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INSTITUTIONAL VOID AND THE EVOLUTION OF APPROPRIABILITY REGIME - THE CASE OF THE TRANSITION OF INTELLECTUAL PROPERTY RIGHTS POLICY IN TAIWAN

Abstract:

This paper examines the evolution and stages of Intellectual property rights (hereafter as IPRs) regimes since 1980s by investigating historical and quantitative data of IPRs. We explore how policy network of IPRs responds the development of industries, the evolution of innovation systems, and international IPRs harmonization and in turn affect the profile of IPRs policy. Theoretically, we will identify the determination of institutional voids and ask how Taiwanese industries face the issues related to appropriability regimes and in turn affect the development of innovation system and IPRs policy. The perspective of policy network is used to explore the whole structure of IPRs policy making and justify the role of state and industries in the relative evolution process. We used different types of IPRs data and historical archives to examine how the evolution of IPRs are established to build market, seek innovation chance, to network resources, and finally legitimately ensure appropriability amongst industries from closed to open innovation regime reach out beyond institutional voids.

To sum up, this study regards IPRs regime as a striking case study to demonstrate the effect of institutional voids on the governance choice of policy network. Empirical results will demonstrate that the innovation activity processed by industries is increased only when the appropriability strategies are resumed to catch up with new market created by institutional voids. This would allow us to better assess the global optimality of the array of international IPRs harmonisation currently in use around the world and their interplay. Finally this outcome of this paper have implications of IPRs policy for policy makers in the developing countries.

Keywords:

Appropriability regime; policy network; institutional voids; Intellectual property right harmonization

JEL Classification: F42, F63, H11

Introduction

Nations have become increasingly aware of the economic importance of intellectual property rights (henceforth IPRs) protection over the past twenty years. Issues related to IPRs have moved beyond the perspective of national discretion and legal analysis to the forefront of global policymaking. IPRs have continued to be strengthened in different international trade negotiations (e.g. Trade-Related Intellectual Property Rights (TRIPs)). In addition, the multilateral framework for international trade under the General Agreement on Tariffs and Trade (GATT) has attempted to enforce the protection of IPRs globally. The conclusion of the TRIPs agreement represents a major turning point in the effort to achieve a uniform or non-discriminatory standard across the world.

However, enhanced IPRs protection may have different welfare implications based on a country's characteristics. Given that countries are at different stages of development, they tend to adopt different development and protection strategies to safeguard their own economic interests of their major industries, this is an appropriability regime, in the international trade environment. Such developments in IPRs have become a leading source of force toward the evolution of IPRs regime. Taiwan, a newly industrialised country, is a striking example where the IPRs regime has been affected as a consequence of its considerable trade negotiations with the harmonization of international IPRs and demands from domestic industries' development. .

While scholars have highlighted the issues for strengthening IPRs to protect appropriability (Gallini, 2002; Lo, et al, 2013; Jaffe, 2000;), several studies have suggested that enhanced protection may have frustrated innovation rather acted as an incentive to innovate (Aoki and Prusa 1993; Mutti and Yeung 1996; Co 2004; Lo, 2013). From the institutionalism viewpoint, institutional voids are sources of market opportunities by refining market architecture and legitimating new when supportive institution or policy are absent or weak (Mair et al., 2013). This study picks up this issue particularly in the context of analysing the historical events of IPRs reform by considering Taiwanese industrial development lodged with policy network of IPRs. The study is going to argue that international IPRs uncertainty may lead to the institutional voids of IPRs protection in Taiwan, but the increased permeability of IPRs regime also lead to the evolution of innovation system in more open ways. That is, while the failure of IPRs protection may not actively defend the economic interests within the context of international trade, domestic firms instead exploits their technical and product advantages in or around institutional voids.

Pressure from developed countries, led by the US, certainly played a critical role in pushing forward a global reform agenda. The US designated inadequate protection of IPRs as an unfair trade practice that could revoke retaliation under Section 301 of the Trade Act of 1974. Those negotiations and threats under Section 301 authority in the 1980s and 1990s enhanced the stronger IPRs legislation in South Korea, Taiwan and China (Maskus 2000).

By contrast, developing countries complained that any effort to impose standards for protection was inappropriate. For instance, there was a considerable dispute during the Uruguay Round of GATT negotiations over the mandates in IPRs between the World Intellectual Property Organisation (WIPO) and the proposed World Trade Organisation (WTO) (Doern 1999). These provisions the developing countries favoured in effect were recognised to weaken protection of IPRs by developed countries (Sherwood 1990). Most importantly, there were also complaints about the discriminatory trade policy of IPRs protection in developed countries. Consequently, in spite of an agreement for minimum IPRs protection being set up in the TRIPs agreements, the wider debate between developing countries and developed countries over this issue has become extremely polarised.

This controversial role of IPRs has been deepening due to economic disputes between the south and north. So far there is no empirical consensus on whether the strength of IPRs protection has in fact influenced industrial development. The social welfare of developing countries may be harmed by the insertion of IPRs into the trade arena. For example The subject of pharmaceutical patents illustrates this issue as poor people in less developed countries where there is greatest need cannot afford the high cost of patented medicine. Many researchers sought to explain that the south has been deprived of resources due to the strict IPRs protection and in turn innovation from the south has been hampered (Lesser 1998; Perrin 1999; Gaisford 2001). Thus, the debates on the impact of IPR protection on different economies are still on ongoing. This study picks up above debates by exploring the evolution of IPRs in Taiwan, a newly industrial country, to illustrate the global optimality of the array of international IPRs harmonisation currently in use around the world and their interplay.

The contribution of this study, in general, is related to two strands in the literature. Firstly, the issue examined here extends the scope of the research on the optimal form of patent protection in relation to international trade context. Secondly, the study seeks to extend and integrate the empirical findings from policy network and institutionalism in highlighting the role of industries in cross border competition. In particular, this study takes a viewpoint from a newly industrialised country, Taiwan, to illustrate the issues of global IPRs protection affected by domestic trade regulatory protection. This leads to the implication of theoretical framework of the linkage of strategic concepts from industries with formal law and economic theories in international business and international IPRs harmonisation.

Secondly, the implications of IPRs disputes over cross border trade issues under international trade negotiation has never been previously analysed in the literature. This study therefore also contributes to our knowledge on the empirical studies of the effect of cross border patent disputes on IPRs regime. The discussion of evolution of IPRs in Taiwan from the integrative perspectives of policy network and institutionalism helps us to identify the sources of complex and dynamic dimensions that lie behind change of IPRs regimes.

