

# Do stronger intellectual property rights kick away the ladder or create the ladder for developing nations?

A case study on China

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## Abstract

This paper discusses the relation between IPR Strength and economic catch-up In China compared to the USA and South Korea. The relationship between IPR and the economic catch is complex and complicated. However, this paper finds that developing countries' social capabilities are crucial for developing countries to exploit foreign technology and catch up. Additional, what seems to be driving IPR strength is the nations own ability to invent. When nations become more reliant on innovations, they increase IPR strength and improve enforcement. When Nations are reliant on imitation, they have weaker IPR regimes and relax enforcement of IPR. The finds suggest that nations should adopt their IPR regimes according to the domestic capabilities to maximise technological gain. FDI increase in China and South Korea was not directly a result of increased IPR strength, and the determining factor was low labour cost.

## Abbreviations

IP= intellectual property

IPR = intellectual property rights

FDI= Foreign direct investment

WTO= World trade organisation

TRIPS= Trade-Related Aspects of Intellectual Property Rights

# Table of content

1 Introduction	4
1.1 Relevance, Aim and research scope	5
1.2 Research questions	6
1.3 Definition	6
1.4 Delimitations	7
1.5 Global governance of IPR	7
2 Theoretical framework and previous literature	8
2.1 How nations catch-up	8
2.2 How the IPR institution diffuses technology	9
2.3 How IPR Facilitates innovation	10
2.4 The Downside of IPR	11
2.5 Previous literature	11
2.6 IPR trade-off	13
3 Methods and data	13
3.1 Methodology	13
3.2 Data and limitations	14
4 Cases	15
4.1 China	15
4.2 The USA	18
4.3 South Korea	19
5 Analysis	20
6 Conclusion	25
7 Reference list	26

# 1 Introduction

Since the industrial revolution, humankind's technology and knowledge have increased exponentially. The frontiers of sciences are moving rapidly forward, creating huge benefits for the average person as technologies that improve our productivity and make our lives better become more accessible. Today is often referred to as the information age as information and technology are the key features of countries' economic success. The countries that can harness the forces of innovation and adaptation into producing new technological products will be the ones that succeed in this Era. The expanding significance of information and innovation for the economy has resulted in increased attention to its ownership. Today's most prominent example of the direct effect of this is the ongoing trade war between China and The USA. At the heart of the conflict is intellectual property rights. Developed nations, particularly the USA, are reliant on their intellectual property rights as it protects their main advantage in the world economy, which is their technological advantage. As Developed nations have been ever more reliant on their technical so has their desire to protect it. The USA has pushed for harmonisation of intellectual propriety rights since the 1980s. Initially, via the WIPO because of the dominance of the developing nations in this organisation they were unsuccessful. Therefore, the USA and other developed countries moved their efforts towards harmonisation to WTO, which eventually resulted in the TRIPS agreement in 1995. The TRIPS agreement limits nations ability to construct their IPR laws to increase harmonisation and suit the needs of developed nations (Drahos 2002).

There was significant pushback from developing countries and scholars towards the TRIPS agreement. They argued that strong intellectual property rights would limit developing nations ability to economic catch-up. Developing countries rely on technology from developed countries to quickly catch up as it's more productive for them to rely on imitation until a certain point. Stronger protection would tax the technological transfer between developed and developing countries and make the transfer more difficult. Enforcement of intellectual property rights is expansive and requires state capacity many developing nation lacks. Granting monopoly rights to foreign firms can reduce market access and increased prices, especially for seeds and medicine. Their main claim is that developing countries need the flexibility to achieve economic catch-up (Braga, Fink & Sepulveda, 2000)

The developed nation legitimacy the push for harmonisation by suggesting that stronger intellectual property rights will lead to economic growth. Stronger intellectual property laws

would enhance domestic innovation capacity by incentivising innovations. By strengthening intellectual property rights will incentivise foreign firms to invest via FDI and trade with developing as firms will feel secure that their IPs will not be stolen and exploited. Strong intellectual property rights would enable knowledge transfers via the information in patents themselves and from FDI and trade spillover effects. The main argument is that stronger intellectual property rights will lead to institutions that incentivise technological advancement in developing countries (Braga, Fink & Sepulveda, 2000).

