovation. The resultant racing game could then be even more costly in total than the total advantages of the innovation.

Competition is usually seen as conducive to innovation, but it is neither necessary nor sufficient for a flow of innovations. Curiosity and necessity would induce innovations in the absence of competition, and e.g. induce a Robinson Crusoe to become an innovator. On the other hand, presence of competition from imitators could bring forth innovations but could also bring innovations to a halt. Moreover, innovations mostly require cooperation, so prospects and advantages (rewards) have to be shared from that point of view in some kind of cooperative game. Difficulties then arise since incentive structures differ among individuals, some preferring monetary rewards in the first place, some fame and social recognition, some satisfaction from achievement and so forth.

There are various ways or strategies for early as well as late movers to reap or appropriate the benefits from innovations. The innovator, being in fact the first mover, can create a lead time over late movers by being secretive about the innovation, relatively faster in exploitation, and more skilful in subsequent development (upgrading), production and marketing to various users of the innovation, and in forging durable links with users for sharing advantages.

There are also various ways or policy means for a society to foster flows of innovations in rates and directions thought to be proper. Thus a society

can provide means for social recognition and/or financial rewards in the form of ceremonies, prizes, grants, subsidies, procurement contracts, property rights or some form of regulation with associated penalties etc. Most societies or cultures, primitive as well as advanced, also employ such means, e.g. for social recognition of creators and innovations. At the same time there are usually means for checking, if not punishing, the kind of deviant behaviour associated with innovations and creative work. Despite this ambivalence, most cultures seem basically to welcome innovations.

The use of property rights or privileges to induce innovations of various kinds through strengthening first mover advantages is an old institutional arrangement. It is now customary to refer to these rights as intellectual property rights (IPRs), comprising old types of rights such as patents for inventions, trade secrets, copyrights, trademarks and design rights, together with newer ones such as breeding rights, maskwork rights and database rights. These rights – although subsumed under the label IPRs, suggesting some coherence – in fact comprise a very heterogeneous set of rights with fragmented historical developments, hardly constituting what could be called an IPR system. It is not even clearly natural to view these rights as property rights.

1.1.2 Economic, legal and technological changes

Innovation is a special type of change, being cause and consequence of a multitude of other interacting changes of various types. IP studies, and innovation studies more generally, tend to be oriented around some discipline or type of variables, and the interaction across relevant disciplines tend to be much weaker than the real interaction across the types of variables they study. This will be illustrated below, first by simply listing a limited number of major changes, which also serve as a background, next probing a few of them in more depth and then describing the disciplinary structure of IP studies.

The many strong interactions between general economic, organizational and technological changes and more IP-specific legal changes can be illustrated by listing various changes and trends which clearly are intertwined and clearly interact with other types of changes as well – political, managerial, social etc. (In fact, difficulties of classifying them into different types indicate close interaction.) With usual reservations about the adequacy of selective listings of different types of changes and uncertain trends, the following examples are hopefully sufficiently illustrative:

Economic changes

1. Economic rise of Japan and Asian NICs in the 1980s and disintegration of the Soviet Union political empire and economic system in the 1990s, changes which in large part were innovation- and technology-related.
2. Gradual emergence of a new type of economy (more knowledge- and innovation-based, ICT-driven, IP-oriented, etc.) with more use of technology and information markets, firms and products.
3. Military R&D, still amounting to roughly half of the world's R&D, is shifting in character, including increase of IP relevance.
4. Increasing importance of dynamic innovation-based competition across nations, sectors, companies and markets (including markets for labour, knowledge/ideas and financial services).
5. Increasing gaps of technology and competitiveness between the USA and Europe, including the defence sector.
6. Perceived underinvestment in R&D in Europe has prompted the European Commission to adopt the goal that overall spending on R&D and innovation in the EU should be increased with the aim of approaching 3% of GDP by 2010.
7. Universities and public research organisations are becoming more economically focused, i.e. becoming more industrialised, commercial, competitive, international, alliance-prone, strategic, and IP-conscious.

IP legal changes

1. Increasing strengthening, widening, awareness, use and enforcement of the various IP systems around the world, with growth on average of patents, patent portfolios, IP values, IP disputes, damages etc.
2. Increasing interaction between IP policies and other economic policies, especially trade policies through TRIPs and the WTO.
3. Extension of patentable and IP-protectable subject matter and IPR types (e.g. database rights).
4. Increasing international harmonisation of IP laws and practices.
5. Increasing strategic role and use of IPRs in various industries.
6. Increasing protests against the IP system and disputes within the IP system, with increasing litigation costs.

7. Increasing interaction between various IPR types and between IP laws and other areas of law, especially contract law, trade law and competition law.

Technological/R&D changes

1. Emergence of new technological systems (families of interrelated technologies), in particular ICTs, biohealth technologies (BHTs) and material and energy technologies.
2. Continued build-up of in-house R&D and various forms of corporate innovation systems in industry, now controlling most of worldwide technology and an increasing share of worldwide science.
3. Increasing specialization and division of R&D labour, use of technology markets and external technology acquisition.
4. Increasing technology diversification of products and processes, leading to increasing interdependencies among technologies, companies, products and processes.
5. A continued transition from individually based research and invention (for which IPR laws originally and still cater) to intra-company team-based and further to inter-company team-based, i.e. to inter-organisational R&D collaboration. Scale, critical mass, scope, interdisciplinarity, and speed to market will make collaborations and networking an increasingly appealing governance mode over purely market-mediated coordination.
6. Internationalisation, globalisation and "glocalisation" of R&D and technology acquisition (i.e. global coordination of firm R&D with increasing concentration in certain technology-intensive regions around the world).
7. Technological changes in the production and distribution of new technologies. Emergence of what can be called "e-Research" in intra- and inter-firm R&D through use of various infocom technologies as research tools (Internet, multimedia conferencing, networked databases, artificial intelligence tools, distributed computing, data grids, large-scale simulations etc.).

The first four changes listed as economic changes (in the main) above will be explored in greater depth below. The first example about the rise and fall of specific nations will be commented upon more generally, however.

1.1.3 Innovations, IP laws and economies in interaction

Progress requires innovations, but it is not clear that innovations require IP laws. Nevertheless, when innovations require investments, as for most technological innovations, some laws for public or private provision of the investments are required. These laws could vary as the nature of innovations and their interaction with the economy vary. To what extent IP laws, as they have developed, actually have influenced the flow of innovations and economic developments has long been debated. From time to time the debate has been quite heated, indicating deep-running controversies about rationales, impacts and relative merits.

