How Weak Institutions Can Produce Strong Regimes: Patents, Lawyers and the Improbable Creation of an Intellectual Property Regime in China (1985-2007)

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INTRODUCTION: BUILDING CREDIBLE PROPERTY RIGHTS INSTITUTIONS

Many developing countries have recently adopted Intellectual Property rights (IPR) reforms (Braga, Fink, and Sepulveda 2000; Finger and Schuler 2004; Jayasuriya 1999; Katrak and Strange 2004; Lele, Lesser, and Horstkotte-Wesseler 2000; Mansfield 1995; Oddi 1987; Odek 1994; Ostergard 2003; Sherwood 1990; Siebeck 1990; United Nations Conference on Trade and Development. 1996; World Health Organization. Commission on Intellectual Property Rights Innovation and Public Health. 2006; Yang 2003). These reforms reflect wider efforts to combat poor governance, strengthen legal institutions, and improve the "rule of law" infrastructure. Domestic firms and inventors are unlikely to engage a patent system unless they have access to legal counsel in order to navigate the technical challenges that come with filing and defending property rights. When disputes arise, courts must have the capacity to adjudicate them, and mechanisms for implementing both judicial and administrative decisions have to function effectively. Simply put, the creation of IPR institutions and the ways in which they develop over time (or fail to do so) offers important insights about the broader mechanisms conducive to the consolidation (or weakening) of the rule of law in developing countries.

This paper examines the dynamics of an emerging patent regime using systematic patent-level data filed with the State Intellectual Property Office (SIPO) of the People's Republic of China. Given the PRC's historical experience with economic socialism and

the complete breakdown of its legal system during the Cultural Revolution, few observers of early economic reforms could have predicted that China would become an intellectual property powerhouse within two decades. Bluntly stated, the system that was established in 1985 was not credible. The Patent Law made references to numerous legal institutions, but very few of them had any practical significance: SIPO was in infancy, there were virtually no patent agencies (and very few lawyers) who could assist inventors with the application process; most judges were not trained nor had any experience in intellectual property law, and their decisions were widely regarded as unenforceable. In fact, the PRC's tortuous negotiations for membership in the World Trade Organization were frequently derailed by accusations that China's compliance with IPR was very poor.

Yet, twenty three years after its creation, SIPO is regarded as one of the more vibrant patent offices of the developing world, where an ever-increasing number of domestic and non-resident applications are processed each year. I do not claim that all is well with the current IPR regime in China: there are indeed plenty of reasons to doubt its efficacy, even today. At the same time, its transformation from a non-credible system into an imperfect but functional regime in less than two decades demands explanation.

The empirical literature has largely ignored the process by which IPR regimes emerge and mature in some countries and why they fail in others. Much of the extant research on IPR in developing countries has focused on the implications of stronger intellectual property law for domestic innovation (Grossman and Lai 2004; Jefferson 1929; Lanjouw, Pakes, and Putnam 1998; Moser 2005; Reingold 1960), as well as the protection of the intellectual capital of foreign firms that engage on these markets (Mertha 2005). Others have investigated the relationship between degrees of IPR protection and economic growth (Fink and Maskus 2004; Khan 1995; Maskus, Dougherty, and Mertha 2004). However, this line of research offers few concrete prescriptions for countries seeking to create or reform their IPR regime. Finding that poor intellectual property protection is bad for innovation and economic growth does not offer a practical roadmap for building a better system. One may point at "best practices" in advanced industrial democracies, but while there are good reasons to favor strong institutions that offer complete bundles of rights to those that only supply limited rights, few states have the ability to immediately adopt "best practices" and supply the full array of legal protections that are theoretically desirable (Qian, 1999). Most incomplete property rights regimes must have been "good enough" at some point of their historical development to attract end-users, while further refinements were adopted incrementally. A more productive line of inquiry should therefore address the conditions under which concrete improvements can occur, identify the factors that are likely to help achieve convergence with the norms of competing IPR regimes (if that is the chosen policy), as well as those that hinder it.

Domestic firms and inventors who confront poor IPR regimes at home can sometimes bypass them. National laws may allow inventors to secure their rights through international IPR institutions. The global patent regime allows non-nationals to file at the leading patent agencies such as WIPO, the USPTO, JPO or EPO. However, the right to file for patent protection overseas offers few practical guarantees for most developing country innovators: access to these legal markets is restricted by strict visa and travel regulations, and the cost of foreign legal counsel is often prohibitive. For the vast

majority of innovators in the developing world, out-of-country patent protection of their intellectual capital is only a remote possibility, and this cannot be good for economic development.

Even when the political leadership is committed to IPR reform, it is not clear that the experience of long-established IPR regimes is relevant to countries struggling to develop their own institutions (Oddi 1987). In contrast to their counterparts in developing countries, the leading patent regimes in Europe, Japan or the United States are the product of decades of legal development, embedded in stable political institutions and sustained by political, economic, administrative and judicial actors endowed with vast human and financial resources.[1] Few countries can afford to wait for decades, even if one accounts for the benefits of steep learning curves that foreign experiences can provide. In an integrated global economy, trade and investment flows that are crucial for economic development can simply bypass markets with poor IPR regimes, and be allocated instead in regions where patents, trademarks, copyrights and other forms of IPRs are better protected.

Committed IPR reformers face multiple trade-offs. They may opt to establish a complete IPR regime as soon as possible in order to demonstrate their commitment to rule-of-law reforms. These investments may be costly, but they may appeal to investors and inventors who have reasons to question the government's commitment to reform. The problem is that developing countries rarely have the resources and infrastructure needed for the wholesale adoption of complex legal systems. Nor is it likely that concepts and procedures applied beyond the legal cultures where they were created can be accepted locally. Mimicking off-the-shelf solutions can be counterproductive and create considerable resistance to IP reform: in the late 19th century, Japanese reformers experienced an early backlash: during the Meiji restoration, the patent law of 1871 failed completely. Fifteen years would pass until the promulgation of the Patent Monopoly Act of 1885, and a further fourteen until Japan became a signatory to the Paris Convention for the Protection of Industrial Property (Japan Patent Office).

Most states have limited resources, and therefore tend to choose incremental change despite the difficulties of implementing partial reforms. The key problem of incrementalism is credibility: enacting a Patent Law as a first step to IPR reforms that is not enforceable without other elements of judicial reform is unlikely to convince inventors to trust the state that they should disclose trade secrets through the patent publication process and risk the theft of their intellectual capital. Recognizing that full legal reforms are rarely feasible, Posner (1998) argues that under certain conditions, virtuous cycles can occur, and ultimately strengthen property rights. According to this view, limited legal change enacted concurrently with economic reforms can produce strong enough property rights, even in the absence of full judicial reforms. This rules-based approach emphasizes practical steps that enhance (but do not guarantee) the predictability of rights and contracts. If early economic reforms are minimally successful,

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[1] These include England's Monopoly Act of 1624, The United States Patent Act of 1790, the French Patent Law of 1791, and the Japanese Patent Monopoly Act (專賣特許條例 Senbai tokkyo jōrei) of 1885. Japan Patent Office. 2008. *A History of the System of Industrial Property Rights* [cited March 18 [http://www.jpo.go.jp/seido_e/rekishi_e/rekisie.htm] 2008].

the state should gradually be able to support more costly forms of juridical transformation.[2]

These arguments are plausible, but a rigorous evaluation of these competing understandings of the dynamics of IP reform requires firmer micro-foundations. Ultimately, end-users decide whether an institution is credible or not, and the process by which (dis)trust in these institutions is acquired can only be understood with individual-level data, where the heterogeneity of actors and their ecology can be better specified. Access to systematic patent-level data has historically been beyond the reach of researchers interested in institutional change in developing countries. Fortunately, the situation is changing rapidly, as more countries develop searchable electronic databases of their patents and trademarks. The patent data of several developing countries is more easily accessible than those of established IPR systems, since their entire historical record has been digitalized.[3] Among those, the Chinese patent system is particularly appealing due to the completeness of the databases that have been made publicly available and their relative ease of use. Though considerable data download and manipulation is required before the information can be used for econometric analysis, it is conceivable to test hypotheses based on the complete historical record of the Chinese State Intellectual Property Office.