From a historical perspective, successful catch-up stories have changed their intellectual property rights protection in line with the needs of nations over time and had a lot of flexibility, especially towards the enforcement of foreign patents. It was not until they became wealthy nations that relied on innovation rather than imitation that they adopted strong intellectual property rights protection. As previously mentioned the trade conflict between China and the USA is deeply rooted in the protection of IPR. The USA is pushing China to enforce stronger IPR as they see their IP to be frequently violated by China. However, if we go back more than 100 years, the USA was doing the same thing to Britain, and Britain was trying to limit their innovations leaking out to its competitors. In this Era, the USA was the big IP pirate, but they were not alone. Germany, Switzerland and many other European nations acted in the same thing. Influences from Britain and Europe was highly influential in the USA eventual overtaking of Britain as the technological leader (Chang 2001).

Despite much controversy, most nations signed the TRIPS agreement, resulting in a massive increase in intellectual property rights strength since then. However, the verdict is still out on how strong intellectual property rights affect developing nations. The literature indicates that intellectual property rights in developing nations are complex processes and could have a range of impacts, depending on the characteristics of different countries' products, markets, and institutions.

## 1.1 Relevance, Aim and research scope

Most studies done on IPR have been conducted in the developed world. Therefore, their results are hard to apply to developing nations. The studies which have been done in

developing nations are often cross-national with ambiguous results. As the relationship between IPR and economic catch up is very complex, the literature points out a need for case studies on developing to understand the specific relationships within the country and its relationship to IPR (Odagiri et al 2010, pp 4). This study will therefore be a case study on Chinas relationship between IPR strength and economic catch-up. The findings on the Chinese case will then be compared with the successful case of economic catch up such as the USA and South Korea to identify similarities and differences across the cases.

The study aims to examine the relationship between IPR protection and economic catch-up. By using China as a case study to see if stronger IPR protection has increased the incentives for domestic innovation, incentivised FDI and technological transfer. Or, if stronger IPR protection has made economic catch up more difficult by increasing the cost of imitation and developing nation needs more flexibility to adjust their IPR regime to their condition. The additional study aims to determine why some nations are more successful than others by comparing the Chinese case with successful economic catch-up cases.

The scope of the study will focus on time period between 1980-2020 as this is the relevant time period for China as rapid growth and the reestablishment of patent law happened in the 1980s, and there is extensive data on this time period. However, the comparison between the other case goes back further to the point in time where they were developing nations that in the Korean Case would be the 1960 and the USA the 1800s.

## 1.2 Research questions

*What is the relationship between IPR protection and economic catch-up in China?*

*How does the Chinese case compare with the USA and South Korea?*

## 1.3 Definition

Intellectual property rights refer to laws that govern the rights to the use of the creation of the minds. Generally, they give an exclusive right to the person or firm for a certain amount of time. It also enables these rights to be sold or transferred to other firms or people. Intellectual

property has five major categories: patents, plant breeders rights, copyrights, trademarks and trade secrets. Patents or utility patents apply to product and process inventions. They generally give the monopoly powers on the market for a set period that varies across nations, but 20 years is very common. Plant breeders rights are a patent-like form of protection initially intended to cover traditionally bred plant varieties. Copyrights protect creative works such as books, movies, music, games and apps. Trademarks reserve a portion of language, for example, Spotify or Paradox interactive. Trade secrets protect firms or individuals from the unauthorised disclosure of proprietary information to ensure their information does not land in a competitor's hands. A common example is the coca-colas recipe. Trade secrets are often used when patenting the product would reveal too much information to competitors.