While there undisputedly is a strong interaction between innovations and the economy, especially regarding technological innovations, there seems to be a much weaker interaction between IP laws on one hand and innovations and the economy on the other, at least in the past. Focusing more narrowly on technological innovations, IP laws seemingly have been neither necessary nor sufficient for either technological or economic progress throughout history, indicating a weak form of interaction on average. Nevertheless, there are numerous examples from history of how IP laws have in fact been influential upon, as well as influenced by, technological and economic developments. For example, there is a long history of how IP laws and trade-related privileges (patents in particular) have been used for national protectionist purposes. Handing out privileges and property rights was (and is) simply a handy way for rulers and governments to influence the economics of innovation.[2]

Various countries have, in the course of their catch-up processes, switched from weak to strong IP regimes (but seldom the reverse). Many industries and technologies have emerged under weak IP regimes, which then for various reasons have become reinforced. The same could be said about many companies, but here reversals have also occurred in the sense that some companies have had their cumulated IP powers curbed by antitrust authorities.

The contemporary and perhaps largest example of close economic, legal and technological interaction is the emergence of a new type of economy based more on knowledge, new technologies, innovations and intellectual capital and the emergence of a generally strong IP regime (dubbed the pro-IP era). The new type of economy has emerged gradually for a long time, although recognition and debate grew rapidly in the late 1990s, culminating

[2] In fact this policy could be seen as a special use of taxation powers, in the sense that some of these powers are handed over under certain conditions to innovators who, at their discretion for a limited time, can tax consumers through higher prices on the innovations.

with the financial bubble. The latter burst and so did some of the surface talk about the new economy, but the undercurrent of the latter remains. The pro-IP era emerged much more rapidly from the early 1980s onward, triggered by legal changes (judicial and policy-based) in the US, then spreading almost globally. Although too early for historians to say conclusively, it seems as if the new type of IP regime was more a consequence than a cause of the new type of economy. To proceed with sweeping characterizations, the latter seems to be more a consequence than a cause of new technologies, new infocom technologies in particular. These in turn, and the industries that have emerged based on them (computer, software, semiconductor and modern telecom industries), have by and large not developed as a consequence of a strong IP regime, but have rather developed in a weak IP regime that has then become strengthened.[3]

Another contemporary major example is the military sector with its special economy, technologies and laws. (The exposition of this example here is also motivated by the limitation to civilian innovations in this book.) For a long time roughly half of the world's S&T and R&D activities have been defence-related. R&D activities have been performed in mostly national military-industrial complexes, led by super-powers in distinctive alliance structures. The "appropriation" and control of military S&T have formed a special military IP regime based on secrecy and various types of controls and sanctions, quite separate from the civilian IP regimes (regardless of type of economic system – market or planned). Military and civilian technology, R&D, industrial activities, and governance structures in general have in fact been quite separate from each other (even within firms). For various reasons (downfall of the Soviet Union, multi-polarisation of power, US hegemony, growing importance of China, terrorism, guerrilla warfare techniques, rising capital intensity in conventional warfare, rising R&D costs, new technologies, waning geographic borders and distances etc.) this situation is now subjected to far-reaching changes and trends (without completely changing the nature of military affairs, of course).

What are increasing, and already visible in the USA, are: integration of military and civilian technologies and markets (through dual use, lead/lag reversals, scientification etc.); outsourcing of defence R&D, production and services for firms, nations and even cross-national alliances; internationalisation and globalisation of defence R&D, defence services, defence procurement and defence industries; limited military/police international "ventures";

[3] For some further readings, see e.g. Coriat and Orsi (2002), Granstrand (2000 a,b) and Jaffe (2000).

cross-national trade of military technology; R&D and production collaborations.

The likely implications of this are increasing R&D collaboration across nations, sectors, firms and civilian-military borders, industrial restructuring (divestments, joint ventures, M&As) and global concentration. Defence R&D as well as defence services (based on surveillance, command and control, robots, unmanned vehicles, electronic warfare, network defence etc.) will increasingly be ICT-based, and probably with closer integration of military and civilian ICT systems. This is especially likely in the area of surveillance, with its vast possibilities to use ICTs for development, production and exploitation of databases. (Note the military role in developing e.g. the Internet, GPS and Echelon (as alleged).) Awareness and strategic use of IPRs beyond trade secrets are then also likely to increase in military industry as a consequence. A more speculative but still conceivable scenario is that some kind of joining of legal and military powers could accrue in some situations.

A fourth example, concerning competition, will be given in Section 1.2.3 below. Other examples of economic, legal and technological interaction becoming closer might be found in environmental protection and health care regulation.

1.2 The Need for Economics and Law in Interaction for Innovations

1.2.1 Purpose of this book

This book is about intellectual property and its role in innovation. Since the early 1980s interest in, and concern about, the IP system and its various types of IPRs have grown rapidly. This rapid change is accompanied by an increasing recognition of a need for further research and teaching. A main purpose of this book is to contribute to meeting this need and to stimulate a more comprehensive understanding of IP issues and how their associated economic, legal and technological changes interact in an international context. A corollary purpose is to further stimulate the growing interest in IP studies among new generations of researchers, teachers, students and practitioners, thereby stimulating growth as well as renewal of the field.

A special purpose is to present different disciplinary approaches to IP, mainly within economics and law, two disciplines that unfortunately have become quite separated in the field, as we will see. Thus, this book is also a

call for more interdisciplinary approaches in IP studies, besides being a call for international and intergenerational approaches.

1.2.2 Separation of economics, law and IP

Sins of omission and commission are common accusations of every discipline. As to economics and IP, the declaratory judgement of Prof. Fritz Machlup could hardly be expressed more succinctly:

> "Judging from the share which the subject of patents has had in the literary output of economists of the last fifty years, and from the share which economists have had in the literature on the subject of patents, one may say that economists have virtually relinquished the field. Patent lawyers were probably glad to see them go; some said as much with disarming frankness."
>
> Fritz Machlup (in Penrose 1951, p.viz)

This judgement is supported by a bibliometric analysis in Section 1.3 and still holds half a century later, although decreasingly so. The dictum in the last sentence can be supported by the following citations:

> "…the competing [economic] theories provide an unwitting parody of what must be one of the least productive lines of inquiry in all of economic thought. What does the patent system give us, and at what cost?"
>
> "…The ratio of empirical demonstration to assumption in this [classic economic] literature must be very close to zero. …and all related literature of which I am aware have consisted of little more than assumptions."
>
> "…The inability of economists to resolve the question of whether activity stimulated by the patent system or other forms of protection of intellectual property enhances or diminishes social welfare implies, unfortunately, that economists can tell lawyers ultimately very little about how to enforce or interpret the law of intellectual property. …Personally, I believe there is little hope that economic analysis can resolve the question of the appropriate scope of the protection of intellectual property. …As a consequence, I regret, the influence of the economist on the law of intellectual property will always be limited. The lawyer must look to other sources for guidance. "
>
> George L. Priest (in Palmer 1986, pp. 19-24)

Some confessions might be added to complete the case that economists have shown negligence in the upbringing of the family of IPRs, not only regarding patents but also regarding other IPRs.