This context gives rise to a primary question of how institutional voids of IPRs regime affects systems of innovation in Taiwan; in other words, how industries responds to the voids and plays their roles in the governance of policy network in order to have appropriability.

The crisis of IPRs regimes from institutional void's viewpoint

Thurow (1997) has argued that "Squeezing today's innovation into yesterday's system simply won't work". With the rapid change in technology and international economics, the existing system of IPRs has been shown to be the sources of institutional voids in encouraging innovation. The concept of institutional void refers that absent and weak market institutions reinforce existing social inequalities as market access and opportunity are governed by complex interlocks of local formal and informal institutional arrangements (Mair, et al, 2013). A variety of explanations in terms of occurrence of institutional voids are addressed as follows.

First of all, the emergence of new technology has resulted in a new crisis for IPRs protection. The debate over the patent-ability of biotechnology and software programmes is whether genetic material and software programmes are subject of granting patents. In particular, the issue of enforcement is especially difficult with rapid imitation enabled by digital technologies. It seems that copyright protection is not able to provide a sufficient protection from free-riding behaviour in the digital world (Thurow, 1997). As a result, through new technology a new challenge of the classic IPRs system is created and in turn leads to the occurrence of institutional voids.

Secondly, new product development generally requires the integration of inputs from multi dimension technologies. Such complex technological requirements have resulted in the need for extensive negotiation amongst patent-holders for firms to be able to access external technologies. In order to successfully commercialise technologies, firms are expected to build up a patent portfolio in an attempt to cross-licence with other firms or to avoid the blocking possibility by competitors. Semiconductors industries provide a striking example, in which firms are engaged in patent portfolio races in an effort to cross licence to avoid possible infringement claims (Hall and Ziedonis 2001). Therefore, the characteristic of complex technologies has increased the possibilities of interaction based on IPRs among firms. Based on that, the mechanism of IPRs protection is not only just to protect their rights, but also need to take intermediaries of institutional voids into consideration.

Last but not least, with global competitiveness, the interaction among firms has become more complicated. Cross-border patent enforcement has been an important issue for multinational firms. For instance, multinational firms may try to file their patents

internationally in order to safeguard their intellectual property (Ernst, 1998). The cost of enforcing a patent globally has become a concern in the investment of foreign countries. Empirical work has shown that the weak IPRs regime probably deters foreign investment in high technology due to the high cost of enforcement (Lee and Mansfield 1996; Javorcik 2002). Consequently, despite the effort toward a one-fits-all standard protection since TRIPs, patent protection is probably not perfectly enforceable within the global competition framework. Consequently, the institutional voids of current IPRs protection are illustrated by the emergence of new technology, complex technologies and global enforcement issues. The deficiency reflects multi interactions and unclear trade-offs between IPRs harmonisation and national interest's concerns. Thus, it would be useful to review the literature of the perspectives of institutional voids in an effort to identify where deficiencies are in the transformation of IPRs protection; and to explore the possible resolution for those deficiencies within the new framework of global competitiveness.

In general, Institutions are regarded as the rule of the game, including both legal rule and informal rules in the society (North, 1991; Hodgson, 2006; Zheng, et al, 2010). While there has absent or weak institution, the presence of Institutional voids may affect market formation, economic growth, and development (Khaima & Palepu, 1997; Webb, et al, 2010; Mair, et al, 2013). Most importantly, while new laws become rules on the condition new laws have to be enforced to avoid or perform the behaviours, which are in question becomes expected and acquires a normative status (Hodgson, 2006).

Previous studies have shown that absent and weak market institutions reinforce existing social inequalities as market access and opportunity are governed by complex interlocks of local formal and informal institutional arrangements, including property rights, and governmental regulations, customs, traditions, and religious beliefs (Mair, et al. 2013). Therefore, the focus of institutional voids emphasize the central role that institution and their absence—play in developing market economies and in shaping the behavior of a particular set of actors: firms and entrepreneurs. In addition, Khanna and Palepu (1997) highlighted the role of business groups in developing countries through imitating and substituting strategies to facilitate market function in the presence of market failures. Similarly, Keupp et al. (2012) study emphasize the motives and archetypes of foreign firms patent in emerging economies with weak appropriability.

In institutionally complex contexts, If these specific institutions are absent or weak, institutional voids occur and a compensatory social structure is needed to spur market formation and operation (Mair, et al, 2013). For example, weak and lacking formal institutions in China force entrepreneurs to rely on trust within networks (Zheng, et al, 2010). Webb et al. (2010) has shown that institutional incongruence and weak enforcement of formal institutions facilitate entrepreneurial processes in an informal economy. Therefore, the relative strength or weakness of various institutional frameworks may have influence on alternative modes of entry. However, while previous studies have elaborated

on a varied set of consequences resulting from the presence of institutional voids, much is still unknown about how institutional voids are constituted and how they relate to existing policy network and how they matter for actors from industries in the context of IPRs protection.

With this in mind, this study has regarded as market access and participation are negotiable and market boundaries are potentially permeable for actors who have been excluded. Based on Mair et al. (2013) study, a fresh perspective regarded institutional voids as an important driver of market exclusion. Mair et al. (2013) study identify two sets of activities of market exclusion: (1) Redefining market architecture; (2) Legitimizing new actors-as critical for building inclusive markets. Consequently, this study will identify the institutional voids in the development of IPRs protection in Taiwan, and further illustrate how institutional voids of IPRs result from conflict and contradiction among institutional bits and pieces from the development of IPRs.

The concept of policy networks has been highlighted in the policy analysis fields (Marsh and Smith, 2000; Rhodes, 1990, 1997; Zheng, et, al., 2010). While the importance of policy network has long been highlighted In line with the pioneer study of Rhodes' studies (1990, 1997), policy networks used to be characterized as pluralistic, heterogeneous sets of actors, actor interdependency, and complex network relations (Shi and Hu 2006; Zheng, et, al., 2010). For instance, as mentioned before, there are a variety of conflicts of interests between international IPRs protection and the interests of domestic industries through time. Therefore, the decentralization, fragmentation and sectoralization are indeed the nature of policymaking which are regarded as a different governance mode.