## 1.4 Delimitations

The study will focus on patents as this is most common in the literature. There is a powerful theoretical framework and data available to be used for the analysis of Patents. In comparison, there are limited measurements in the literature on other aspects of IPR. Additionally, it would make the study too large if it tried to implement the full definition of IPR. There are limitations in comparing the American case, mainly as there is a lack of statistical data and large differences in the adopted technology and time period. It would have been much easier to imitate innovations from the 1800s for a developing country as they are not as advanced as the technology of today and the gap in absorption capacity of technology was not as large back then as it is today. The statistical analysis is limited to the Chinese case as otherwise ending being three studies rather than one.

## 1.5 Global governance of IPR

The World Trade Organization (WTO) is a global international organisation dealing with the rules of trade between nations. WTO agreements are negotiated and signed by the bulk of the world's trading nations. One of these agreements is the TRIPS agreement which every member who joins WTO has to sign. By joining the TRIPS agreement, members have to change their IPR regime to adhere to international standards. The most important part of the agreements is Article 27.1, 27.2 and 31. Article 27.1 states patents should be available for any innovations or processes in all fields of technology as long as they are new. Article 27.2 say

that member state can exclude patentability inventions, with their territory of the commercial exploitation if its need to protect public order or morality. Article 31 allows members to use compulsory licensing under certain conditions. The other big international body for IPR is the WIPO. The WIPO is the global forum for IP services, policy information and cooperation. It's an agency of the UN with 193 members with the goal to develop an effective international IP system that enables innovation and creativity for all (Odagiri et al 2010, pp 15).

## 2 Theoretical framework and previous literature

### 2.1 How nations catch-up

Catch-up is never achieved by investment in physical assets and labour alone. The key to success is learning of modern technologies and accumulating technological capabilities. What differentiates developed countries and developing countries is productivity. Developed countries rely on advanced technology to fasciate high productivity, while developing nations have poor technology and low productivity. In 1986 Abramovitz suggested that backward countries have the potential for rapid catch-up. Backward countries have old technological stock, which is unproductive if these countries could improve their technological stock, they will see an immediate improvement in productivity and economic growth. Top of the line technology exists in the developed world, particularly in the World leader USA. Backwards would be able to grow quickly by modernising its economy. In developing countries, it should be able to grow much faster than developed countries as it is easier to imitate the leader technological stock than developing new capacities. However, adopting and imitating technology is not as easy as it seems. Learning from what others have already done is rarely a simple process of copying the exact product or practices. Often the imitator will have to innovate themselves to implement the copied technology to fit into local conditions. However, the organisational, managerial and institutional aspects of production practices are often hard to replicate. These are in particular need to be adopted to the indigenous conditions, norms and values. As a result, if two countries import the same technology, likey they will have different outcomes on might quickly adopt it will the other take a long time to embrace it (Abramovitz 1986).



Technology can not so easily be transferred for a developing country to use its potential for catch it needs to have technological absorption capacity. Technological absorption capacity or social capabilities refers to a nation's ability to absorb technology. A country's ability to absorb technology depends on its education, governance, organisational, commercial, industrial and financial institutions. Often its developing countries lack of social capabilities, which is the reason why they are poor. However, if they were able to develop sufficient social capabilities, they would be able to grow rapidly until they would catch up to the frontiers of knowledge. Then growth would start to slow down on to a more even pace with the developed countries once they have. IPR regimes are one of these institutions that determine a nation's social capabilities. But exactly to what extent how it affects countries catch-up still rather unclear (Abramovitz 1986).

## 2.2 How the IPR institution diffuses technology

Institutions from the incentives structure in society and therefore shapes political and economic institutions that determinants a country's economic fortunes. They exist in every instance of social life and incentives our behaviour, common institutions are family, laws, values, norms, culture, religion, etc (North 1994). IPR exerts its influences on social, economic, legal, institutions, and other conditions that vary significantly across countries, development stages, industries and technology fields. It contributes mainly to the diffusion of knowledge and the development of technological capacity (Odagiri et al. 2010, pp 8-11).