> "Although the patent system has developed primarily to promote economic ends, economists have devoted very little attention to it and none at all to the international patent system."
>
> Penrose, E. (1951, p.xi)

> "Despite the practical importance of trade secrets to the business community, the law of trade secrets is a neglected orphan in economic analysis."
>
> Friedman, D., Landes, W., and Posner, RA. (1991, p. 61)

> "Trade marks are … significant business assets; … Yet, they have not … been systematically studied by economic or business historians, even though much has been written by other scholars on these intangible assets."
>
> Wilkins, M. (1992, p. 66)

Having established the economists' sin of omission of IP in this way through "hearings" of the literature, one could ask for explanations. This would lead beyond the scope of this chapter. Suffice to say that there has historically been a broader sin of omission of technology and innovation in general for various reasons (see Granstrand 1994, Ch. 1). A major reason, and in fact partly an excuse, is that economists committed themselves to more pressing problems of their times and to refining and applying tools of their times, which were mainly tools for static analysis.

Besides, technology and innovation were (and are) complex, dynamic and unpredictable, not easily taken care of by a fairly young and busy social science such as economics. In the static frameworks for resource allocation and competition analysis, only process technology could be fitted in and then only in a static sense, and innovation could hardly be fitted in at all. Thus, assuming static conditions made patents (as well as copyrights and designs) difficult to handle (except by comparative static analysis), assuming certainty (perfect information) and no information asymmetries made trade secrets impossible to handle, and assuming homogeneous products across firms made trademarks (as well as other IPRs) impossible to handle. These common assumptions in static analysis in fact assumed away IPRs. Still, IPRs were present in the economy after all (guarded by many lawyers, engineers, inventors, managers etc.), if not in economics. Applied economists

then largely perceived them as a disturbance of competition and efficient resource allocation.

This perception and commitment to static competition analysis and resource allocation suppressed a wider positive interest among economists in IPRs for a long time, and probably still does so.

In all fairness it must be said that an increasing number of economists have made considerable contributions to IP studies in the 20th century (see Granstrand 2000a, Ch. 2-3 for a review). Also it must be said that IPRs have not traditionally accounted for a large share of legal studies either. Stretching the metaphor perhaps too far, one may venture to say that the father (economics) left the difficult and disturbing minors (the IPRs) – occasionally paying them some visits, but then mostly complaining about them – in the custody of a happy, understanding but elsewhere busy mother (law).

1.2.3 The need for economics, law and technology in interaction

Given a historical separation intellectually of economics and law in the IP area, compounded by the "ordinary" institutional separation of the disciplines of law and economics, one can argue for increased interaction and integration, and then on several grounds. (See also Chapter 21 for further discussion.)

Section 1.1 showed several major examples of close interaction between economic, legal and technological factors and changes, a level of interaction that could be expected to grow stronger. Lags in legal responses to technological changes might be a natural (economic) way to position law in general, but the cost of too slow and/or erroneous legal response probably grows with increasing scale and scope of technological changes. Legal control can also be lost or counterproductive if the speed of technological changes is not matched. A highly complicating circumstance is that technological changes also change the language and its underlying conceptualisations. This slows down and distorts legal analysis, preoccupied as it is with the use of existing language. Legal analysis in turn is an important part of the total time lag in legal responses, so the issue of how to speed up legal responses is magnified by an increasing speed (rate) of technological changes. Should then the law become more anticipatory and/or research-based? Should "legal R&D" be more integrated with technological R&D? Should the public goods delivered by court cases be increased by pro-active measures? Should technology be slowed down? Should the mode of legal analysis be changed? Should it be complemented or replaced in part by more economic analysis? Which type

of legal system is most fitting?[4] The general answer here is that answers to these difficult questions can more easily be found with closer interaction between economics, law and technology, i.e. between economists, lawyers and engineers.

Take the competition area as an example. Competition is a powerful but double-edged tool for price control (static competition) as well as for generating innovations in a broad sense, giving enhanced performance of products and services (dynamic competition). Financing increasingly expensive R&D and innovations through related prices and/or taxes builds in counteracting tendencies between static and dynamic competition, thus calling for adaptive trade-offs in terms of pro/anti static/dynamic competition policies. Typically these trade-offs have to be made with different time frames and with different levels of economic, legal and technological uncertainty.

The uncertainty pertains e.g. to innovation returns, market shares and market structure, but also to the concept of what is a relevant market. Major innovations in the form of entirely new products could be regarded as creating entirely new markets ("innovation markets"). At the same time, markets can always be conceptualised at multiple levels of product areas (e.g. sugar, sweetener, foodstuffs), and functional substitutes (e.g. gas/electric heaters) with competition always taking place at some higher level of substitutes; hence the notion of multi-level competition.

In addition, an increasingly systemic nature of complex products and systems technologies creates product complementarities, and thereby markets with complementary demand. This in turn enables more market leveraging and the creation of market power across interdependent markets.

Moreover, there is no one-to-one relationship between technologies and products or industries as often assumed. Rather there is a growing many-to-many correspondence between technologies and products, with the emergence of generic ("general purpose") technologies, having a wide range of product applications, and multi-technology ("mul-tech") products, incorporating a wide range of technologies. With increasing R&D costs for new product generations, increasing division of R&D labour and increasing use of technology markets, competition in product markets is increasingly accompanied by competition in a web of technology markets, including competition between substitute technologies ("technological competition").

[4] Just as for economic systems, one could speculate on a certain convergence of legal systems, possibly driven by technological changes and internationalization. After all, the original divergence of the civil and common law systems was not contingent upon large, lasting differences – quite the contrary (van Caenegem 1988).

Finally, technological change and innovations in general tend to change basic conceptualisations of products, markets and industries (cf. calculator versus computer; typewriter versus word processor; palmtop computer versus handset telephone; copier versus printer). In the case of converging technologies (with computer and communication technologies as a standard example of macro-technological change) the concept of a relevant market is broadening. In the case of diverging technologies and product differentiation, the opposite may occur (e.g. cars historically differentiating into passenger cars and trucks).

In summary, the dynamic nature of competition and market definition, in connection with R&D and innovation, calls for adaptivity in competition and IP policies, with due concern paid to economic efficiency of static vs. dynamic competition on product and technology markets, definable and redefinable at multiple levels of substitutes and complements. How to accomplish this is obviously non-obvious, but novelty in interdisciplinary thinking about legal certainty vs. static and dynamic economic efficiency vs. technological dynamics and uncertainty is likely to be useful. This theme will be returned to in Chapter 21.