THE RISE OF CHINA AS PRODUCER OF INTELLECTUAL PROPERTY SINCE 1985

Although an increasing number of governments have recognized the need to offer IPR protection through stronger domestic institutions, only a handful have actually captured a significant share of the global patent market. From 1883 through the Second World War, four patent offices (the United States, the UK, Germany and Canada) accounted for most filings worldwide: by 1939, they amounted for over 60% of global patent applications. Only three countries, all of them East Asian, were able to establish patent offices with a significant global impact: Japan's importance rose throughout the 20th century, especially after 1950. Since the 1980s, filings at the JPO have routinely surpassed those at the USPTO.[4] In recent years, the surge in applications from both South Korea and China has been especially noteworthy (Figure 1).

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[2] Formal models of patent adoption in developing countries are consistent with this approach. Using a simple North/South two country model, Grossman & Lai have show formally that harmonization is not a necessary condition for patent reforms in developing countries, and their result generalize to a multi-country world Grossman, Gene M., and Edwin L. C. Lai. 2004. International Protection of Intellectual Property *American Economic Review* 94 (5 [December]):1635-1653..

[3] The USPTO allows full-text electronic searches from 1976 to the present. Historical patents dating as far back as 1790 can be searcher in part, but the fire of 1836 destroyed many originals documents. Only a small number of the earliest years of the patent system have been recovered. These are known as X-patents, for their special classification code.

[4] Kinmonth cautions that the institutional features of the Japanese patent system exaggerate the extent of true technological innovation in comparison with other countries. Kinmonth, Earl H. 1987. Japanese Patents: Olympic Gold or Public Relations Brass. *Pacific Affairs* 60 (2 (Summer)):173-199.

The advent of a functional patent system in China is arguably the most important development in the recent history of global intellectual property rights. In 2005, SIPO fillings exceeded 10% of global applications for the first time, doubling its 2002 share. In 2006, SIPO was the fourth largest patent office by number of applications, up 42.1% from 2005 (WIPO report, 2007). If one includes non-resident applications, SIPO ranks third worldwide, behind JPO and the USPTO respectively. This is an astonishing feat considering the brief history of the PRC's patent system. Given its absolute size, high GDP growth-rate and the degree of openness of the Chinese economy, these trends are likely to continue. China's patent activity will probably reach a level comparable to those of the JPO or the USPTO within the next decade (Figure 2).

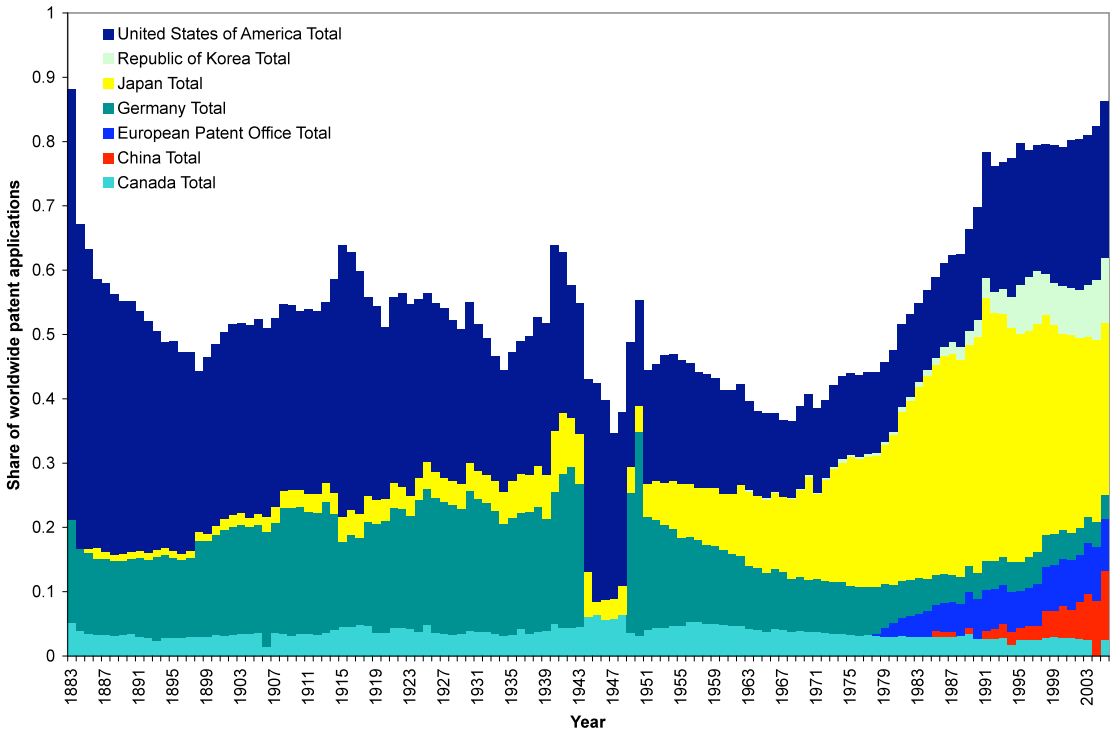

Figure 1: Global share of patent applications by the top 7 leading patent offices (1883-2006)

Source: WIPO: Patent Applications by Office (1883 to 2006). (http://www.wipo.int/ipstats/en/statistics/patents/source/wipo_pat_appl_from_1883_list.csv) Note that this data does not include utility models.

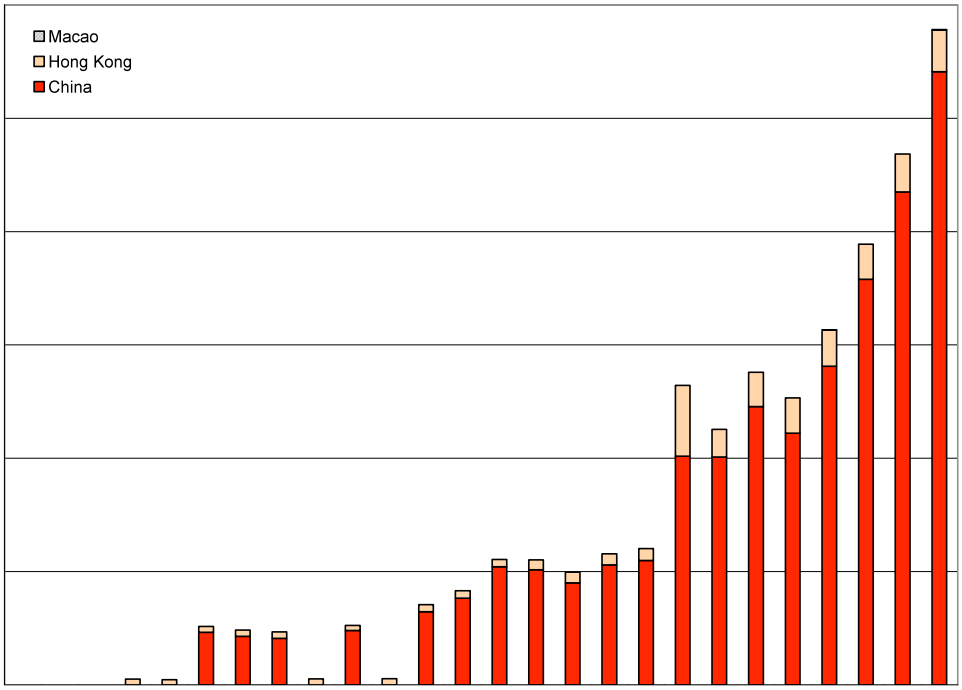

Figure 2: Patent applications in China, Macao and Hong Kong (1980-2005)

Source: WIPO (2007)

The Chinese case may seem bewildering. Chinese officials are routinely pilloried in the international press about extensive copyright violations and patent infringement. Legal experts have tied the weakness of the Chinese IPR system to a cultural tradition that has little regard for individual creation (Alford 1995; Guvenli and Sanyal 2003); Liu, 2006:746-49). Beyond the quantitative rise of patent applications, other developments lead to far less optimistic conclusions. Soon after China joined the WTO, press reports suggested that only 12% of large and medium sized firms understood the meaning of intellectual property. Seventy percent of large and medium sized firms, as well as 95% of small enterprises have never filed a single patent (Xinhuanet[新华网] 2002). In 2005, China's total number of applications to WIPO did not even surpass those of the Phillips Corporation alone (Liu, 2006:743).