Overall, the division of policy network approaches includes the interest mediation school and governance school (Börzel,1998; Kitthananan, 2006). Similarly, both schools emphasizes the interdependence between actors drawing from a substitution of pluralism and corporatism. Kitthananan (2006) argue that the concept of governance is regarded as a useful method better understanding the changing roles, powers, functions and activities of the State in both the economy and society. This study therefore takes a governance school point of view. In this study, the concept of policy network is regarded as a way for the government establishing a communication and coordination mechanisms in order to generate various policy alternatives. With various policy alternatives, the structure of policy making are based on concentration, interactive co-operation, communication, and policy learning amongst government and other policy actors. Most specifically, the process of exchange and interaction among diverse actors, such as, public and private organizations, constitute formal and informal relations are a result of resource interdependency.

However, limited attention has been paid to the question of governance outcomes in the governance network literature (Klijn,1996; Kitthananan, 2006). Policy outcomes are usually as trade-offs between goals and multi stakeholders. The outcome of policy decision is

partly intentional and a compromise which is not necessarily a coherent decision (Rhodes, 1990). As a result, the concept of policy network assumed that policy problems are solved through multi-centric interactions rather than centralized ways. The study aims to fill the knowledge gap for analysing such questions.

In this study, the evolution of IPRs regime of Taiwan is the case in point to demonstrate the environmental factors influencing policy outcome. IPRs policy is used to be viewed as intended design processes, but as a series of interactions among multi actors, such as domestic industrial demand and international harmonization, has an indefinite influence on certain issues or on the implementation of IPRs. The evolution of IPRs regime are based on the development of network in the course of time through frequent interactions. Networks of IPRs regime are activated parts of networks around a concrete international issue or innovation policy. Therefore, policy networks of IPRs regimes are a collection of stable relations between mutually dependent actors within the network. Different types of policy network may influence interaction, co-operation and learning between actors in terms of IPRs regime in policy-making. Networks provide institutional rules and arrangements that reduce strategic uncertainty and the risk of opportunistic behaviour. In this way, institutional conditions, as IPRs regime in the Taiwan, may affect the interactions amongst across different policy networks.

To sum up, policymaking is used to be regard as t linear ways according to a number of known chronological phases, such as problem formulation, development of alternatives, decision-making, implementation, evaluation, but policy network demonstrates the policymaking as erratic and developing in non-predetermined rounds with varies of nature of changing (Teisman 2000). A breakthrough decision may occur in different rounds and in turn these may lead to the new momentum of game resulting in an important decision (Zheng, et, al., 2010). Therefore, in this study each round actors in terms of IPRs explore an appropriability problem and look out for opportunities to reach a joint decision.

Conceptual framework

IPRs regime are based on enhanced technical capacity composing of a package of policy instruments which recognise the multi-facetted nature of appropriability problem from industries and bring together knowledge and skills that successfully appropriate economic return. Undoubtedly, more aspects in terms of appropriability could be considered into the framework but we believe that a more parsimonious framework that extracts some of the most important governance outcomes and how these vary across the axes that we have identified is preferable to a more complex formulation. Reflecting debates in relation to the impact of change of institutional voids, such as international patent protection harmonisation on IPRs regime, this study examines the issues that arise when IPRs regime are related to trade regulatory protection where domestic industries have additional intentions exploring for re-defining market around or in the institutional voids. Following

explains the three concept related to IPRs appropriability, namely, legitimating actors, actors networking, and forming institutions.

Legitimating Actors:

The preferences for particular policies and the actions of network actors also influence the network structure (Marsh and Smith, 2000). Actors depend on the interest and attention given to them and the policy in question by other actors in the network. There are several dynamics and interactions influencing actors' innovation activities in national innovation system, such as social-institutional adaptation (Freeman, 1987); producer-user interactive learning (Lundvall, 1992); firm competence and routines (Nelson, 1993); wider innovation networks through the mechanisms of multinational enterprises R&D and international technical alliances (Freeman, 1987; Niosi, 2011). These studies has shown that individuals, producer, users, companies and institutions, even from abroad, are regarded as innovation actors to jointly to create, diffuse, and use knowledge in nations. Therefore, this leads to the legitimating process of actors may involve into following conditions:

Firstly, vertical and horizontal power relations affect the ability of the meta-governor to achieve these goals. The extent to which exclusion takes place has an important impact on the functioning of governance networks. The exclusion of certain interests from specific actors may provide better opportunities for policy innovation, effective policy delivery and adaptability, but may lead to the lower adaptability of institutions. This may affect the occurrence of networks.

The adaptability to adapt to changes in the external environment will vary depending on whether it is in the interests of actors within a network to reform and on the state's willingness to persuade and even force the network members to consider broader societal interest when adapting to changes in environment and context (Daugbjerg & Fawcett, 2010).

At the actor level, the strategy of policy actors was explored by assessing the level of conflict within IPRs regime by considering whether opinion blocks exist with regard to the issue of appropriability. These opinion blocks could be identified by a blocking modeling procedures (Burt, 1976; Henning, 2000) based on the questions: with which policy actors do you share opinion towards the appropriability of IPRs and with whom do you have diverging opinions on this issues. Therefore, within dynamics of interactions, innovation actors, particularly the central role of firms as highlighted by NSI, may search, source and collaborate at different networks based on the institutional contexts where they are located and operated.

In closed innovation in which the policy network is characterised by state-centred governance, the inclusion of actors with various perspectives on a policy problem and the incorporation of different concerns have the potential to bring about policy innovation, effective policy delivery legitimacy and adaptability (Daugbjerg & Fawcett, 2010). However,

the process leading to the choice of policy instruments is likely to be time consuming because actors find that they have difficulties developing a shared understanding of the policy problem and are unable to agree on what policy measures would be appropriate. The state's capacity to exercise meta-governance may, to some extent, overcome these problems and enable the network to function reasonably well in terms of bringing about policy innovation, effective policy delivery and adaptability, and in particular legitimacy.

A transition from closed innovation system to open innovation system has been highlighted in the economic development (Chesbrough, 2003). In line with open innovation, the distributed knowledge can be obtained from external sources outside of firms or globally knowledge networks. the main actors in OI era, namely, sponsors, investor, generators, and most particularly, marketers and one stop centers are specified actors now are being "legitimizing" in acquiring outbound knowledge (Chesbrough, 2003). Above intermediary actors in the knowledge network have created a new technology integration corporate and entrepreneurship. Therefore, the state's capacity to simulate intermediary actors may, to some extent, exploit the possibilities around and in institutional voids and enable policy network to function reasonably well in terms of bringing about policy innovation, effective policy delivery and adaptability, and in particular legitimacy.