Technology never flows automatically from a developed country to a developing country. Historically countries used diverse means and channels to acquire advanced technologies. The flow of people has been a vital diffuser of knowledge in the American and Chinese case, which will be discussed in greater detail later. A strong IPR regime may even limit the movement of people, which was the case in the 1800s in Britain, where they restricted the migration of high skilled textile workers to ensure that the British textiles advantage would be maintained.

However, the more common connection with IPR and technological diffusion is firstly trading. Trade-in goods and services always transmit some information that can be used reverse engineering. The second connection is FDI through multinational enterprises. The technology provided by multinational enterprises to their subsidiaries is generally more

advanced than any that can be found in the same market. Subsidiaries that use these technologies have an edge as they are more productive and cost-effective. The third connection is technological licensing, which is generally done by purchasing production or distribution rights. Another form is a joint venture which is a mix between FDI and licensing where contracted agreements with both parties have been reached. Both parties generally provide some advantage that reduces cost or increases market share. There are also less legal means that are facilitated with IPR. The first is imitation, where a rival firm invests resources to understand the rival firm's technology by trial and error, reverse engineering or product inspection. If it's illegal or not depends on the IPR regime with the country. Another source is by studying patent applications domestically and abroad. Therefore there exists a trade-off in IPR strength, a stronger IPR regime will encourage knowledge diffusion by patents, FDI and licensing however, it will make imitation more difficult. A weak IPR regime will encourage imitation but disincentivises knowledge diffusion by patents, FDI and licensing (Maskus 2012, pp 64-73).

## 2.3 How IPR Facilitates Innovation

Aside from technology diffusion IPR also increases the creation of new knowledge by giving incentives to innovate via patents, which are based on three fundamental theories: the invention motivation theory, the induce commercialisation theory and the information disclosure theory. The invention motivation theory suggests that a patents system would promote innovation in developing countries by encouraging indigenous inventions or R&D investment into the country by multinationals as inventors are rewarded for the work, often in the form of monopoly rights. The second theory is the induce commercialisation theory, suggesting that strong IPR will make the market see a patent as something of value that can be traded. This enables foreign investors to license their technology to domestic firms and incentivise investment into firms that hold valuable patents. The third theory, the information disclosure theory its effects have been mentioned in the previous section that patents documents can transfer knowledge. The theories suggest the benefits of a strong IPR system that would incentivise innovation and technological diffusion (Mazzoleni & Nelson 1998).

## 2.4 The Downside of IPR

The main consequence of a stronger IPR regime is that I make imitation more difficult. Developing nations are reliant until a certain point on imitating innovations from abroad if they wish to catch-up until the social capabilities have been improved. Stronger IPR would tax the technological transfer between developed and developing countries and make the transfer more difficult. Enforcement of intellectual property rights is expensive and requires state capacity that many developing nation lacks. Granting monopoly rights to foreign firms can reduce market access and increased prices, especially for seeds and medicine. Which are otherwise easy to imitate medicine, particularly as long the process is known (Braga, Fink & Sepulveda, 2000)

It must also be mentioned that there exists a stronger opposition towards patents within the literature. The opposition towards patent argues that patents strong patent protection is negative for innovation because monopoly rights deter competition and they suggest that it is the competition that drives innovation. They argue that the first-mover advantage is incentive enough for innovators to benefit from the innovations and is a significant advantage towards competitors. Monopolies also drive up prices and can attract rent-seeking behaviour which can be very harmful to the economy for example, in the pharmaceutical sector. The opposition even goes so far as to say that even the pharmaceutical industry does not necessarily need patents to facilitate innovation. They stress recent evidence from the Indian pharmaceutical sector reverses engineering efforts, which roughly takes four years to imitate a new drug, which would grant the first-mover advantage of four years which is in stark contrast with the conventional wisdom of no patent no drug (Boldrin & Levine, 2013).