1.3 The Growth of IP Studies

As described above, the economic value of and strategic attention paid to IPRs has increased considerably since the 1980s (without actually any far-reaching legislative changes), and a need to more closely integrate the previously fairly separate areas of IP economics and IP law has arisen. How does this separation reflect in the structure of contemporary academic writings on IP? To probe this question a bibliometric analysis has been undertaken.[5]

As a first step, a simple search of articles in Social Science Citation Index (SSCI) containing "intellectual property" or "IPR" in title, keywords or abstract in the period 1975-2002 was performed.[6] This revealed 1,064 papers in total (ca. 99% of which were in English) with a clear growth trend. The annual number of published IP articles in social sciences was below 10 in the period 1975-1981, between 10 and 100 in the period 1982-1999, and exceeded 100 from year 2000 on. In rough terms, the number of IP articles grew over 7 times faster in the whole period than the total number of articles in SSCI.

[5] The help of Prof. Olle Persson, Inforsk, Dept. of Sociology, University of Umeå, Sweden is gratefully acknowledged.

[6] IP articles (defined in this way) also appear in Science Citation Index (SCI). However, journals in economics and law are by and large covered by SSCI.

In order to see the positions of economics and law in academic IP writings, the top-cited journals in the set of IP articles were identified. The top 10 were (ranked according to number of citations):

Yale Law Journal	(Law)
Harvard Law Review	(Law)
Columbia Law Review	(Law)
American Economic Review	(Economics)
Stanford Law Review	(Law)
Science	(General)
California Law Review	(Law)
Journal of Legal Studies	(Law)
Univ. of Chicago Law Review	(Law)
Rand Journal of Economics	(Economics)

As seen from this list all journals are US, and most journals are law journals, accounting for 73.6% of the citations collected by the top 10, while economic journals collected 17.9% and the general journal Science collected 8.5%. US law journals also dominate the top 50 list of journals cited by IP articles. In fact almost all of these top-cited journals are disciplinary journals in either law or economics, with over 30 law journals and over 10 economic journals. Exceptions are Science (no. 6), Research Policy (no. 12), Journal of Law and Economics (no. 15) – the only explicitly bi-disciplinary journal – and Nature (no. 45) and Strategic Management Journal (no. 47).

Now if the central journals on IP in social science are discipline-oriented and fall into economics and law, how much do articles in them co-cite various pairs of economics and law journals, and how much do articles in economic journals cite law journals and vice versa? In other words, how much cross-disciplinarity is there in these two types of disciplinary journals? Moreover, is there any convergence in some sense over time between IP writings in these two social sciences, i.e. is there any sign of "science convergence" (analogous to the phenomenon of technological convergence)?

As a second step, a co-citation analysis of the IP articles was performed for the period 1986-2001. A co-citation map of journals is shown in Figure 1-1, where the proximity between any two journals approximately corresponds to the extent to which they are co-cited, i.e. the number of articles that cite both of them. Figure 1-1 shows that the law journals and the economics journals form two distinct and quite separated clusters, with American Economic Review and the Journal of Law and Economics being the two closest from each cluster. The singular but fairly central position of the jour-

nal Science is also noteworthy, indicating a cross-disciplinary bridging role with fairly strong ties to both clusters.

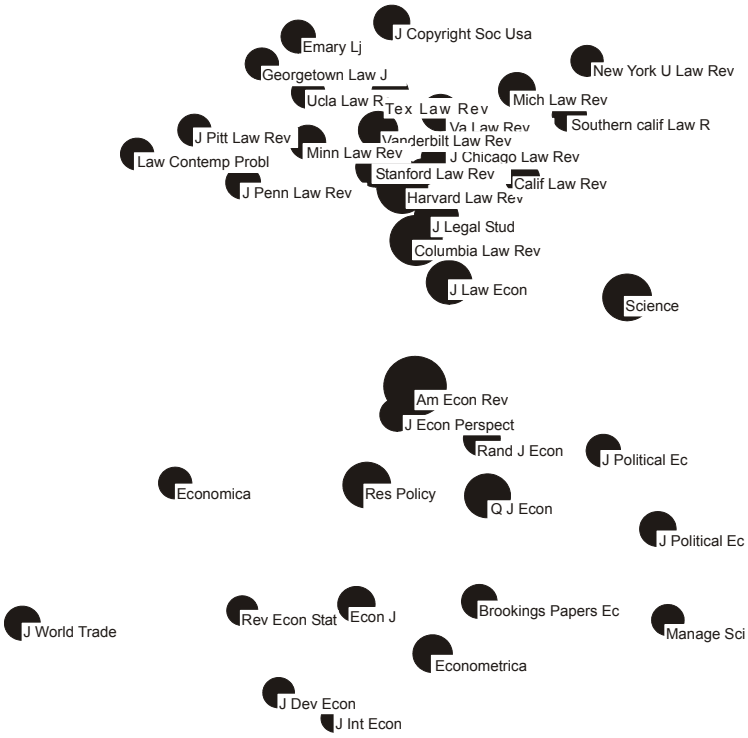

Figure 1-1: Most co-cited journals in articles on intellectual property in SSCI 1986-2001.

Figure 1-2 shows a co-citation map, now based on frequencies by which pairs of authors (rather than pairs of journals) appear in the same reference list of the various IP articles. Figure 1-2 shows a similar type of separated clustering of authors into economists and lawyers, with Kenneth Arrow and

[9] Since maps like the ones in Figures 1-1 and 1-2 are projections of positions in a "bibliometric space" of much higher dimensionality, the two-dimensional distances in Figures 1-1 and 1-2 are crude approximations and should consequently be interpreted with much caution.

Robert Merges as a close economist/lawyer pair.[9] The most frequently cited scholar is the economist Edwin Mansfield, however, followed by six lawyers (Samuelson, Merges, Reichman, Gordon, Landes and Goldstein).[10]

Figure 1-2: Most co-cited authors in articles on intellectual property in SSCI 1986-2001.

As a third step, Table 1-1 then shows a list of the 20 most cited authors, based on citations from **only** economics and law, with the citation shares of

[10] The areas of the black circles in Figures 1-1 and 1-2 are used to indicate the number of citations.

[13] Articles were classified into economics and law respectively on the basis of the department names associated with the authors.

these two disciplines.[13] Lawyers dominate the list by far and there are only three economists on the list (Mansfield, Maskus and Teece). As expected, authors get most of their citations from within their discipline. Almost half of the lawyers are collecting citations solely from within their discipline.[14]

Table 1-1: Top 20 authors on IP by citations from economics and law in SSCI 1986-2001.