Yet, a remarkable (and ever increasing number) of both domestic and non-resident applications are filed with SIPO, a clear sign of increased confidence in the efficacy of the Chinese patent regime. Given that the Chinese IPR system is the product of international pressures dating back to the early years of reform, we would expect to observe applications for patent protection among non-residents seeking to buttress their rights on the Chinese market by extending the protection of innovations made overseas (O'Keeffe, 2005). Nevertheless, a large number of domestic inventors embraced the IPR system long before the protection of private property was added to the Chinese constitution, or the promulgation of the 2007 property law (*wuquan fa*).

BUILDING DOMESTIC SUPPORT FOR INSTITUTIONS THAT STRENGTHEN PROPERTY RIGHTS IN CHINA

When China introduced its patent law in 1985, domestic inventors had few apparent incentives pay any attention to the new institution. The creation of a patent protection system was spurred not by pressure from domestic inventors eager to defend their rights, but instead resulted from the state's decision to allay fears among foreign governments and potential investors that the virtual absence of an IPR regime would prevent future investment and other forms of economic interactions with China. In fact, early Sino-American economic negotiations resulted in the 1979 US-China Agreement on Trade Relations guarantying intellectual property, six years before the first version of China's patent law was even promulgated.

From the perspective of domestic inventors and firms, the Patent Law of 1985 was highly unusual. Conferring legal protections to intellectual property that did not extend to other forms of property was a legal oddity. "Property rights" and their meaning in a regime formally committed to socialism remained a hotly debated issue (Qian 1999). The Chinese government did not fully embrace private enterprise until the 1990s, when regulations restricting hiring of employees by self-employed (*getihu*) and private firms were relaxed. Land remained in the hands of the state, though long-term "use rights" were gradually granted to both rural and urban residents, as well as firms. A general "property law" (*wuquan fa*) was finally adopted in March 2007, after nearly three decades of reform and an intense debate that forced the government to withdraw an earlier draft from consideration by the National People's Congress.[5]

China's "rules-first" approach had the considerable advantage of lowering the costs of legal reform (Posner, 1998:4). When the patent law was promulgated, neither domestic nor international actors had any illusion the IPR regime that was being introduced bore any resemblance to the well-institutional counterparts in advanced industrial democracies. China had neither the legal infrastructure nor the needed human capital--in the form of well trained corps of judges, lawyers, patent examiners or an institutionalized intellectual property rights bureaucracy--to give any confidence to potential users of the Patent Law that their rights would be protected, should they choose to use the law.

Creating a range of intellectual property rights

States can facilitate institutional development by lowering barriers to entry into the patent regime. As in many other countries (though not the United States), China's patent law allows "utility models" that offer protection for ten years for inventions that need not be as novel as fully patentable ones (Patent Law, Art 22) Utility models are also relatively

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[5] Property Law of the People's Republic of China (中华人民共和国物权法), adopted at the 5th Session of the 11th National People's Congress, March 16, 2007, applicable from October 1, 2007. The Chinese version is available at http://www.gov.cn/flfg/2007-03/19/content_554452.htm). See http://www.lehmanlaw.com/resource-centre/laws-and-regulations/general/property-rights-law-of-the-peoples-republic-of-china.html for an English translation.

easy to obtain, because they not subject the level of scrutiny that full patents require. Upon filing, utility models are presumed valid, unless the patent agency detects obvious flaws on the application. Utility models may be contested ex-post, but they are presumed to be valid upon preliminary examination (Patent Law, Art 40). By contrast, the more lengthy (and uncertain) process of substantive examination is reserved for invention patents (Patent Law, Art 39).

This two-track patent system is particularly appealing when the bureaucratic capabilities of the state are weak. Whereas a corps of patent examiners takes years to recruit and train, applications for utility models can be processed expeditiously and in much larger numbers by applying the kind of simple administrative rules that Posner advocates for building of property rights. Easy-to-obtain forms of intellectual property rights are also appealing to the political sponsors of IPR institutions who seek to build popular support for their reforms.

Utility models remain the most popular instrument among SIPO applicants. Although the proportion of invention patents is increasing gradually, SIPO still grants nearly four times more UMs than patents of invention among domestic applicants. This ratio stands in sharp contrast to non-resident applicants who overwhelmingly choose to file for full patents (Table 1).[6]

Table 1: Patents and Utility Models granted by SIPO for domestic and foreign applicants, 1985-2005

	Domestic			Foreign		
	Total	**Invention patents**	**Utility Models**	**Total**	**Invention patents**	**Utility Models**
1985-2005 cumulative total	1264887	87365	725326	204615	151352	5247
2001	99278	5395	54018	14973	10901	341
2002	112103	5868	57092	20296	15605	392
2003	149588	11404	68291	32638	25750	615
2004	151328	18241	70019	38910	31119	604
2005	171619	20705	78137	42384	32600	1212

Source: SIPO http://www.sipo.gov.cn/sipo_English/statistics/200607/t20060725_104687.htm

Setting low standards for inventiveness

The Chinese Patent Law deliberately created lower standards for patentable innovations in comparison to those applied in the dominant patent agencies. While many countries require inventions to have *industrial* applications in order be patentable, the Chinese law lowers the threshold to "practical applicability", which "means that the invention or

[6] The behavior of Chinese domestic applicants is also very different from that of their Japanese counterparts. The JPO 2007 reports 347,080 domestic patent applications (and 126,804 registrations) in 2006, against only 8922 utility model applications (8523 registrations). (JPO, 2007:141)

utility model can be made or used and can produce effective results"(China (NPC) 1985 [rev. 1992, 2000]: Art 22; Fai 2005:53) The threshold for inventiveness is lower than in other countries: utility models need only have "substantive features and represents progress", in contrast to invention patents that must have "prominent substantive features and represents a notable progress" (Art. 22).[7] This definition departs from that of most patent regimes "where the requirement on inventiveness is almost exclusively defined as non-obviousness" (Fai 2005:53).

Fai (2005:55) cautions that inexperienced patent examiners probably granted patents that did not meet China's own legal standards. SIPO's database indeed offers evidence that these lower thresholds stimulated applications of questionable quality in the early years of the patent regime. Consider the earliest filing in China, a patent application filed by the Environment Chemistry Research Institute under the Chinese Academy of Sciences filed on January 4, 1985, four days after the patent law went into effect. It lists a group of four inventors[8] for a "technology of de-hairing with triethanolamine".[9] In their abstract, they claim that leather production can be improved because "[t]he technology is simple and convenient to be operated, but it needs adding a working procedure of haircut. However it produces better economical effects and eliminates sulfur pollution in environment."[10] The application was published in September 1986, and its substantive examination began March 11, 1987. The life of the patent, however was short lived: by June 15, 1988, SIPO's records state the application was "deemed to be withdrawn".