Actors Networking

Networking dimensions demonstrate how innovation actors adapt to environmental changes through interactive learning amongst different organizations (Lundvall, 1992). Institutional voids can be found at the interface amongst universities, industries and final users in order to enhance actors' competencies and resources.

However, the characteristics of policy network lead to the failures of learning. Strong network failures with the characteristics of over-embeddedness, such as group thinking, myopia and inertia, tend to lead to blindness due to the fact that stable relationships within network (Granovetter 1985; Nooteboom 2000). On the contrary, weak network failures may result in under exploitation of resources and inefficiency because of the non-complementarities of actors and the lack of relationships between complementary technologies or actors within network (Woolthuis, K., et al. 2005). With above failure, firms are unable to adapt new technological paradigm (Smith 2000, Edquist and Chaminade 2006).

In openness IPRs regime where the state has less capacity to meta-govern and society-centred governance results, there is a considerable risk that the network may be unable to arrive at such a decision as actors find that they cannot develop a shared understanding of the policy problem and are unable to agree on what policy measures would be appropriate. The importance of weak ties allows network members to access the new knowledge and ideas beyond their own social network (Granovetter, 1985). Therefore, IPRs regime in open innovation is to foster outbound flows of knowledge and technology should take care of the implications intellectual property management. For example, intellectual property can be used as a bargaining chip in obtaining valuable knowledge

(Chesbrough, 2003). However, such decisions may suffer from the lack of broader legitimacy because only some stakeholders have been involved and the costs of the policy may be passed onto such stakeholders these concerns will be considered.

To sum up, the broadening of some interests increases the complexity of the decision making process and making difficult for network members to develop a shared understanding of their policy field. With the importance of spin-offs and licensing as a means of obtaining the commercial benefits of innovation in contrast to aiming solely at new products commercialized by firms' own innovation activities (Chesbrough, 2006), institutional voids occurs due to the fact of the inefficiency of appropriability, timely policy decisions that have the potential to solve the problem in question and which can be effectively delivered. For example, firms are not able to appropriate the benefits from network to sourcing innovation intermediary, entrepreneurship, double loop/ exploring learning.

Forming Institutions

Institutions are the concept in terms of co-evolutionary process and mainly focus on the possibility of market failure that lead to the public measurement initiation. Firms do not innovate in isolation but with continuously interaction and co-evolution with other organizations in the system (Edquist, 2004; Lundvall, 1992). Institutions include formal institutional factors, such as infrastructural IT and science and technology infrastructure, IPRs law, tax law, environment and safety regulation etc, as well as informal institutional, such as culture and politics (Chang and Chen, 2004). The long term investment in formal institutional and informal institutions are important in foresting willingness to cooperate and bear risk, openness toward change, and the society's general attitude toward the policy.

The resources available in institutions for actors determine their political action. Networking activities then are other limited by financial or time constraints (Casey, 2004). The market failure is resulted from searching failure and business model failure, such as insufficient institutional incentives for R&D outsourcing and corporate venture fund. There is therefore a dilemmas in advantageous appropriability regimes in OI practice between openness and appropriability due to the fact that the institutional failure (Huizingh, 2010).

To sum up, systemic failures are mainly resulted from several types of institutional factors, such as Infrastructural failures; luck-in failure; hard institutional failure, soft institutional failures etc., but it must be noted that these types of failure occurs due to complex interconnections of existing technologies and institutions (Schröter, 2009). When a policy network has more actors and interests, the more complicated the decision making process becomes. The following knowledge gaps therefore are needed to be addressed whether a new awareness of OI policies leads to the possibility of institutional voids.

Methodology

To explore and explain evolution of IPRs regime requires inter-disciplinary knowledge and data, namely, the understanding of justice systems, technology development and the growth of industries. A naturalistic inquiry approach is used as basic methodology, which has been viewed as an important research strategy in social science and management (Lincoln and Guba, 1985). This proposal is not originally designed to understand specific strategies of IPRs, but rather to examine the co-evolution of Taiwanese industrial growth and IPRs regime more generally

Yin defines a naturalistic inquiry approach as “seek to describe, understand, or interpret daily life experiences and structures based on field observations in an attempt of developing new theory and/or verifying existing theory by demonstrating plausible support through data” (Yin, 2003:13). This definition points out the strength of a naturalistic inquiry approach, which enables us uncover the causal path and gain a rich understanding of contextual conditions. In this regard, Yin emphasises (Yin, 2003:13) that a naturalistic inquiry approach includes an all-encompassing method, including data collection and data analysis strategies. In addition, empirical evidence and theoretical constructs are justified in the same time with the movement between data analysis and conceptualization iteratively. We abandoned or modified tentative categories and retained those that recurred in the growing body of data. In order to create the historical narrative in which we present our findings, we identified “common social accounts” (Jepperson, 1991, p. 147) that described key events, practices, and the work of actors. We wrote these social accounts into historical narratives for each case.

With above philosophical stance, we identified the growth of IPRs regime and mapped them according to the stages of industrial change. These issues pose difficulties in the analysis of the complex interaction between industrial change and evolution IPRs. In addition, case study on Taiwan IPRs development can be seen to satisfy the three tenets of the qualitative method: describing, understanding, and explaining. In this study, the case study method has been chosen for the following reasons:

Firstly, the change of IPRs regime is typically a system of action rather than an individual or group of individuals. A case study can be implemented beyond the quantitative statistical results and can explain the conditions through the perspective of the ‘actors’. Statistic methods are not able to capture the complex process of the change of IPRs regime. In this regard, case study evaluations can cover both quantitative and qualitative data to capture the dynamic process of IPRs regime. Secondly, the sampling logic in the selection of events may raise some problems. The most significant problem is that the events are often involved in several relevant cases, which can create a bias of sample selection. In this regard, case studies can be involved into single or multiple-case designs, where a multiple-design follows replication rather than sampling logic. This enables researchers to overcome

the systematic bias from sampling. Thirdly, with the initial development of theories, multiple events as case study design can strengthen the results by replicating pattern-matching. Case studies may contribute to the robustness of the development of theory (Eisenhardt 1989)

A frequent criticism of case study methodology is lack of representative-ness, which is incapable of providing a generalised conclusion. Yin (2003) argues that the relative size of the sample does not transform a multiple case into a macroscopic study. By contrast, one of the aims of a case study should be theory-driven and generalise to a theory based on cases selected to represent a dimension of the theory (Eisenhardt 1989). In this way, even a single case could be considered acceptable, provided it met the established objective.