Cited author	Percent citations from		Total no. of citations
	Economics	Law	
Gordon, WJ	0.8	99.2	118
Merges, RP	13.9	86.1	101
Samuelson, P	8.4	91.6	83
Reichman, JH	10.4	89.6	67
Litman, J	3.0	97.0	66
Mansfield, E	92.1	7.9	63
Lemley, MA	0.0	100.0	63
Ginsburg, JC	0.0	100.0	62
Maskus, KE	98.4	1.6	61
Landes, WM	8.3	91.7	60
Cohen, JE	0.0	100.0	48
Goldstein, P	4.7	95.3	43
Easterbrook, FH	2.8	97.2	36
Boyle, J	0.0	100.0	36
Teece, DJ	91.4	8.6	35
Radin, MJ	0.0	100.0	34
Eisenberg, RS	15.6	84.4	32
Dreyfuss, RC	0.0	100.0	32
Kitch, EW	3.2	96.8	31
Epstein, RA	0.0	100.0	31

An important question now is: Who are the most interdisciplinary-oriented authors? Table 1-2 shows those authors, among the 100 most cited ones in IP articles in SSCI 1986-2001, who have at least a 10% citation share in each discipline, ranked in order of increasing absolute difference between

[14] It is possible to design more accurate indicators of disciplinary inwardness, as well as of the correspondence to an "export/import ratio" in the cross-disciplinary "citation trade" (e.g. using diversification or concentration measures based on entropy or Herfindahl's index). Interdisciplinary composition of the education of the authors could also be taken into account, of course. All authors considered here have a single discipline as "theirs", however.

the two citation shares. These authors with strong interdisciplinary ties could be considered bridging persons, connectors or linking pins between economics and law.[15]

Table 1-2: Authors among the 100 most cited ones in IP articles in SSCI 1986-2001 with at least a 10% citation share in both economics and law.

Author	**Percent citations from**	
	Economics	**Law**
Arrow, KJ [1]	50.0	50.0
Scotchmer, S[1]	47.6	52.4
Nelson RR [1]	43.8	56.3
Klemperer, P[1]	36.4	63.6
Scherer, FM	65.2	34.8
Williamson, OE	66.7	33.3
Farrell, J	33.3	66.7
Coase, R.H.[1]	31.6	68.4
Braga, CAP	68.8	31.3
Besen, SM	69.2	30.8
Lerner, J	72.7	27.3
Katz, ML	72.7	27.3
Griliches, Z	78.3	21.7
McCarthy, JT	18.2	81.8
David, PA	83.3	16.7
Heller, MA	16.7	83.3
Eisenberg, RS	15.6	84.4
Merges, RP	13.9	86.1
Evenson, RE	87.5	12.5
Reichman, JH	10.4	89.6
Posner, RA	10.3	89.7
Demsetz, M.	10.0	90.0

Notes:

[1)] These are interdisciplinary cross-over authors in the sense that they collect more extra- than intra-disciplinary citations or equally many. Cross-disciplinary co-authoring contributes to such a status (e.g. the highly cited article by Merges and Nelson (1990), published in Columbia Law Review). It is notable that all interdisciplinary cross-over authors are economists (including two Nobel Prize Winners as of 2002), and mostly theoreticians.

[15] This does not mean that authors with weak interdisciplinary ties are unimportant from an interdisciplinary point of view. On the contrary, weak ties may have the strength that they link to otherwise disconnected parts of the citation network, thereby indicating interesting knowledge combinations or early-stage convergence. (Cf. Granovetter 1973.)

There are 22 such authors, meaning that about 4 out of 5 highly cited authors have their citations concentrated to more than 90% within their discipline. (Extreme "cross-over" authors with over 90% extra-disciplinary citations are not present.) As seen from Table 1-2, this set of 22 authors (all in the US) is dominated by economists, especially at the top.

Thus, these statistics indicate that, for academic IP articles, lawyers have a greater overall impact in terms of total citations, while economists have a greater cross-disciplinary impact in terms of citation shares. The question now is if there is any convergence of law and economics as the two dominating social sciences in academic IP-article writings. To probe this question as a fourth step, the number of shared references in articles from law and economics respectively was used as a measure of proximity between each disciplinary vintage of articles. A two-dimensional projection of the results is given in Figure 1-3. Although distances in figures like these must be interpreted with much caution, Figure 1-3 indicates a convergence over the years of economics and law when it comes to IP articles. Moreover, there seems to be a somewhat larger movement in economics than in law, and from more distant origins.

Thus, in summary, the bibliometric analysis indicates that the IP field in social sciences is:

1. Rapidly growing in absolute terms as well as relative to growth in general of social sciences
2. Dominated by US journals and authors
3. Dominated strongly by law, followed by economics, being fairly separated as disciplines, although showing signs of convergence
4. Dominated by economists when it comes to interdisciplinary citations from law and economics.

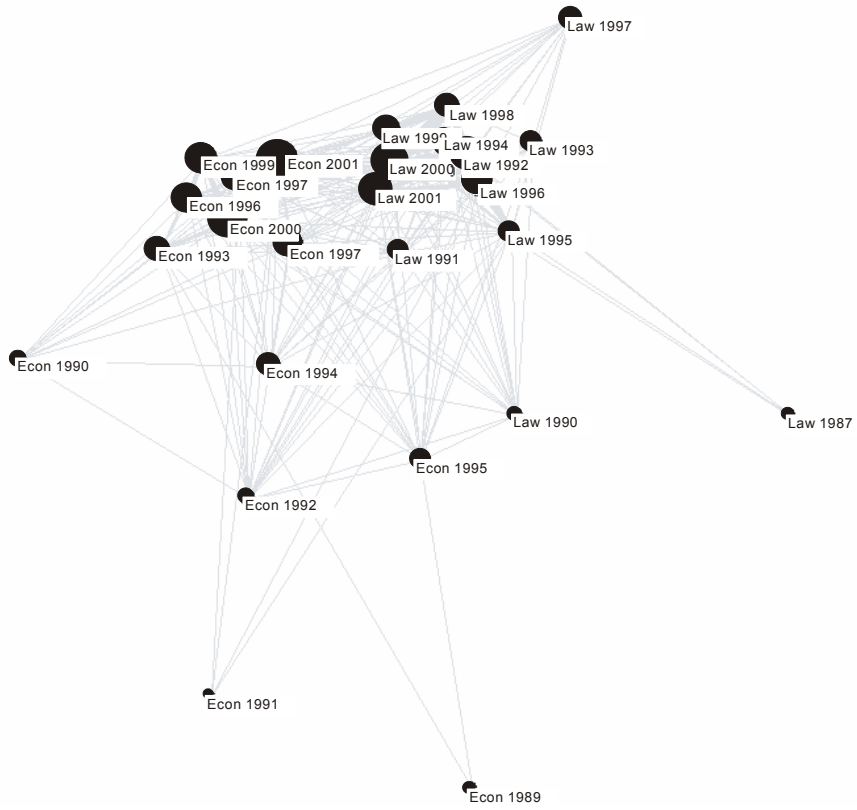

Figure 1-3: Projected proximity map over vintages of IP articles in economics and law in SSCI, based on shared references.

Finally, it must be emphasized that further research on IP studies is needed in the light of their rapid recent growth after a long period of minor existence. Some suggestions are to (1) study the history of IP studies and ideas in general, and in economics and law in particular; (2) make a thorough review of recent IP studies;[16] and (3) make a further bibliometric analysis of the structure and interdisciplinary relations in IP studies.