These lower legal thresholds have the obvious drawback of limiting the ability of domestic inventors to extend rights granted in China to countries with higher standards for inventiveness. It also renders the quantitative growth of Chinese patent application and grants less comparable internationally by exaggerating the extent of innovation. At the same time, supporters of IPR reform can use these looser standards to create a constituency of IPR owners in relatively short order and further legitimize the IRP institutions.

Fostering IPR competition among state-owned entities

In economies where the public sector is large, bureaucratic authority can be used to create empirical realities that can subsequently motivate private agents to emulate. In the mid-1980s, the Chinese state was well equipped to entice a variety of actors to engage its fledgling IPR regime. Since most industry was still in state hands—along with academic and scientific research institutes—government officials could easily lean on them to file

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[7] The Japanese Utility Model Act protects "devices relating to the shape or construction of articles or combination of articles."(http://www.jpo.go.jp/cgi/linke.cgi?url=/toiawase_e/faq_e/faq_e_1-4.htm)

[8] Xu Houxiao[许后效], Zhao Lixin[赵立新], Shao Wenya [邵又雅] and Xiao Deshun [肖德训]

[9] Case 85102770: *Technology of de-hairing with triethanolamine*, filed by Inst. of Environmental Chemistry, Chinese Academy of Sciences.

[10] The translation is verbatim from the English version of the application available at http://app.sipo.gov.cn:8080/sipo/enzljs/hyjs-yx.jsp?recid=85102770

patent or utility model applications, particularly since these organization were often the key beneficiaries government projects targeting technological innovation (Sun 2000:442).

The concurrence of partial IPR reforms with economic liberalization facilitated the process of rule-of-law building. The marked increase in the degree of competition between firms (even state-owed) created incentives to lay claims on trademarks and intellectual property circumscribed to individual firms, as opposed to assigning them to "the state", broadly conceived. Unlike the Soviet Union, Chinese firms were not fully integrated into rigid bureaucratic hierarchies during the period of strict central planning (Solnick 1996). By the early 1980s, many SOEs that operated in a given sector of the economy had counterparts in various localities with definite corporate or "work unit" (*danwei*) identities. Most were still "state-owned" *de jure*, but operational control was usually granted to a multiplicity of actors of within central, provincial, municipal, or even county governments.

These features of Chinese industrial organization positioned domestic firms well to respond to the opportunities of a fledgling patent regime. The law allowed specific work units to file for patent or trademark protection, and early users took advantage of it. The PRC's first patent application (case number 85102770) which was filed on Jan 4, 1985 was assigned specifically to the Environmental Chemistry Research Institute under the Chinese Academy of Sciences, not CAS in general, let alone the broader ministerial "owners" of the Academy.

The list of China's patent pioneers, composed of all applications filed in January 1985, confirms the importance of the state sector among resident applicants (Table 2). Apart from only two invention patents filed individually, all other applicants originated from universities or research institutes. Although most applications for utility models were technically filed by individuals, their employers were frequently state-firms. For instance, Chen Li (Utility Model 86200321) listed his address as "Zhanjiang Auto Repair Plant" in Guangdong Province. Allowing employees of state-owned firms to file individually also legitimized the distinction between inventors and employers, thus allowing the assignment of intellectual property rights to individual creators.[11] This distinction was particularly important as the country was still in the early stages of its transition away from a socialist planned economy.

[11] Chinese patent law distinguishes service applications for inventions made during the course of employment from non-service applications, for which inventors and applicants are generally identical.

Table 2: China's patent pioneers: applications filed in January 1985

Patent /UM Number	Patent Title	Applicant	Applicant's country of Residence	Agency Used
PATENTS				
86100933	Temp. sensor of high resistance conductor for microwave heating	Tianjin University	China	Yes (Patent Agency of Tianjin University)
85100074	Photoelectrical transducing method for monitoring workpiece grooves and assembling condition during welding	Qinghua University	China	Yes (Patent Agency of Qinghua University)
86100775	Sheetlike temperature indicator	Individual, Hunan Province (He Minglin)	China	Yes (Patent Service Centre of Hunan Province)
85102770	Technology of de-hairing with triethanolamine	Inst. of Environmental Chemistry, Chinese Academy of Sciences	China	No
86100651	Fastly and simply determining method for discriminating pure honey from adulterate one	Individual, Henan (Li Gaozeng)	China	Yes (Patent Agency of Henan Province)
85104542	Properties of Qilianwan undergrade asbestos grade No.6 and No.7 short fibers and their application in the wet spinning yarn industry	Qingdao Chemical Engineering College	China	Yes (Qingdao Municipal Patent Service Centre)
86100138	Process for the production of pig iron	Korf Engineering GmbH	F.R. Germany	Yes
86100296	Boiler for boiling mash or wort	Anton Steinecker Maschinenfabrik GMBH.	F.R. Germany	Yes
86100747	Process and reagent for the specific determination of pancreatic alfa-amylase	Boehringer Mannheim GMBH (DE)	F.R. Germany	Yes
86100126	Process for the preparation of 6,7-disubstituted 1-cycloppopyl-1, 4-dihydro-4-oxo-1, 8-naphthyridine-3-carboxylic acids and use	Bayer AG(DE)	F.R. Germany	Yes
86100156	Apparatus for testing electric properties of automobile	Robert Bosch GmbH	F.R. Germany	Yes
86100696	Apparatus for turning modulation	Hartmann & Braun AG	F.R. Germany	Yes
86100703	Winding method	Barmag Barmer Maschinenfabrik AG	F.R. Germany	Yes
86100066	Apparatus for disposing fluidizable powder material at an adjusted speed	Aluminium Pechiney	France	Yes

86100050	Fluidised-bed apparatus for continuous separating mixture of two kinds of solid	Aluminium Pechiney	France	Yes
86100112	Hygienic developed injector structure with end-protecting device of enabling syringe needle	Pharmachim Engineering S.R.L.	Italy	Yes
86100164	Method of producing dough modifier	Chiyowa Fermentation Industry Co. Ltd.	Japan	Yes
86100622	Gas-water separator	TLV. Co., Ltd.	Japan	Yes
86100253	Conveying device	Weimar N.V.	Netherlands	Yes
86100251	Platform conveyor	Weimar N.V.	Netherlands	Yes
86100726	Process for the preparation of canine parvovirus vaccines	AKZO N.V.	Netherlands	Yes
86100790	High detergent/dispersant content lubricant additive for use in alcohol fuel burning engines	Bankamerica Corporation	USA	Yes
86100215	Automatically adjustable slatted blind	Vermont Management Ltd.	USA	Yes
86100895	Gold electroplating bath	Engelhard Corporation	USA	Yes
86100128	Machine slide bearing assembly	Detroit Edge Tool Co.	USA	Yes
86100913	Method of producing high molecular weight sodium hyaluronate by fermentation of streptococcus	Bio-Technology General Corp (US)	USA	Yes
86101153	Adhesive application method for manufacturing cigarette filter elements	Hercules Incorporated (US)	USA	Yes
86100315	Bidet	American Standard Inc.	USA	Yes
86100761	Novel 4H-1-benzopyran-4-ones and their sulfur containing analogs	Warner-Lambert Co.	USA	Yes
UTILITY MODELS				
86200472	Spiral drum-type distiller's grains-cooling machine	Steel Furniture Factory, Yibin City	China	Yes (Chengdu Patent Agency)
85200419	具有塑料内衬的整体式离心泵壳体及其压塑模具	Shanghai Hengda Surveying Instrument Factory	China	Yes (Shanghai Patent Agency)
86200137	Multipurpose boiler fueled with moulded coal	Individual, Liaoning (Ma Honglong)	China	Yes (Patent Agency of Shenyang City)
86200257	Automatic stopper for liquid container	Individual, Jilin (Yang Guangyu)	China	Yes (Patent Office of Changchun City)
85200432	浮阀式自动放气阀门	Individual, Jilin (Shi Chanqing)	China	Yes (Jilin Province Patent Service Center)