In addition, a number of methodological constraints are encountered because of the research context in relation to Taiwanese firms. Firstly, when intellectual property systems used to be weak, people quite naturally knew little about IPRs and are also very sensitive about the change of IPRs. Secondly, statistics in many developing countries, including Taiwan, hardly compare in quality and quantity with those in developed countries (Gonsen 1998). In order to overcome the constraints of this study, the method of triangulation will be used in the study. The application of triangulation is based on the assumption when convergent results are obtained with different measures; bias is not likely to distort the results.

The research question is: "What actors and network interactions have taken place in the transformation of IPRs regime in Taiwan?" To answer this, secondary and documentary data analysis will be conducted. These data include legal documents, international trade information, patenting activities information etc. An interview method may be employed before analysing two in-depth case studies for which longitudinal data is available. Interviewing is viewed as a research method of data collection. Interviews can help to gather insightful data that are pertinent to both the research questions and objectives (Saunders, Lewis et al. 2003). Through Interviews the information that is required to develop the case studies and establish more in-depth understanding can be found out (Robson 2002).

The evolution of Institutional environment of IPRs in Taiwan

In line with national differences in economic development, intellectual property rights (IPRs) regimes and the enforcement of existing laws also differ widely across countries. This difference is highly concerned with legitimately balancing the protection of IPRs and the promotion of some consumer benefits. These benefits are through allowing free-riding behaviour on the innovations of advanced countries against IPRs.

Taiwan is a striking example, which is economically dependent upon expanding manufacturing capabilities and acquiring technology from advanced countries. The US was one of the largest trading partners and sources of imports during the Taiwanese economic transformation. For example, the US market accounted for 47.8% of total exports in 1986 and trade surplus was 135.8 billion American dollars till 2004. In spite of the decrease of the importance of the US market (14.5% of total value of exports), Taiwan still maintained a bilateral 64.9 billion American dollars trade surplus with the US in 2004. In addition, Hu and Jaffe's study, using a proxy of patent citation, shows that knowledge diffusion from the US and Japan has played an important role in Taiwan's economies transition from labour-intensive manufacturing to technology- and human-capital intensive economies (Hu and Jaffe 2003).

At the same time, over the past two decades, Taiwan restructured its IPRs regime significantly because of pressures to strengthen and harmonise the protection from advanced countries. US trade sanction actions, in particular, forced the Taiwanese government to modify its IPRs regime in order to reduce the problems of piracy and counterfeit goods. Hence, the US plays a crucial role in the change of Taiwan's economy as well as its IPRs regime. Analysing the change of Taiwanese IPRs regimes will be beneficial to developing a deeper understanding of the relationship between stages of economic development and the change of IPRs protection regimes.

Economic transition in Taiwan

Taiwan's economic development has shifted over the past 50 years from an agriculture-based economy to an industrialised era. Since the Taiwan experience of the shift to industrialisation is well documented in the literature (Wade 1990; Mathews and Cho 2000; Mai and Shih 2001), this section focuses on the development of international trade since the 1980s.

From the 1980s onwards, Taiwanese labour-intensive industries were replaced by technology and capital-intensive industries and the composition of its exports changed from agricultural products to industrial ones. In particular, it has been recognised by several scholars that the ICT (Information and Communication Technologies) industries were the primary drivers of economic growth in Taiwan (Mathews 1997; Mathews and Cho 2000). For example, between 1989 and 1996 the share of technology-intensive products in total exports rose from 24% to 38% (Kuo and Liu 1999). The rapid growth of the Integrated Circuit (IC) design industry is another striking example. Taiwan has now become the second largest IC designer after the US and the IC design section grew from 51 companies in 1991 to 225 companies employing 11800 in 2002 (ITRI 2003; ITRI various years).

As the economic transition occurred, the result was massive trade surpluses and rapid growth of foreign exchange assets during these periods. The Taiwanese government trade policy also promoted the transformation of liberalisation and globalisation economy during

this period. For example, with the privatisation of government-run enterprises, the economy became increasingly open and free from earlier restrictive and protectionist tendencies. In addition, the Hsin-chu Science-Based Industrial Park was established in 1980 to compete globally, in particular for the development of semiconductor industries. Both of the world's top semiconductor-manufacturing firms: United Microelectronics Corporation (UMC) and Taiwan Semiconductor Manufacturing Corporation (TSMC), founded in the late 1980s are residents of Hsin-chu.

The main factor to explain Taiwan's rapid economic growth relates to the role of the state in persuading new activities and the growth of private entrepreneurs (Mathews 1997; Kuo and Liu 1999). Those policies were developed through governments' interactions with private industries. For example, by initialising the 'Statutes for the Encouragement of Investment' in 1960, the Taiwanese government attempted to improve the investment environment and attract foreign capital through lowered tariffs, a unitary set up, and the abolishment of the required permits for remitting money abroad. In addition, by building public research institutions, the intervention of the Taiwanese government not only helped industries acquire technologies from advanced countries, but also developed working product prototypes before 'handing them over' to industries (Mathews 1997). Therefore government interventions are considered to have played an important part in the economies transition from labour-intensive manufacturing to technology-intensive manufacturing in particular in the upgrading industrial technological capabilities.

Another point which explains Taiwan's economic growth is its specialisation in producing systems and equipment for other companies. This business model became the main source of competitiveness of the Taiwanese electronics industries in the international economy (Wade 1990). Over the industrialising period, small and medium enterprises (SMEs) become an important part in the process. With a limited technology base, SMEs found that affiliation with major manufacturers was one of the easiest ways to transfer technology. This kind of strategy became known as Original Equipment Manufacturing (OEM). Furthermore, foreign direct investment (FDI) has been involved in OEM systems. For example, around the 1980s' electronics industries accounted for around one third of Taiwan's total FDI (Wade 1990). Through intensive contacts with foreign firms and international business, Taiwanese companies were able to extend their opportunities to efficiently import materials, parts and equipment, and to acquire broader international markets (Kuo and Liu 1999).

To summarise, with a lack of natural resources, Taiwan is economically dependent upon expanding manufacturing capabilities and acquiring technology. Economic growth is based on manufacturing relevant products exporting and to the West. This export orientation of the economy has brought about the need for the reform and harmonisation of Taiwanese legal institutions with global regimes.

Trade disputes between Taiwan and the US over IPRs

As mentioned above, Taiwan developed strong economic relation with the US with Taiwanese ICT firms specialised in producing systems and manufacturing complementary products for leading US firms. However, at the same time IPRs protection, pirating and enforcement problems are critical issues that have led to disputes and US unilateral retaliations.