## 2.5 Previous literature

Literature on IPR has rapidly been expanding since the establishment of the WTO agreement. However, the literature has mostly measured the impact of IPR in developed nations. The studies done on developing nations have found at varying evidence that is often contradicting each other. This is likely because IPR is hard to measure, and there is still room for improvements in theory and methodology. However, there seems to be a positive relationship between stronger IPR trade, FDI and licensing. Maskus & Penubarti, 1995 found that stronger IPR leads to increased trade and suggest IPR to be trade-related (Maskus & Penubarti, 1995). Branstetter, Fisman & Foley Suggest that stronger IPR increase licencing to developing

nations(Branstetter, Fisman & Foley 2005). Branstetter et al. Found that stronger IPR indicates more FDI investment by USA firms and a stronger incentive to transfer technology to developing nations. Mansfield found that IPR strength in developing countries determines if foreign firms are willing to invest and license to the country (Mansfield 1994.) Park & Lippoldt findings suggest that patent strength is key for foreign firms to licencing their technology based on firm-level data (Park & Lippoldt 2005).

On the other hand studies point the Diffuclites with IPR for developing nations A study that looks at who would benefit from the TRIPS agreement concludes that the USA would benefit in particular by being able to appropriate rents on innovation. However, harmonisation of IPR could Generate large beneficial technological transfers to developing nations. Which may offset the increasing rents innovations developing nations will have to pay (McCalman 2001). Helpman found no evidence in his studying in IPR in developing nations that they could benefit from stronger IPR and it would only benefit developed nations (Helpman 1992)

Evidence from Palacio indicates that catch-ups are reliant on social capabilities. In 2018 he found that his four social capabilities are related to income growth and long-term performance in manufacturing. Additionally, it explained the rise of the Asian tigers and China and confirms why India has not caught up to the same degree. He had constructed an index with four social capabilities transformation, inclusion, autonomy and accountability. He was using a sample of 27 countries in Asia, Latin America and Africa during 1990-2010. China and East Asian tigers had improved drastically on the index over the time period South Korea went from 3 of the 27 countries in 1990 to rank 1. At the same time, China went from rank 15 to 8 (2018 Palacio).

In the literature, there have been several findings on what they define as U-shaped relation between economic and IPR Strength. Maskus (2012) and Braga, Fink & Sepulveda (2000) was the first to find the U-shaped empirical relations. In 2005, Chen and Puttitanun and found that GDP per capita is positively related to IPR strength. Based on their finds, they developed a theoretical explanation for this phenomenon that has gained much support (Odagiri et al. 2010, pp 12). Their and previous find indicate that is not a negative or positive relationship but that it changes depending on the conditions with in the country. They suggest that IPR is defined by Trade-offs (Chen and Puttitanun 2005).

## 2.6 IPR trade-off

Their explanation of the relationship is based on that a developing country goes through phases. Initially, a developing country has low technological stock and low capabilities for innovation. At this point, they rely heavily on imitation from abroad, and they will apply a weak IPR regime to facilitate imitation from foreign firms. However, this comes at the cost of domestic firms that are trying to be inventors. As if they are successful in developing a new innovation, the innovation will be imitated by competitors because of the weak IPR regime, which disincentivises domestic innovation. As the nations develop, their capabilities for innovations increase and at a certain point, it will be favourable to increase IPR strength as their economy is more reliant on innovation rather than imitation (Chen and Puttitanun 2005).

## 3 Methods and data

### 3.1 Methodology

A mixed-method case study will be used for data collection to triangulate the results to account for the fact that IPR is hard to measure and very complex. This is done to strengthen the results and increase internal validity and reliability. Many different sources will be used to cover potential weaknesses in the data and reduce the significance of potential biases.

Additionally, there will be a comparison between the Chinese case, American case and South Korean case to increase the explanatory value of the research by trying to identify similarities in successful economic catch-up, the previous sections presented the theoretical framework, which consists of a wide range of perspectives and theories in IPRs impact on economic catch-up which will be used to guide the results. Firstly the study will look at the relationship between economic growth and IPR protection. The theoretical framework indicates that there should be a relation between stronger IPR and increased FDI as stronger IPR should incentivise FDI by ensuring protection for foreign firms IP. This will be tested by looking at Ginté and Park index and FDI. Secondly, the theoretical framework suggests that Stronger IP

and increased R&D investment will increase domestic patent application, which will also be tested. Lastly, the theoretical framework suggests that there should be a relationship between IPR protection and a transition from imitation to innovation as a nation because richer and thus relies more on innovation. There should be an identifiable pattern of higher spending on R&D, More domestic patent applications, Lower growth rates, Stronger IPR and sufficient enforcement of IPR this will be tested to answer the research questions.