86200321	Electrothermal fuel-economizing device for internal-combustion engine	Individual, Guangdong (Chen Li)	China	No
86200326	Far infrared rays treating unit used in body	Individual, Jilin (Li Hongwei)	China	No
86200480	Seed and fertilizer-expelling unit with a wheel attached with spoon-type parts	Individual, Hebei (Tian Shouxin)	China	No
85201950	Dinner table with a center rotated by a motor	Individual, Shanxi (Huo Zili)	China	No
85201382	Portable weigh	Individual, Zhejiang (Wu Chengde)	China	No
85203892	Spring socket	Individual, Shanxi (Peng Jie)	China	No

Reducing transaction costs for applicants

The Patent Law also limited transaction costs by allowing most applicants to file with SIPO directly, without the use of a patent agency or a lawyer. A patent agency is required only when a Chinese entity intends to file in a foreign country (Patent Law, Art 20-1) or when a foreign entity without a permanent residence or business office in China files with SIPO (Patent Law, Art 19). All other domestic or foreign applicants with permanent residency in China may--but are not required to--obtain the services of a patent agency (Patent Law, Article 20-2).

The decision to make patent agents optional not only lowered the transaction costs for applicants, but it also widened access to the patent system to entities that were geographical remote. In the 1980s, only a handful of agencies in Beijing and a few large cities were available, and none had significant professional experience. Forcing all domestic applicants to rely on them would not have been realistic. Indeed, China's first patent application signaled to would-be applicants that barriers to entry were low: the institute did not use a patent agency, even though it was located in Bejing's Haidian district, where SIPO is located.

The state's approach to patent agencies (and later law firms) was evolutionary. The law left it to applicants to figure out whether it is in their best interest to hire an agent. Presumably, the profession would develop over time if enough customers were satisfied with their services and word of mouth spread the information that agents increase the odds of success or improve the capacity of firms and inventors to defend their rights, once granted. It was a convenient approach at a time when the number of lawyers in the country was exceedingly small, and those specialized in IP law even smaller: it would indeed take years to develop a corps of trained patent agents. At the early stages of reform, this hands-off approach to the use of agents was also risky, because it exposed SIPO to the risk that many poorly prepared applications would be filed, and in all likelihood be denied. A wave of unsuccessful applications in the early period of the patent regime could undermine the legitimacy of SIPO among pioneer applicants.

Decentralization of IP services

Decentralization was one approach to overcome the shortage of patent agents and reduce the proportion of poorly prepared applications. This process was facilitated by the creation of regional and sub-administrative patent offices acting as legal agents. Without a corps of readily available lawyers or specialized patent agents, these bureaucracies filled the vacuum: it was common for provincial or municipal Intellectual Property Offices to act as agents for local applicants. The government also created patent agencies embedded within bureaucracies with regulatory authority over specific industrial branches. For example, Xiao Deshun—one of the four inventors listed on China's first patent application—was cited as the sole inventor on a related application filed in 1988 on behalf of the Jinjin tannery of Tianjin, with the assistance of the Patent Agent Office under the Second Light Industry Bureau of the Tianjin Municipality.[12]

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[12] Application number 88103066 by Jinjin Tannery, Tianjin City. [searchable at http://www.sipo.gov.cn/sipo/zljs/]

To sum up, the Chinese IPR regime that was created in the 1980s bore the characteristics of a partially reformed and incomplete legal system. It was designed not to offer the best-possible protection to domestic inventors, but rather to provide a reasonable enough legal framework that would be acceptable to China's international economic partners. It is not self-evident that the partial reforms would succeed in the long run. By offering more on paper than they can deliver in practice, incomplete institutions can easily breed disappointment. China's policy may have been flexible enough to entice novices to engage new IPR institutions, but giving domestic inventors little practical recourse to defend themselves against infringements greatly increased the odds that disappointed patent holders would, over time, eschew formal IPR protection.

In spite of these weaknesses, several aspects of state policies were aimed at attracting domestic inventors to the system. Quantitatively, these efforts were successful if we judge success by the benchmark of increasing applications with SIPO. However, a more meaningful criterion of the quality of an IR regime in the long run is whether right owners actually maintain property claims to the inventions that they have patented. By exploring the dynamics of individual decision-making over time, we can stand on firmer empirical ground to explain why China's initially fragile IPR institutions did not decay, but instead matured into a more trustworthy system. In the remainder of this paper, I explore how the features of China's seemingly weak IPR regime have impacted the behavior of domestic owners of patents and utility models. I test whether stronger forms of intellectual property rights are less likely to fail than weaker ones, and whether the experience that recurrent applicants accumulate as they patent more inventions reinforces their willingness to maintain and defend their rights.

DATA

This paper relies on publicly available patent-level data. SIPO has digitalized the entire case history of patents, utility models and designs published since its inception in 1985, and made this information available online.13 Such openness is rare in comparison to other aspects of legal reform in China, and is largely the product of China's international obligations as a member of WIPO and the World Trade Organization. In addition to the basic data on published applications for patents and utility models, I also draw on the legal status database that provides relatively detailed event-history of these applications.14 We can therefore know not only whether inventors withdrew their application before a patent was granted or a utility model was registered, but we also know the status of their rights long after a grant or a registration: patents may be abandoned by owners (who can, for instance stop paying the required fees) or they can be revoked following a dispute with a third party.

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[13] SIPO offers interfaces in Chinese (http://www.sipo.gov.cn/sipo/zljs/) and English (http://www.sipo.gov.cn/sipo_English/zljs/). The dataset was complied from the records in Chinese.

[14] The patent legal status available in English is known as the "Experimental Platform of Patent Information service" (http://pub.cnipr.com/enpubpisfts/snapshot/view.do). Since its Chinese-language counterpart"专利信息服务平台试验系统" (http://pub.cnipr.com/pubpisfts/index.do) is updated more frequently, this paper draws on the database in Chinese.

SIPO also collects data about the application process, particularly whether a patent agent (*zhuanli daili*) or a law firm (*falu shiwusuo*) was used. The records include not only the name of the agency, but they also list the agent(s) who were personally involved with the application. Similarly, inventor-specific information includes the name(s), address as well as their employer when the case is considered to be a "service application".

The most appealing feature of SIPO data is its completeness. One need not worry about the risk of selection bias, sampling error (if one were to draw a random subset of cases), or missing data. Its strength lies in the ability of researchers to track inventors, employers and agents over time and observe how their behavior changed as they accumulated richer experiences with the IPR system. Though the data is large and somewhat cumbersome given the current limitations of many statistical packages, it provides a far clearer picture of the history of the interactions among legal actors than in other sectors of China's legal system. The data is thus long, but it is also thin, in the sense that several desirable variables are not recorded by the patent bureaucracy. We know for instance very little about the personal details of inventors, or the nature of the firms that employ them.

The data analyzed in this paper is provisionally restricted to the northern province of Hebei, which neighbors Beijing and the port city of Tianjin. Hebei is a "normal" province in a loose statistical sense of the term. It is a middle-income region which was not given special privileges during the reform era in the form of special economic zones or favorable policies, with the expectation of the early open coastal city" of Qinhuangdao.[15] Though I cannot claim that my results at this stage are fully generalizable to the entire county, I am confident that the findings are reasonably representative of the history of patent regime in China's ordinary provinces.

[15] Although the status of "open coastal city" that is no longer meaningful, I account for unobserved heterogeneity at the municipal level though a set of geographical fixed-effects.