US trade laws such as “Section 301 ” and “Special 301”¹ are an important means of ensuring enforcement of US rights and interests in trade. These acts enable the US to protect their interests globally and have been used against Taiwan.

Special 301

Part from lobbying in the international organisation of IPRs protection, the US also takes unilateral trade retaliations toward trading partners in order to appropriate the IPRs protection. Since the Trade Act of 1974, the US government has been offered power to retaliate against countries, which are improperly restricting US exports. For example, Section 301 of the 1974 Trade Act is the principal US statute for addressing foreign government practices affecting US exports of goods or services. Section 301 may be used to enforce US rights under international trade agreements and may also be used to respond to unreasonable, unjustifiable, or discriminatory foreign government practices that burden or restrict US commerce (USTR 2001).

The US Trade Act was further expanded to protect US IPRs globally in “the 1988 Omnibus Trade and Competitiveness Act”. With this Act, the US increasingly used its economic and political measures to pressurise other nations into providing and enforcing IPRs for the benefit of US companies in their territories disregarding the requirements of international laws (Rosenthal 1998). For example, the aim of Section 182 of the Trade Act of 1974 (commonly known as ‘Special 301’) was to take a hard line against intellectual property piracy, in particular, the Act enabled the US to take a retaliation measure to trade rivalries if other countries failed to protect US IPRs and ignored commercial piracy as well as counterfeit goods.

Whether the US adopts Special 301 to retaliate against trade-partners is based on the evaluation of the damages to US exports. Basically, the list places suspected US trading

¹ For example, the use of Section 301, Section 1377, Super 301, Special 301, and Title VII has enabled the US to challenge market access barriers to US goods and services, protect US intellectual property rights, ensure compliance with telecommunications agreements, and address discriminatory foreign government procurement practices.

partners into three separate categories of inadequacy in their intellectual property protection: 'Priority Foreign Countries', 'Priority Watch List' and 'General Watch List'. The list of retaliation is based on the annual review by the Office of the US Trade Representative (USTR, 2001).

Most seriously, in terms of lists of 'Priority Foreign Countries', the US would initiate an investigation within 30 days of designation. If an agreement could not be reached, the US would take mandatory actions for trade revenge or requests for negotiation within six months.

'Priority Watch List' and 'General Watch List' countries are mainly designated by the seriousness of IPRs protection problems. 'Priority Watch List' countries will not have instant trade retaliation, but must engage in a negotiation with the US within 6 months of designation. If designated countries have improved IPRs protection since designation, those countries will be listed in the General Watch List. If not, they can be listed as Priority Foreign Countries. General Watch List IPR protection problems are less serious than those of the Priority Watch List. Those countries on the list will be evaluated yearly to confirm adequate IPRs protection.

In addition, apart from those categories, if the US is of the view that there is a need to review certain countries, then those countries may be listed on the irregular review list. If that country has already breached its bilateral IP agreement with the US and has not made promised improvements, the US can proceed directly with trade sanctions without further investigations or discussions when a country was listed as under monitoring of Section 306 of the Trade Act. This Act empowered the sanctions of Special 301.

Taiwan's experience on the Special 301 lists

Part from the years 1996 and 1997 Taiwan has continually been listed on the Special 301 Watching List from 1989 to 2002. In 1992 and 1993 Taiwan was on Priority Foreign Country. Table 1 shows details of Taiwan's inclusion on the Special 301 list and the government's responses toward trade pressure. To demonstrate the seriousness and determination of its efforts to deal with IPRs infringements, Taiwan amended its intellectual property laws pursuant to a memorandum of understanding, which concluded with the US in January 1992. The 1992 IPRs reform is a direct response to threatened retaliation by the US.

Table 1 Taiwan in Special 301

Unit: Million USD

Year	US Trade deficit with Taiwan	Special 301 List	Taiwan government responses in terms of IPRs reform
1989	120.0	Priority Watch List	Starting trade negotiation
1990	91.3	Watch List	No action
1991	82.0	Watch List	No action
1992	78.0	Priority Foreign List	IPR-relevant law amendment
1993	67.6	Priority Foreign List	No action
1994	63.0	Watch List	No action
1995	56.4	Watch List	No action
1996	68.9	Negotiation	No action
1997	63.2	Priority Watch List	No action
1998	97.0	Not in the List	No action
1999	112.0	Watch List	No action
2000	96.9	Watch List	No action
2001	94.4	Priority Watch List	Strengthening protection agrochemical products
2002	86.6	Priority Watch List	Intensification of crackdown on downloading of MP3 music

Source: compiled and adapted from (Wu 2003)

In 2001, Taiwan was removed from the United States Trade Representative's Special 301 General Watch List to the Priority Watch List. This is mainly because the US was unsatisfied by weak links in Taiwan's judiciary system, such as, a lack of vigorous follow-up by Taiwan IPRs prosecutors and judges, lack of police seizures of counterfeit products and, in particular, the debate over the inadequate protection of pharmaceutical goods, agrochemical products, and copyright violation on the internet (USITC 2002: 123-126). With this pressure, in 2002 TIPO stepped up efforts to protect patent rights on pharmaceutical products, to strengthen IPRs protection pertaining to agrochemical products, and to intensify the crackdown on the downloading of MP3 music files from the Internet and other commercial piracy. Of course, Taiwan is not as isolated case in respect of trade/IPR retaliation. The US also takes unilateral retaliatory trade actions against other countries. For example, Argentina's patent system was accused of inappropriate

pharmaceutical IPRs protection and onerous compulsory licensing. This then resulted in the withdrawal of benefits of approximately 50 per cent of Argentina's exports (Rosenthal 1998).

To sum up, in spite of being in violation of international legal regime of WTO dispute settlement mechanism, Special 301 takes retaliation actions against an alleged violation exclusively. Special 301 has generally encouraged speedier and more substantial changes in suspect nations without the respect of territorial sovereignty of Nation States.

Development of Taiwanese IPRs regime

Stages of the change of IPRs regimes

Taiwan's patent system was introduced in 1945, but the concept of intellectual property rights was not a primary concern in Taiwanese society until 1980. Except for minor amendments in 1958 and 1978, the main changes to the IPRs regime occurred from the 1980s due to the significance of international trade during industrialisation. This section focuses on the changes of the patent law after 1980 from both the perspectives of industrial learning and technology policy. A chronology of the amendments of the IPRs-relevant law is given in table 2.