[16] Several surveys and review articles exist; see Granstrand (2000a). For a recent bibliography, see Granstrand *et al*. (2002). For surveys of IP-related theories, see Mazzeloni and Nelson (1998) for an economics perspective and Gutterman (1997) for a legal perspective. For literature on the new theme of university patenting, see Link *et al*. (2003) and Mowery *et al*. (2001). For

1.4 Outline of the Book

The authors and chapters in this book represent a wide variety of backgrounds, perspectives and foci. This diversity is by design as IPRs and innovation represent a complex and many-faceted phenomenon with recently rapidly growing proportions, needing a rich picture, calling for a variety of angles and lenses. Still diversity is limited. The authors mainly represent Western contemporary perspectives within economics and law. Needless to say a book like this cannot cover everything and should never pretend to do so. Thus many IPR relatated topics are still out of focus and several other disciplinary and international perspectives could have been represented. Then, however, commonalities and differences between the disciplines economics and law in the IP field would be less sharply focused. In fact the authors have been "sampled" from the economics and law "strata" (being the major ones in the IP field as described above), to allow for some comparative interdisciplinary analysis, as presented in Chapter 21.

The authors and chapters representing economics are Kenneth Arrow (Prologue); Ashish Arora, Andrea Fosfuri and Alfonso Gambardella (Chapter 4); Wesley Cohen, Akira Goto, Akiya Nagata, Richard Nelson and John Walsh (Chapter 6); Jeannette Colyvas, Annetine Gelijns and Nathan Rosenberg (Chapter 7); Dominique Foray (Chapter 9); Ove Granstrand (Chapter 10); Bronwyn Hall (Chapter 11); Dietmar Harhoff, Frederic M. Scherer and Katrin Vopel (Chapter 12); William Kingston (Chapter 13); Bonwon Koo and Brian Wright (Chapter 14); Richard Nelson (Chapter 15); Ruth Towse (Chapter 18) and Bart Verspagen (Chapter 20).

The authors and chapters representing law are John Adams (Chapter 2); Howard Anawalt (Chapter 3); John Barton (Chapter 5); Bengt Domeij (Chapter 8); Ulf Petrusson (Chapter 16); Margaret Jane Radin (Chapter 17); and Hanns Ullrich (Chapter 19).

Chapter 2 by John Adams sets out to discuss how problems of ensuring consumer protection in e-commerce are best approached. Most such problems essentially represent traditional types of problems with faulty products, faulty delivery and fraud. One issue is whether there are new types of problems, or whether some of the old ones are becoming so aggravated that they essentially should be looked upon as new types from a legal point of view. As is well known, e-commerce is subjected to rapid technological changes regarding forms of market communication among buyers and sellers, the

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recent literature on IP and economic development, see Mansfield and Mansfield (2000). In general, various chapters in this book give further literature overviews.

appearance of pure information products, and the performance of various transactional steps in a mix of online/offline operations together with internationalisation. This leads to aggravated problems following from jurisdictional uncertainties, separation and mobility of buyers and sellers in space and also in time, distance e-contracting, e-payment and e-delivery (e.g. music, video, data, books or software on demand). Another issue is whether new solution approaches are needed, or whether old ones can be stretched to apply to new types of problems as well as to old but aggravated problems. John Adams then argues that market solutions are, after all, preferable to selective government intervention. The effectiveness of market solutions is in fact aided by internationalisation of trademarks together with extension of liabilities, in particular for intermediary financial institutions such as credit card companies. Thus, in this case, radical technological changes enabling e-commerce also enable existing institutions to provide solutions to old and new problems of consumer protection. No need for alarm by and large, that is. Far-reaching technological changes do not necessitate far-reaching legislative changes in the case of e-commerce.

In Chapter 3, Howard Anawalt addresses in a brief historic account the internationalisation of intellectual property rules, generally conceived of as international harmonisation. However, recent developments of international institutions in the form of TRIPs agreements and WTO represent a step beyond the traditional general principle of non-discriminatory treatment of foreigners in a given national legal culture. The step means making the acceptance of a fairly detailed legal framework, in no small measure rooted in US legal culture, the discriminatory condition for membership in WTO. Although some form of international harmonisation of IPRs is by and large conceived of as desirable, Howard Anawalt discusses its limitations and drawbacks. In national as well as global interests, there is a certain need to preserve national legal cultures in which intellectual property rules are embedded, and consequently a need for tempered international harmonisation. The chapter concludes with a fairly specific list of suggestions for IP guidelines and further research along this line of thought.

The author trio in the fourth chapter – Ashish Arora, Andrea Fosfuri and Alfonso Gambardella – presents an empirical study of the old but recently rapidly growing phenomenon of technology trade from an economics perspective. A growing importance of technology markets is an expected consequence of the emergence of the pro-patent era and the growing importance of IPRs. Well-functioning technology markets facilitate division of R&D labour and diffusion of new technologies. As a consequence there will be more attractive strategic options open to firms, small as well as large, for

their acquisition and exploitation of new technologies. This in turn tends to reduce at least the relative importance of the traditional strategies of in-house R&D and product sales. The authors proceed even one step further and propose that the role of new technologies as a source of competitive advantage may thereby become reduced, relative to other resources with less well-functioning markets.

John Barton in the fifth chapter returns to the theme of changing IPRs in an international context, focusing on changes in the relation between IPRs and competition, static as well as dynamic. IPRs have traditionally been conceived of as presenting barriers to entry in order to foster dynamic competition, but there is also reason to be concerned over possible adverse impacts of IPRs on dynamic competition. In an international context with countries developing at different levels and paces, advanced ones may sustain their market power in various ways through utilising strong IPRs, and John Barton describes three contexts in which this may take place: (1) licensing, tying and leveraging; (2) research tools and broad patents; and (3) oligopolistic licensing. Thus, in these contexts anticompetitive behaviour is enabled by strong IPRs regarding both static competition and dynamic competition. Remedies, as suggested by John Barton, do not necessarily have to rely on an international antitrust body but rather on a redressed WTO code.

The author quintet in the sixth chapter – Wesley Cohen, Akira Goto, Akiya Nagata, Richard Nelson and John Walsh – presents another economically oriented empirical study, this one focusing on US-Japan comparisons of R&D and patenting and the role of patent information for coordinating R&D. A number of significant US-Japan differences were found across industries, such as Japanese firms having more R&D, having a larger share of product R&D, and having more emphasis on patents for appropriation, strategic use and information purposes. The latter in turn induce greater flows and spill-overs of R&D information, as well as greater cross-licensing propensities. The large cross-national differences compared to cross-industry differences suggest explanations to be found in national patent systems, policies and cultures, such as Japan having first-to-file priority, pre-grant opposition and lower infringement costs. The authors conclude by suggesting further research on the welfare costs and benefits of patent information disclosure.