Table 3: Distribution of Domestic Applications Received for Patents, Utility Models and Designs (1985 -2006)

Province	Cumulative Number	1985-2002	2003	2004	2005	2006
Tibet	447	170	24	62	102	89
Qinghai	2826	1988	173	124	216	325
Ningxia	5371	3344	441	399	516	671
Hainan	5716	3860	445	375	498	538
Gansu	13702	8612	961	910	1759	1460
Inner Mongolia	17282	11031	1393	1457	1455	1946
Xinjiang	17531	10459	1473	1492	1851	2256
Guizhou	17666	10038	1242	1486	2226	2674
Shanxi	24513	16012	1743	1949	1985	2824
Yunnan	25774	16035	1966	2132	2556	3085
Jiangxi	28750	17645	2434	2685	2815	3171
Guangxi	28798	19183	2250	2202	2379	2784
Anhui	32413	18599	2676	2943	3516	4679
Chongqing	38002	15511	4589	5171	6260	6471
Jilin	44197	27594	4267	3657	4101	4578
Shanxi	44296	27775	3421	3217	4166	5717
Heilongjiang	61670	39194	4972	4919	6050	6535
Hebei	**69325**	**44434**	**5623**	**5647**	**6401**	**7220**
Tianjin	70932	30758	6812	8406	11657	13299
Fujian	71068	36523	7236	7498	9460	10351
Henan	72051	39953	5261	6318	8981	11538
Hubei	77853	37148	6635	7960	11534	14576
Hunan	82125	49366	6054	7693	8763	10249
Sichuan	85779	47400	7443	7260	10567	13109
Liaoning	141098	80134	13545	14695	15672	17052
Shanghai	188614	76986	22374	20471	32741	36042
Shandong	195137	93836	15794	18388	28835	38284
Beijing	195597	111065	17003	18402	22572	26555
Jiangsu	214883	84880	18393	23532	34811	53267
Zhejiang	234077	91119	21463	25294	43221	52980
Guangdong	426856	168363	43186	52201	72220	90886
Total	2727857	1344177	251238	278943	383157	470342

Source: SIPO [http://www.sipo.gov.cn/sipo_English/statistics/200204/t20020418_34787.htm]

DEPENDENT VARIABLE: MAINTAINING AND DEFENDING IPRs

Patents rights can be lost (or "fail", using event-history language) for two broad sets of reasons. Right owners may decide that the cost of maintaining a patent exceeds its benefits. They can voluntarily give up their rights by formally notifying the patent office, or they can simply allow them to lapse by not paying the required maintenance fees. Intellectual property rights may also be lost involuntarily, since contestation by third parties may result in the invalidation of the losing party's patent or utility model. Thus, the proportion of patents failure is a good marker of the quality of an IPR regime. If, over time, an increasing proportion of inventors lose or give up their rights, the utility of the patent protection system is likely to be questioned.

The evidence among Hebei applicants is unambiguous: patents and UMs hardly ever fail because they are contested. Instead, they lapse because many owners tend to give up their property rights voluntarily. Over 80% of all patent "failures" are due to the non-payment of fees (Table 4).

Table 4: Distribution of patent failures in Hebei province, 1985-2007

Event category	Freq.	Percent
Voluntary	***31287***	***99.30***
▪ Patent right lapsed (non-payment of fees)	25,377	80.62
▪ Patent right lapsed	350	1.11
▪ Withdrawal of patent application	55	0.17
▪ Patent application deemed to be withdrawn	4,685	14.88
▪ Patent right deemed to be abandoned	817	2.60
▪ Other related matters (withdraw patent)	3	0.01
Involuntary	***250***	***0.70***
▪ Invalidation notification of patent rights	154	0.39
▪ Patent right lapsed (renunciation)	66	0.21
▪ Revocation of patent right	30	0.10
Total	***31,477***	***100.00***

Source: Author's database based on SIPO's patent status data

Given the short history of China's IPRs regime, it is still not possible to measure "failure rates" precisely. Figure 3 summarizes the distribution of failures over time, based on legal status data updated through March 2008. Since utility models expire after ten years, we can confidently state that the failure rates through 1997 are final for this category of rights (right-censoring is no longer possible). From 1992 onward, these rates hover around 50%. Among UMs that are still in force, the failure rate "so far" is already very high, exceeding 40% for models filed in 2002. The invention patent data is still largely provisional, because China's earliest patents (filed in 1985) only began to expire in 2005. In 2008, virtually all patents filed with SIPO are still "at risk" of failure until their eventual expiration date. Nevertheless, the distribution so far strongly suggests markedly lower failure rates than utility models (by about 10 percentage points),

regardless of their year of application. This is consistent with the proposition that owners of more secure forms of property rights are more eager to maintain them.

Figure 3: Patterns of failure for patents and utility models filed in Hebei province (1985-2007)

Turning to the bottom quadrant, we also notice significant differences when plotting the mean "time to failure" (measured in days elapsed since the application date) for both types of property rights. UMs registered through 1997 typically failed within 1500 days. Patents seem to fail sooner, but that is an artifact of the censoring process: the data so far only captures patents that have--by construction--failed early in their life course.

I estimate a dynamic XT-logit model of patent failure. It includes 44,375 cross-sectional units (patents or utility models) filed in Hebei province since 1985.[16] The panel is unbalanced, since the number of possible events varies by patent. The simplest records include patent applications for which grant decisions are still pending, or utility models that are registered and still in force. Such cases are only observed once in the dataset. Complex cases have up to 13 observations. Patents with a long event-history may for instance be granted, extended, partially invalided, revoked, re-instated, and so on.17 The dependent variable is coded one when the patent or model failed, and zero otherwise. Thus, positive coefficients (or rrr>1) must be interpreted as increased risks of failure. Among the 82380 observations, we observe 31,477 instances of failure. Thus, the overall failure rate so far is 70.93% (that is, 31477/44375).

The raw data imply that the patent regime is more fragile than a simplistic count of applications suggests. If property rights owners derived clear benefits from their inventions, so many of them would not have given up their rights prematurely. At the same time, the long-term impact of patent failures on the regime depends on the conditions under which property rights fail. If high failure rates are associated with applications filed without legal assistance or less secure forms of property rights (utility models), we may simply be observing a learning process that will in the long shift the preferences of applicants in favor of more effective forms of IPRs. Furthermore, if fewer experienced applicants give up their rights than novices, it is reasonable to conjecture that trust in the Chinese intellectual property regime should increase among its habitual customers.

INDEPENDENT VARIABLES: EXPERIENCE WITH IPR INSTITUTIONS

Identifying Inventors

First-time applicants are assumed to have no prior experience, and all variables that apply to recurring applicants are coded 0 in their case. It is important to note that given the nature of the data, this is only an assumption because the SIPO database lists inventors by name and address, but does not provide unique identity markers. Given the size of the database and the frequency of homonyms among Chinese names, it is essential to use both pieces of information in order to generate unique inventor identity markers. I assigned them by sorting cases along four fields: location (subdivided between municipality and county/district), address stub, and the name(s) of the inventor(s).

[16] The number is cross section is smaller than the 69,325 cased reference in Table XXX because I do not consider designs in this analysis.

[17] Non-substantive events are excluded, such as bibliographic corrections, address changes, or various corrections to a record that has no impact on its legal status.

Records that match on all four fields were assigned a unique inventor ID. This conservative coding rule of inventor identity is preferable to the alternative of sorting records only by address fields, because too many stubs are either vague or incomplete. Since applicants often list their address as "village x" in "county y" without further details, sorting records without inventor names would assign a single ID to all patents originating in the same village.