After 1980: the process of industrial learning

The main change of Taiwanese patent law after 1980 coincides with the first steps towards developing information technology industries and with a series of decisive trade negotiations. The first stage is the introduction of the patent concept to industries. This stage is initiated by the pressures from US trade negotiations in relation to product imitation and counterfeit products being produced and exported to the US market. In response to this, the Chinese National Federation of Industries organised an anti-imitation committee in 1984 and issued an 'Alliance Self-Restraint Declaration'. This measure has shown that the government intended to implement the perception of IPRs to industries in the earlier stage, but the industries did not yet endorse this concept.

The next stage of development was the learning process of industries. Industries learnt a bitter lesson due to the intensive disputes over patent infringement and the rate of royalty payment. For example, Intel filed a complaint in US International Trade commission against Twin-Head Corporation, a Taiwanese computer firm, accusing it of patent infringement in 1993¹. In order to protect their profits, Taiwanese firms began to understand the importance of IPRs protection and started to apply for patents and conduct more research. Responding to the demand from enterprises, the Taiwanese government established an agency of IPRs development and management in the Industrial Technology Research Institute (ITRI) and

¹ For a detailed data, see USITC Section 337 investigation No. 337-TA-352 "Personal Computers With Memory Management Information Stored In External Memory and Related Materials"

Science & Technology Law Centre in order to provide the IPR expertise and disseminate the lessons learnt by the above agencies to enterprises (Mathews 1997).

With revisions in 1981, 1986 and 1987, the essential features of the modern administrative system were settled. The Taiwan intellectual property office was established and began to examine patent applications. But the industries did not consider the importance of patent portfolio seriously. This is partly because Taiwanese firms specialise in producing systems and equipment for other companies, which can avoid directly infringing other companies' patent rights. Parts of the explanation lie in the inefficiencies and uncertainties that surrounded the procedures for securing and enforcing patents in the international environment. The number of Taiwanese patentees was very small in the USPTO before 1990, and can be partly explained by the ignorance of the importance of patents.

After 1995 the intensity of patent disputes dramatically increased due to the demand of upgrading technology in Taiwanese industries. Having learnt from financial losses due to ignorance regarding intellectual property rights and patenting activities, Taiwanese firms' patenting activities became more active than in previous years. The reform of the patent system established a solid legal base for further participants of the WTO.

IPR policy and Innovation policy

If we consider IPRs policy as one part of national technology policy, the process of government technology policy is also consistent with the process of the learning of industries. The issue of IPRs was discussed initially in the Third National Science and Technology 1986 Conference¹, and was concerned with IPRs education and protection (ITRI 2003). The next stage of technology policies highlighted the management and utilisation of IPRs with emphasis on the promotion of technology transfer from international technology corporations in order to upgrade industries. At this stage the government considered harmonisation with international patent regulation and national treatment principle.

In the mid of 1990s, the focus was on the creative aspects of IPRs. The outcome of the fifth National Science and Technology Conference was the collection of the 'White Paper on Science and Technology' and the draft of the 'Fundamental Science and Technology Act' (FSTA). The FSTA got underway later in 1999 with the aims of promoting the patenting

¹ Taiwan's science and technology development operates within the framework of meetings of the National Science and Technology Conference, which is organised by the heads of government agencies related to S&T. This board carries out the management and allocation of the national budget. For detail see 'National Science Council (2001). Yearbook of Science and Technology: Republic of China 2001. Taipei, National Science Council, The Executive Yuan, Republic of China.'

and commercialisation of the innovation of universities and non-profit-making research organisations. The function of FSTA is similar to the Bayh-Dole Act of the US.¹

The fourth stage was the integration of the effort of patent protection with the concept of education, utilisation, and creation of IPRs. This stage was from 2000. The sixth conference drafted the National Science and Technology Development Plan and promoted IPRs protection in action in 2002.

To conclude, given that IPRs issues are not divorced from other areas of technology and development policy, the changes of IPRs regime together with IPR-relevant policies were put into the infrastructure of national technology policy by the Taiwanese government during the industrialisation process.

Table 2 A chronology of the amendments of the IPRs relevant law

Year	Events
1944	First version of Patent Act (Total of 133 articles)
1959	1 st amendment of Patent Act
1960	2 nd amendment of Patent Act
1979	3 rd amendment of Patent Act
1986	4 th amendment of Patent Act
1986	Third National Science and Technology Conference The issue of IPRs was put into discussing agenda
1990	Fourth National Science and Technology Conference
1994	5 th amendment of Patent Act
1996	Fifth National Science and Technology Conference
1996	Trade Secret Act
1997	6 th amendment due to the participation of WTO
1999	Establishment of Fundamental Science and Technology Act

¹ The common point in both Acts is the function of promotion of technology transfer from universities.

- 2001 Sixth National Science and Technology Conference
- 2001 7th amendment of Patent Act
- 2003 8th amendment of Patent Act and Implementing Regulations of the Patent Act
- 2012 9th amendment of Patent Act

Source: compiled by author from TIPO website: <http://www.tipo.gov.tw/eng/laws/laws.asp#1>

Role of WTO and TRIPs

Since joining the WTO in 2002, Taiwan has enacted many laws and policies that are meant to improve intellectual property rights (IPRs) protection. There is no doubt that the international IPRs harmonisation has had a great effect on the Taiwan patent regime. In preparation for its accession to the WTO, Taiwan completed amendments to its Patent Act in 1997 and then, in 2001, the Act was further amended. There were several significant changes over this period. Here the process of change will not be described; instead the main point is concerned with how large-scale patent reforms were amended.

First of all, the requirements of patent-able subjects became fully consistent with the TRIPs Agreement with regard to specific provisions, such as novelty and invention-step requirements, grounds of rejections, and the definition of unity of invention, disclosure requirement and removal of opposition provisions. Secondly, criminal liabilities for patents were deleted and early publication and domestic priority rights were incorporated. Thirdly, the administration procedures for patent applications are standardised. For example, the new Act stipulates that patent application and other procedures may be filed via electronic means. The procedures of evaluation and examination for patent approvals are also amended and formalised. Fourthly, the strengthening of patent enforcement was reinforced by government announcements. There was a new task force enforcing anti-counterfeits, which has been mentioned in a previous section. In addition, the Executive Yuan (EY) of the Taiwan government proclaimed 2002 as the IP 'Action Year' and a follow-on comprehensive three-year (2003-2005) Action. This action aims to improve the enforcement and judiciary framework of IPRs, in particular in protecting copyrights. As a result, despite the fact that the assessment of this action has not been implemented yet, the objectives under the current plan have shown the awareness of IPR protection in Taiwan's IP regime.