The seventh chapter, authored by Jeannette Colyvas, Annetine Gelijns and Nathan Rosenberg, takes a close look, mainly with economics lenses, at the role of US academic health centers (AHCs) in the generation of new medical technologies and their related patenting and licensing. The approach comprises case studies of a handful of new medical technologies (DNA,

MRI, PET etc.), combined with historical and statistical analysis, with data from top universities (Columbia and Stanford in particular). The authors see AHCs as a dominant and growing source of innovations, patents and licensing revenues, with research tools being a critical output. The patenting and licensing of research tools is then addressed as an issue, calling for a variety of considerations, such as associated transaction costs, prospects for improvement, and development into diagnostic and therapeutic tools. In particular the authors suggest that universities ought to consider a more nuanced approach to licensing.

The eighth chapter by Bengt Domeij stays on in the medical field, and there addresses the very generic problem of how to design patent-based incentives for initial and follow-on inventions, in other words incentive design in the context of sequential innovation. Bengt Domeij's particular focus is patent breadth and patent claim structure for incentive design in pharmaceuticals. The approach is legal analysis of cases of pharmaceutical patents in a sample of European courts, thereby comparing case law with economic explanations in patent claim interpretations. Bengt Domeij finds a tendency in courts to make implicit economic valuations of follow-on inventions when limiting the patent scope of initial ones, which implies that courts take on a certain role of coordinating (or managing or governing) R&D. However, in order to increase consumer value and welfare from pharmaceutical R&D, courts ought to make economic considerations more explicit, substituting for the currently dominating technical analysis.

Chapter 9 by Dominique Foray re-raises the old standing issue of how to find the right balance between public and private domains in the new context of a pro-patent era and new infocom technologies. Public goods, being non-excludable and non-rival in use, typically with large fixed and small marginal costs, include knowledge as a special case, knowledge being in addition cumulative and interactive. Standard approaches to dealing with public goods in a market economy, such as private property, public procurement, public subsidies or private consortia, thus could be expected to apply in special ways to production and distribution of knowledge. Dominique Foray identifies and analyses special coordination problems resulting in tendencies towards overexploitation ("tragedy of commons") as well as underexploitation ("tragedy of anti-commons") of knowledge areas, plus a tendency towards a slow-down of cumulation. Finally, Dominique Foray discusses two remedies to the latter problem – a mixed private/public innovation system and a collective invention mechanism, e.g. in a consortium arrangement.

Chapter 10 by Ove Granstrand raises a question it cannot answer but just probe a bit: Are we on our way in the new economy with optimal inventive

steps? This is a broad question that could be narrowed down in various ways. In granting patent rights to advances in technology space, the practice has for a long time been to require some form of minimal inventive step. The necessary assessment of size of invention by patent examiners is a difficult and subjective exercise, which nevertheless is carried out in patent offices and courts according to some de facto standards, varying somewhat across offices, courts and technologies and over time. The chapter sets out to explore how optimality can be specified in this assessment, especially in the light of transaction costs arising from congestion of patent rights and the increasing necessity for companies to assemble large packages of rights. The transaction costs associated with this IP assembly increase not only due to this congestion, but also due to the increasing interdependence between technologies and products. A narrow specification of optimality is illustrated in a model, which is kept as simple as possible to show that the question of existence of an optimum can be answered, at least in a stereotype way as a start. The chapter also discusses how a low minimal inventive step requirement can be used in particular by incumbents for "evergreening", i.e. for prolongation of effective patent protection. The chapter concludes with a brief discussion of patent rights viewed as a form of taxation rights and a decentralized form of governance.

Bronwyn Hall in Chapter 11 addresses some fundamental economic trade-offs when using IP protection to correct for markets failing to produce sufficient new information and innovations. She distinguishes between the case where pure new information is the main output and the case where physical products embody the new information. These two cases represent the output of university research and industrial R&D. She argues that the two cases are best served by different IP regimes, which have to be interfaced with each other on a boundary of increasing university-industry interaction. She surveys the situation in the US, which probably is a precursor in these respects, and finds that there are risks that the IP regime in industry, which increasingly finances university research although still at a low level, will dominate and impede university research. In particular she looks at software and databases which represent two vital product areas. These two cases involve two different but, since long ago, central types of IPRs – patents and copyrights – plus database rights as a new type of IPR, so far only in Europe.

The author trio behind Chapter 12 – Dietmar Harhoff, Frederic Scherer and Katrin Vopel – explore the nature of the top value distributions for samples of West German and US patented inventions. With the advent of the pro-patent era, the interest in patent valuation has grown considerably together with a variety of approaches. The authors use an asset value approach

in a sound empirical way and find, not surprisingly, a strongly skewed top value distribution (with drug and surgical supply patents being most valuable). More surprisingly, the skewness was so strong that a distribution lacking finite mean and finite variance could not be ruled out as fitting the data. This is a disturbing but hopefully sobering result for all believers in patent counts for purposes of valuation and picking winners. Such distributions could also rule out, or at least limit, mean-variance approaches to financial risk management such as the CAPM.

Chapter 13 by William Kingston provides a thorough critique of the current IP system and the way it has evolved (especially in the US), too loosely connected to the nature of current R&D and new complex technologies, especially in software and biotech. This divergence increasingly creates misfits, and William Kingston proposes a radical *sui generis* type of protection. This approach builds on the ideas of providing to innovators economic rewards directly related to the investment for, and commercial value of, the innovation. The innovation is then subjected to compulsory licensing. In granting patent rights, neither investment effort nor commercial value explicitly enters the criteria for granting. Thus, this approach deviates from the private property approach and it comes closer to a mixed contract-prize approach. As such it certainly warrants serious consideration, at least in some areas. William Kingston finally pursues his constructivist endeavour with a proposal for compulsory arbitration of disputes.

Chapter 14 by Bonwon Koo and Brian Wright returns to the welfare aspects of patenting in sequential innovation, as addressed empirically by Bengt Domeij in Chapter 7. The authors present a theoretical approach with a two-stage model of an innovation process. Patenting in the first stage takes place without competition and is followed by a second stage with necessary follow-up patenting by competitors under competitive free entry. The results from this modeling exercise indicate that certain limitations in patent lifetimes induce follow-up patenting and reduce rent dissipation. This means that there may be other benefits accruing from patent lifetime limitation in addition to the traditionally recognised reduction of deadweight loss. This type of modeling approach to the proper designing or balancing of incentives in sequential patenting for innovation is still in its infancy. The actual importance of this difficult problem justifies a variety of empirical and theoretical approaches evolving over years to come.