The drawback of this approach is that an inventor listed within a group on one application who reappears as the sole inventor (or in different groups) on other applications is assigned multiple codes. Unfortunately, the brief inventor histories that are constructed from the dataset cannot account for individual experience acquired through interaction with varying groups of co-inventors.

I code the past experience of recurring applicants based on

- the inventor's history of filings patents or utility models
- the inventor's propensity to use legal agents (patent agencies or lawyers)
- the inventor's past success rates of patent applications
- the specific characteristics of the agent chosen (if any) when an application is filed

Cumulative filing experience

Besides the simple marker **PATENT** that distinguishes whether the observation is a patent (code 1) or a utility model (coded 0), two variables capture the filing history of each inventor for both patents [**PATENTcum** = $\sum_{t=1}^{t-1} P_{it}$] and utility models [**UTILcum** = $\sum_{t=1}^{t-1} UM_{it}$]. They are simply the running sum of the number of applications (excluding the current one) in order to better measure one's experience until the opportunity for a new application arises. In a multivariate model, positive coefficients for these variables imply the presence of a multiplier effect: experienced applicants are more likely to maintain their patent rights, which suggest the degree of satisfaction with the intellectual property office is likely to increase over time.

Accounting for the role of patent agents and lawyers

I hypothesize that patent agents and lawyers have played a critical role in helping domestic inventors improve the quality of their applications over time. Agents are also likely to be of assistance if property rights are challenged by third parties. Critically, it is the interaction between experienced applicants and experienced agents that is likely to yield the best results.

The decision to use of an agent affects three inventor-level variables. The simplest one is a dummy (**AGENT_USED**) that marks whether the patent or utility model under observation was filed through an agent or not. I further specify how much patent applicants have relied on agents in the past [**PATENTcumagent_lag1**]. A third variable

measures the cumulative success rate for patents filed with an agency [**PATENTcumagentSUCCESSrate_lag1**] in order to capture the interaction between the inventor's filing history and the perceived benefits of using legal counsel. These cumulative odds are defined as:

$$\textbf{PATENTcumagentSUCCESSrate\_lag1}=\prod_{it}=\frac{\sum_{t=1}^{t-1} s_{it}}{\sum_{t=1}^{t-1} n_{it}}$$

In other words, for each filing decision $\prod_{it}$, I measure the success rate of all prior applications. If applicant *i* files subsequently, $\prod_{it+1}$ is updated based on how the last outcome (at time *t*) altered the overall success rate "so far". Since utility models are not substantively examined, it is not meaningful to measure success or failure of such applications. These measures of success only apply to invention patents, which may be rejected on substantive grounds following their publication.

Apart from the net impact of hiring an agent when the patent under observation was used, I hypothesize that applicants who have prior positive experiences with agents are less likely to give up their rights because of their better historical experience with the property right system. First-timers may not be less trusting of the quality of their application, even when it is filed with an agent, that habitual end-user of the patent system.

Agent-specific effects

Three variables capture agent-specific effects. **AGENTcumPATENT_lag1** and **AGENTcumUTILITY_lag1** measure the cumulative experience of an agency with patents and utility models respectively. Presumably, more experienced legal helpers produce applications of greater quality, net of the inventors own history with the agency or the patent system. I also account for the propensity of agents to file for invention patents rather than utility models (**AGENTcumPATENTpropensity_lag1**). The idea is that right owners who confront the choice of maintaining or dropping property rights will be even more reluctant to give up the more secure forms of rights (namely patents) if their agent has long record of favoring them. The more experienced an agency is, more likely it is to be able to supply its clients with evidence (and convince them) about the residual value of their patent portfolio.

Other control variables

In addition, two sets of fixed-effects control for the location of the inventor (aggregated at the level of a municipality or prefecture) and the nature the patent or utility model based upon its primary International Patent Classification code. The baseline categories in the model are Shijiazhuang (Hebei's provincial capital) and IPC category A, respectively. A further quasi-continuous variable captures the proximity of the inventor to an urban area. The idea is that applicants who live in or near large administrative centers

have access to better legal and technical infrastructure than rural residents, which should enhance their ability to protect their IPR rights. Furthermore, given the vast urban-rural income gap in China, the variable "**LEVEL**" also serves as a marker of the likely economic standing of inventors.

Table 5: XT-Logit Model of IPR Failure in Hebei (1985-2007)

xtlogit PATENT_TERMIN PATENT PATENTcum_lag1 AGENT_USED PATENTcumagent_lag1 PATENTcumagentSUCCESSrate_lag1 UTILITYcum_lag1 AGENTcumPATENT_lag1 AGENTcumPATENTpropensity_lag1 AGENTcumUTILITY_lag1 LEVEL TIMEsinceAPPLICATION BAODING CANGZHOU CHENGDE HANDAN HENGSHUI LANGFANG QINHUANGDAO TANGSHAN XINGTAI ZHANGJIAKOU ipcA-ipcG

Random-effects logistic regression			
Number of observations	82380		
Number of groups	44375		
Random effects u_i ~ Gaussian			
Observations per group:			
minimum	1		
average	1.9		
maxmum	13		
Wald chi2(28)	23086.39		
Log likelihood	-25234.46		
Prob > chi2	0.0000		
	β	**s.e.**	
PATENT	-1.2598	0.0323	***
PATENTcum_~1	0.0228	0.0188	
AGENT_USED	0.1297	0.0396	***
PATENTcumagent_lag1	0.0429	0.0427	
PATENTcumagentSUCCESSrate_lag1	-0.9925	0.1412	***
UTILITYcum_lag11	0.0083	0.0122	
LEVEL	-0.0409	0.0080	***
TIMEsinceAPPLICATION	0.0044	0.0000	***
Agent-level variables			
AGENTcumPATENT_lag1	-0.0024	0.0004	***
AGENTcumPATENTpropensity_lag1	-0.8450	0.1433	***
AGENTcumUTILITY_lag1	0.0007	0.0001	***
Geographic Fixed Effects (Baseline= Shijiazhuang)			
Baoding	0.0117	0.0407	
Cangzhou	-0.0030	0.0437	
Chengde	0.0982	0.0600	
Handan	0.0581	0.0423	
Hengshui	0.0014	0.0581	
Langfang	-0.0716	0.0555	
Qinhuangdao	-0.0261	0.0483	
Tangshan	-0.0028	0.0399	
Xingtai	-0.0334	0.0615	
Zhangjiakou	-0.0285	0.0632	
Patent classification fixed effect (IPC code, baseline= H)			
ipcA	0.0820	0.0499	
ipcB	0.0558	0.0506	
ipcC	-0.0629	0.0652	
ipcD	-0.0331	0.0996	
ipcE	-0.1527	0.0587	
ipcF	0.0029	0.0527	
ipcG	-0.0367	0.0612	
Constant	-4.2464	0.0601	***
/lnsig2u	-12.083	3.6010	
sigma_u	0.002378	0.0042815	
rho	1.72E-06	6.19E-06	
Likelihood-ratio test of rho=0: chibar2(01) = 0.01			
Prob >= chibar2 = 0.471			
*** denotes significance levels at the 0.001 level or better			

MULTIVARIATE PATENT FAILURE MODEL

Given the coding scheme of the dependent variable, we expect positive duration dependence since IPRs once granted are by construction are at risk of being abandoned or disputed until their natural expiration date. Not surprisingly, the coefficient associated with this control variable (**TIMEsinceAPPLICATION**) is positive and significant at the .001 level.