### 3.2 Data and limitations

The analysis of the data is done using both primary and secondary data. The primary data consists of government documents from The Office of the United States Trade Representative from 1989 to 2020, which tracks enforcement of IP in countries where the USA trades and their violations and limitations in IP laws.

There are secondary data in terms of both qualitative and quantitative. The secondary qualitative data consists of books, journals and academic articles. In contrast, the Quantitative secondary evidence comes from The world bank and the Ginarte and Park index. Data On IPR in developing countries can be scarce, and therefore, a combination of sources is required. Some limitations exist in the quantitative data as the Ginarte and Park index does not cover China in the original Article as it only covers patent protection up to 1995. The updated index from 2008 only provides an average on the patent protection in China until 1995 the data ends in 2005. The data is only counted every fifth year. However, patent protection does not need to be tracked every year as there are generally small changes on year by year basis. Adding the case section of the studies covers the development of Patent protection in China in detail. Before 1984 was no patent and the major change did not occur until 1992. The big downside of the Ginarte and Park index is that it tracks enforcement poorly and therefore The Office of the United States Trade Representative special annual 301 report will be used to account for enforcement. There is another problem with Chinese data, the data on foreign and domestic patents as they been hard to access for the period of interest which 1990-2020. Therefore, it had to be replaced by data on the patent application as it is covered extensively by the world bank and should indicate similar evidence anyway. Lastly, there will be no quantitative comparison between the USA in the 1800s and South Korea and China as there is limited data and a significant time gap.

## 4 Cases

In this section, 3 cases will be explored China, the USA and South Korea.

### 4.1 China

In 1976, the cultural revolution ended in China and with it began the Chinese reform period that would transition China from a planned economy to a market economy. Two years after the cultural revolution ended, China started to open up its economy to the world as a result China began to grow rapidly. During the cultural revolution and Maoist period, the preexisting patent law that had its legacy from the Qing dynasty era was removed. As in the communist systems, there was no room for private ownership of intellectual property and the state was the only one that permitted these rights. It was not until 1984 China established patent laws again. The patent law shared many similarities with the Japanese system. Chinese patent law was intended to facilitate the diffusion of new technologies as it allowed invention, design and utility patents With the public disclosure of the invention after 18 months.

Because of their short duration, patents were granted on a first to file system instead of a first to invent system. The goal of the design of the patent law was to ensure invention around the parties, especially for native applicants. As a result, individuals struggle to benefit greatly from the new patent law as it was difficult to extract monopoly rents. The state-owned enterprises that dominated much of industrial R&D at this struggled with the system and were far from enthusiastic in engaging with it. The law also excluded chemical, pharmaceutical and alimentary or process invention for patent coverage. Which was intended to improve the development of domestic industries in these sectors (Odagiri et al. 2010, pp 315-321).

China depended heavily on technological transfer from other communist nations, particularly the Soviet Union, even after the split between them before the cultural revolution. As a result, China now needed to develop its own innovation capability and attract foreign capital and

technological transfer to facilitate the transformation of the economy. Therefore China opened up four special economic zones that offered foreign companies special advantages and leeways in the laws to attract FDI. Initially, China was mainly able to attract FDI from Hong Kong and Macau. Foreign companies had significant doubts about investment in China due to the weak IPR protection particularly in the sectors previously mentioned that were not covered by the patent law. Additional limited access to markets and the requirement for majority ownership from the Chinese side in joint venture further deterred FDI inflow and technology transfers (Schiappacasse 2003). The Chinese government and foreign firms were not satisfied with the situation, which led to patent reform in 1992 and increased IPR protection. The reformed patent law would offer a patent law more in line with international standards. Patent inventions were extended from 15 years to 20, the chemical process would now be covered by patent protection and domestic patent fillings would be prioritised. As a result, foreign firms gained more confidence in investments in China and from the early 1990s, China saw a rapid rise in FDI. However, Roughly 75% of technologies foreign companies shared in the 1990s was mature technologies (Odagiri et al. 2010, pp 322-335).