To sum up, table 3 shows a scale of reform in Taiwanese IPR regimes from 1996 in order to be consistent with the regulation of TRIPs (Chen 2001). This modification has shown the intention of the Taiwanese government to join the WTO and this also reflected the demand from US Trade Commission.

Table 3 Illustration of the Taiwan Enhanced Patent, Trademark and Copyright Laws and Related Regulations

Items	Law or Regulation	Date	Note
1	Amendment to the Patent Law	Promulgated by President on May 7, 1997	Fully Consistent with TRIPs
2	Trademark Law	Effective November 1, 1998	Fully Consistent with TRIPs
3	Copyright Law	Effective January 23, 1998	Fully Consistent with TRIPs
4	Rates of Royalties under Article 47 (4) of the Copyright Law	Effective January 23, 1998	Fully Consistent with TRIPs
5	Regulation Governing Registration of Plate Rights	Effective February 25, 1998	Fully Consistent with TRIPs
6	Implementation Regulations for Suspension of Release of Goods Infringing on Copyright or Plate Rights by Customs Authorities	Effective June 10, 1998	Fully Consistent with TRIPs
7	Regulations Governing Application for Approval of Compulsory Licence of Music Works and Royalties for Use Thereof	Effective January 25, 1998	Fully Consistent with TRIPs
8	The Copyright Intermediary Organisation Act	Effective November 7, 1997	Fully Consistent with TRIPs
9	Trade Secret Law	Effective January 19, 1996	Fully Consistent with TRIPs
10	Integrated Circuit Layout Protection Act	Effective February 11, 1996	Fully Consistent with TRIPs

Source: Chen, M.-B. (2001). "Intellectual Property Protection in the Republic of China (ROC)." Presented at American Intellectual Property Law Association-Far Eastern Group Committee Meeting. P. 25.

The Taiwan judicial system is based on the German and Japanese systems, which are systems of codified law, unlike the English common law system. The IPRs enforcement framework is coordinated by many government organisations. The Prosecutor's Office of the Taiwan High Court of the Ministry of Justice is in charge of holding meetings for the coordination taskforce for IPR infringement. The taskforce coordinates activities for all prosecutors' authorities in the execution of IPR infringement cases

Similar to US patent regulation, protection for industrial design is also included in the Taiwanese Patent Act and registration follows a substantive examination system. The type of patent can be divided into three categories in the patent system of Taiwan: Invention, Utility Model and New Design Patent. The duration of a patent has been changed since 2002 due to conformity with provisions under WTO/TRIPs. An approved invention patent is given a twenty-year patent term from the date of filing and others are given a twelve-year patent right. Given that both systems operate under different law regimes, there are only slight differences with the administration process of patent enforcement, such as opposition and open publication.

To sum up, several characteristics related to the change of Taiwanese IPRs regimes were identified. Firstly, the dramatic change of patent regime coincided with the emergence of industrialisation and information technology industries. Secondly, the strengthening of IPRs protection was enhanced by the demand from international trade partners, in particular trade retaliation from the US and the needs of upgrading its own industrial technological capabilities. Thirdly, the US continues to be a popular destination for patent applications from Taiwanese firms. This is partly because of the requirement for market competition in the US. Taiwan has seen a dramatic acceleration in its patenting over time, with the intention being to catch up technologically with advanced economies. Trade regulation has been recognised as a defensive policy for a home country's industry interest. The US operates its trade regulation policy in a manner to 'facilitate' its trade partners' reforms in relation to IPRs protection. Taiwan is a striking example in which reforms were introduced and new infrastructure of IPRs installed because of trade retaliation from the US.

Conclusion

The awareness of IPRs regime is associated with growth of international trade and competition in industrial goods (Granstrand, 1999). As long as competition in the international trade remained primitive, each country might hope to keep its technical advances to itself. Since nations often discriminate against foreigners in order to promote their own industries, the various patent practices also create obstacles to international trade. As a result, a need for international harmonization in IPRs matters grew quickly. Several international agreements and negotiations were established.

To begin with, the study draws attention to the role of trade-relevant patent protection in the point of view of institutional voids. With institutional voids related to IPRs, Taiwanese firms in the ICT sector develop a production strategy that focuses on producing comparable products to US firms within the existing standards. This broad development strategy has been adopted by several developing countries, to improve their manufacturing and production capabilities in order to export their products to advanced countries. The changes in the structure of the Taiwanese IPRs regimes and the factors will contribute to it.

Secondly, this study will highlight the importance of an industries-specific of systems of innovation in the institutional voids in IPRs policy network by patent analysis. Industries characterised by cumulative technologies view the role of patents in different ways. In particular when “time to market” in the ICT industries of Taiwan is considered as an important factor for appropriating rent from inventions, the role of IPRs has been recognised as a strategic tool or a defensive mechanism in competition.

In theory, the IPRs regime is supposed to provide strong incentives for innovation by granting perfect protection to innovators. However, empirical studies suggest that in practice, patent protection is not perfect and imitation is a common occurrence (Mansfield 1986; Levin, Klevorick et al. 1987). However, the institutional voids of enforcement mechanisms led to the different appropriability strategies.

Thirdly, the institutional voids of IPRs policy have many surprising outcomes and a large amount of confusion in the IPRs regime. Trade-relevant IPRs voids are complex issues to analyse due to the mix of technological problems with strategic use of legal enforcement cross borders. The literature on this theme is vast and spans a variety of disciplines. The contribution of this study will open up a new insight into the aspects of the dynamics of IPRs regime, in particular in the industries characterised as cumulative technologies.

Finally, the theoretical framework of policy network literature may be of benefit to the understanding of IPRs regime. Political factors play an important role in the process of international IPRs harmonisation. The Special 301 mentioned as above is a striking example, which shows its impact on the change of Taiwanese IPRs. In addition, further harmonisation in the global IPRs system requires concern for the needs of legitimate technology followers and flexibility to accommodate the evolution of technology leaders. Technological change always outstrips IPRs reform; IPRs change in response to the former. The newest technologies in information science, telecommunications and biotechnology have already placed heavy stress on the IPRs system and on national regulatory regimes. Because dynamic evolution of demands for protection is thus inevitable, the global system will continue to evolve. In order to integrate multi-disciplinary contributions, such as law, economics, and technology policy, a comprehensive framework needs to be established to communicate to the researchers.

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