In Chapter 15, Richard Nelson reviews the state of knowledge regarding the economic value added to university research by university patenting. With the emergence of universities as economic institutions and the emergence of the pro-patent era, the traditional open IP regime in universities not

only clashes with the rather closed one in industry, but is also transformed into a more industry-like IP regime. The issue then is: Is this to the better or the worse? Are important complementarities between a public open IP regime and a private closed one thereby lost in the innovation system as a whole without sufficient gains from choosing just one IP regime, that is, the private closed one? Is complementary co-evolution to be preferred over competitive exclusion in this case? The American research university system has been a forerunner in this context, with the Bayh-Dole act as one palpable feature. Based on various studies of the US situation, and in particular of three top US universities (Stanford University, University of California and Columbia University), Richard Nelson finds a mix of tempered evidence about pros and cons. This ought to sober up the over-expectations held in many quarters, not least in Europe, regarding university patenting pay-offs. Thus, universities contribute increasingly to the flow of innovations, patents and licences, but mainly due to new technological opportunities and enlarged patentability, and less due to the Bayh-Dole act and university technology transfer offices. University patenting and licensing also incur costs, e.g. in the form of tensions in intra-university relations and in university-industry relations, and inefficiencies in fundamental research relative to a public open IP regime.

In Chapter 16, Ulf Petrusson challenges the fundamental nature of IP concepts in jurisprudence, looking at the IP system and its interaction with technological and industrial development. This is part of a grander view of how legal systems and their conceptualisations interact with an increasingly knowledge-based economic system. Ulf Petrusson's perspective draws on Scandinavian legal realism with the ambition of contributing to a constructionist approach to legal argumentation. With this perspective and ambition, the historical evolution of patent concepts is briefly described and analysed as social construction. Finally, Ulf Petrusson as a legal constructionist develops several new concepts for a better comprehension of patents as a type of structural capital.

Margaret Jane ("Peggy") Radin raises in Chapter 17 another set of fundamental issues, revolving around legal concepts and reconceptualisations in the face of new technologies, infocom technologies in particular. These have enabled commodification of a variety of information and communication-related "things", supported by a variety of physical embodiments. A particular example is a traditional contractual relation between a buyer and a seller being commodified into a contract-as-product in contrast to a traditional contract-as-consent relation. As technology leads and law generally follows in conceptualisations, this technological enablement of commodification is then

reinforced by legal enablement through "follow-up" legal conceptualisations, analogies included. In particular, analogies to physical entities are stretched by interested parties (mainly industry) beyond what is reasonable, Peggy Radin argues, since there is an economic incentive to do so because physical property rights enable better rent control. In this process, commodification of information proceeds one step further towards tangibilisation of information and "physicalisation" of knowledge. To the extent that information and knowledge are embodied in human personhood, this physical tangibilisation of information and knowledge paves the way for its alienation from humans and alignment with property. A final question is whether legal concepts, once established in response to technological changes, then become outlived and start to obstruct change rather than facilitate it.

In Chapter 18, Ruth Towse focuses with the lens of a cultural economist on copyright and cultural industries, a concept which is far from an oxymoron. This focus fruitfully deviates from the common but increasingly narrow focus on manufacturing industries and patents in IP discourses. It is much needed as a complementary and mind-stretching focus, not least since it also throws light on the role of infocom technologies. The copyright system has been remarkably resilient or immune to radical technological changes and radical critique (not least creatively expressed by some writers), by and large retaining its basic economic and legal principles for centuries. The system has survived despite technological changes, and despite offering unbalanced incentives along the value chain. Thus, Ruth Towse argues, it has underincentivised artists and other creators in economic terms, while overincentivising intermediaries such as publishers and distributors. The former are perhaps less sensitive to monetary economic incentives, but not sufficiently so to render the imbalance optimal in any sense. In addition, the copyright system provides corporate actors with a higher rate of cumulation of market power. Technological changes "this time" in the form of new infocom technologies (enabling digitalisation etc.) have the potential to radically change this market structure. This in turn creates new challenges to copyright policies, and thereby to economic as well as cultural policies.

Hanns Ullrich in Chapter 19 delivers a fundamental critique of the IP system as we know it. The IP system interacts with competition law and economic policies, especially trade policies and technology and innovation policies. Based on a wide range of essentially legal cases and other sources, Hanns Ullrich argues that the IP system is misleading as a tool of contemporary economic policy. The system has traditionally been justified as an imperfectly designed but still functional tool for trading off (balancing) static and dynamic economic efficiency. However, in the course of functioning

more or less well in this desired way, the system gives negative legal and economic side-effects, and perhaps increasingly so. Therefore it has to be fundamentally rethought, and Hanns Ullrich offers a list of extensive suggestions for further research. In summary, this is a quest for developing legal and economic principles that could better govern the legal and economic functions of institutions like IP laws and WTO. These principles should be based on theories of how to promote technological and economic progress, and should serve as unifying principles behind various forms of IPRs.

In Chapter 20, Bart Verspagen addresses a long-standing but increasingly important issue in the world economy – how a global IP system should be designed that is conducive to development in countries with widely differing levels and pace of development. Is there a "one size fits all" solution, or should IP systems differ as countries do? The problem of how to design or tailor IP systems to fit differing economic sectors, like the university and industry sectors, or differing industry sectors or technologies, like biotechnology and infocom technologies, thus appears for differing countries as well. The problem also has a parallel problem in tailoring free internationalised trade regimes. In his undertaking Bart Verspagen also makes a brief account of the main economic motives behind an IP system, and a patent system in particular, an account that should be useful reading for lawyers and other non-economists as well as students.

A particular feature of a patent system is the breadth or scope of a patent right. Verspagen focuses on this feature in particular as it influences technology spill-overs, which in turn are of crucial importance to economic growth, as demonstrated also by some of the new, endogenous growth models. This focus then gives a nice example of how specific detailed features of an IP system may have strong leverage on economic performance.

It is difficult to draw firm conclusions on such wide-reaching issues as IP impact on global welfare, especially since formal theorising is still highly abstract and stylised and empirical research is in an infant stage. However, Verspagen argues that – beyond some magnitude of country differences – differentiated IP systems could be better than an internationalised uniform one as pushed for in TRIPs. As countries catch up and converge, their IP systems could converge as well.

The concluding Chapter 21 summarizes the preceding chapters as to their main focus, key/novel concepts, approach/empirical data, main findings/arguments and suggestions for further research. The commonalities and differences between economics and law in the IP field are described and discussed. At one level of resolution, the commonalities among the chapters regarding focus, concepts and main findings are quite palpable. At a higher

level of resolution, there is a wide variety of foci, approaches and suggestions for further research. Thus, one can say that there is a white elephant or a black box or a many-coloured cathedral out there that is coherent after all. The main differences between economics and law concern methodological approaches and mode of theorizing.

The final parts of the chapter reflect upon the need and prospects for further interdisciplinary research and teaching in the IP field. The chapter and the book end with some broad-brushed reflections and speculations about the future of the IP system.

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