The XT-logit regression strongly suggests that inventors who file for (and are granted) more secure forms of property rights are far more likely to maintain and defend them than those who choose weaker forms of rights. Patent rights lapse at far lower rates than those of utility models, but a history of successful applications through agents is strongly correlated with lower odds that that an inventor's property rights will lapse unnaturally, be they patents or utility models. Holding continuous variables at their mean, Figure XXX forecasts the probability that inventors who reside in Shijiazhuang and have enjoyed varying success rates with prior applications filed through agents. The wide gap in fitted odds confirms what the raw data suggests: the level of disenchantment with utility models is far greater than with patents. Given that the average cumulative success rates of patent applications filed though agents is only 0.2, it is clear why rights lapse disproportionately among holders of utility models: at the mean, nearly 30% of owners of a UM are at risk of losing their right, three times more than owners of invention patents.

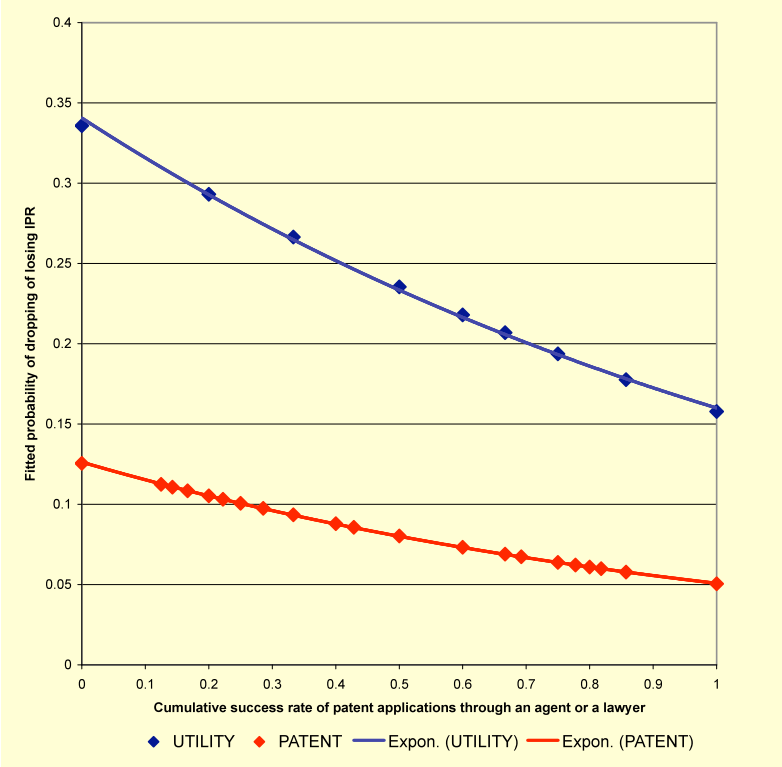

Figure 4: Fitted odds of patent and utility model failure, conditional upon the cumulative success rate of past patent filed through an agent. Estimates are derived from XT-logit model holding all continuous variables at their mean, with Shijiazhuang =1 and IPC H=1).

Figure 4 provides further evidence of the impact of the interaction between the experiences of both inventors and their agents for maintaining and securing IPRs over time. From 1985 to 2005, the profession of patent agents in China was *de facto* in the hands of a small number of municipal intellectual property offices. These "agents" were merely service-units of government departments enjoying quasi-monopolistic privileges in their localities. From the point of view of applicants, the lack of competition may have reduced the quality of available services but it also allowed these agencies (and their employees) to develop considerable experience with the filing process. After 2002, the sector was liberalized. The number of agencies increased dramatically, often headed or staffed by former employees of the intellectual property bureaucracy. Since I measure of "agent experience" based of the cumulative experience of firms named in the dataset, post-2002 measures understate experience, since they do not account for the human capital inherited from established agencies.

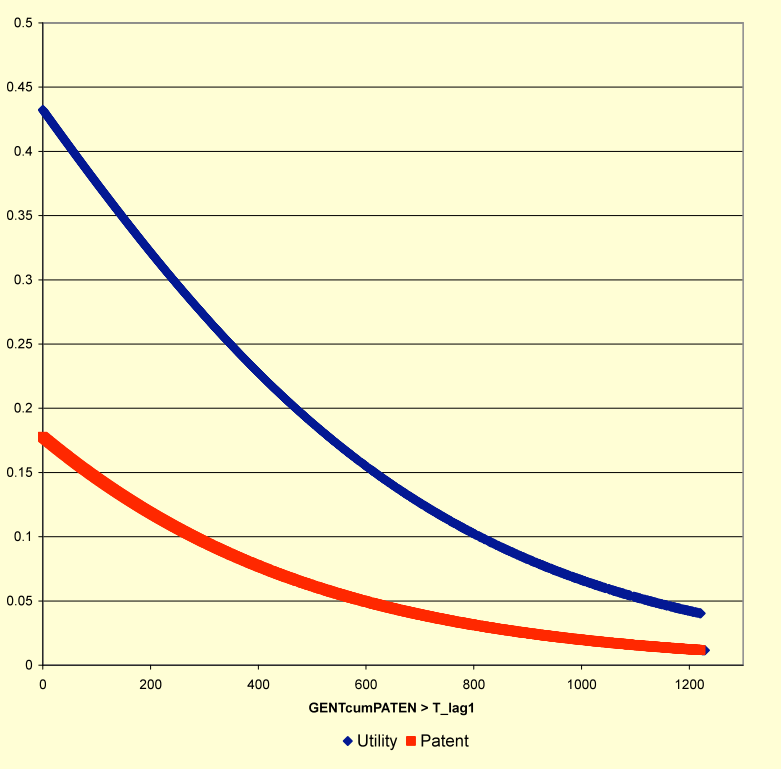

Figure 5: Fitted odds of patent and utility model failure, conditional upon the agent's propensity to file patent applications. Estimates are derived from XT-logit model holding all continuous variables at their mean, with Shijiazhuang =1 and IPC H=1).

Despite these data limitations, one's agent experience looms large when if comes to securing property rights. The pattern is similar to the one observed for inventors: patents and utility models filed by new firms stand a high chance of lapsing, though again the odds of failure are far lower for patents. The firm's preference for filing patents versus UMs also matters. Figure 5 displays fitted odds based the agent's cumulative

experience with patents. These trends are further accentuated if we account to the patent/UM over time (**variable AGENTcumPATENTpropensity_lag1**). Inventors who rely on firms that specialize in patents are less likely to give up or lose their IPR rights, as indicated by a large negative and highly significant coefficient.

Finally, the regression results suggest that both geographical and IPC-code fixed-effects have virtually no relevance in comparison with the model baselines. However, the variable **LEVEL** is significant: the magnitude of difference between rural residents and citizens of the provincial capital is larger for UMs than it is for patents. Though these effects pale with regard to gap between these two types of IP rights, the urban-rural economic and institutional disparities have a measurable impact on the security of property rights.

PRELIMINARY CONCLUSIONS

Since the empirical evidence of this paper draws on the complete of a single Chinese province, my results should be regarded as preliminary until the complete archive of Chinese patents and utility models for the entire country can be analyzed in a single dataset. This will be the focus of further iterations of this research.

At this stage, the findings based on Hebei province reveals important mechanisms behind the gradual institutionalization the Chinese IPR regime, with obvious implications for implementing successful legal reforms in other developing countries. Clearly, incomplete institutions can succeed over time. The econometric results strongly suggest that recurrent users are crucial for institutional development. So long as a sufficient core of initial users is reasonably satisfied with their early experience, they will keep using the institution and provide further incentives for improvement through the fees that IPR offices charge in return for their services and the specific demands that they formulate as they gain experience with the system. Recurrent applicants are able to draw clears lessons from their past experiences,. Adapt their behavior, and have a multiplier effect on the entire IPR regime. Those are initially able to build portfolios of stronger forms of property rights are more likely to hold on them throughout the life of their patents. The policy implications are clear. Rather can seeking pure quantitative growth by convincing as many inventors as possible to apply for patents and utility models with local intellectual property offices, developing countries should instead focus on ensuring the loyalty of recurrent applicants.

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