The reasoning behind why foreign firms were attracted to do technological transfers in China was surveyed in 1998. The survey found that 80% of firms transferred technologies because of markets access. The second most important reason was to reduce costs by 57%.

Additionally, the study found that 78% of firms kept their core technologies during this transferring process as they deemed the IPR protection in china to weak. The most common transfer was via joint venture 58% and licencing 21%. Foreign firms had the dilemma of losing access to the Chinese market or risk technological leakage. Which is still ever-present in the Chinese market dissipated considerable improvement over the years (Schiappacasse 2003) (Odagiri et al. 2010, pp 335).

In 1992 the Chinese launched an ambitious project to increase domestic capabilities. They would launch program 211 and program 985, which intend to build 100 high-level research universities and create world-class universities in China. Following this development, China focused on improving its innovation capacity in high-tech sectors such as ICT, Biotech, and clean energy in 1995. The era between 1984 and 2001, China focused on learning innovative adaptation of old technologies and imitation but started to build the capacity to move into more advanced technology (Odagiri et al. 2010, pp 341-344).



In 2001 China joined the WTO and thereby entering the TRIPS agreement. To fulfil the TRIPS agreement requirements and correct deficits in the old patterns system, China reformed its patent system again in 2001 and made considerable improvements to IPR protection and enforcement. With the reform, state-owned enterprises and private enterprise were now treated as equal. Foreign firms benefited significantly from the change as the new regulations would treat foreign firms similar to Chinese firms. Regulations limiting FDI and requirements regarding technological transfers, foreign exchange and trade balance were removed. The Chinese government opened up sectors as telecommunication, finance and automobiles. Tariffs on foreign goods were reduced, particular exports and imports of technology products were given more freedom. The reforms were intended to put Chinese IPR protection in line with international standards. Which lead to another significant increase in FDI flow into China. In the same year, China also tried to improve its indigenous innovation capabilities. By implementing incentives towards indigenous innovation. The first incentive was to improve subsidies from patent application from the government, especially towards invention patents. The second incentive was for high-tech firms to invest more in R&D by giving a tax cut on R&D investments (Maskus 2012 pp, 70-81). The third incentive was to attract more talents who had studied or worked abroad to return to China. This led to a remarkable increase in R&D spending, increased patent application and innovation (Saxenian 2007). In 2019 China become the world leader in international patents surpassing the USA.

Since 2001 China has continued to improve its IPR protection over time, often after pushback from developed nations in particular the USA, and has today one of the strongest IPR regimes in the world. With the latest to the Ginarte-Park index in 2005, China scored 4,08 out of 5 which is comparable with Lithuania 4,00 new Zealand 4,01 Luxemburg 4,14. The Ginarte-Park index measures intellectual patent protection, but it will be covered further in the data section (Park 2008). However, there is a lack of enforcement in China as they are constantly being characterised as IP Pirates in the media today. China has been making improvements towards enforcement, beginning with increasing punishment for IP violations and creating special IPR courts. Despite much progress since 1984, China is still very reliant on foreign technology even tho it has some strong sectors today, such as telecommunication. However, there is a big divide in the technological progress is not even divided most of the progress that has been made has come from coastal regions, which may be one of the causes for the weak enforcement (Odagiri et al. 2010, pp 347-358). With the made in China 2025 china committed

to furthering its improvements on IPR protection and allocating more resources to developing its technology further. Made in China 2025 seeks to move China from being a low-end manufacturer to becoming a high-end producer of goods. The goal is to use China's increasingly wealthy home consumer base to expand research in key areas such as AI and clean energy, which China aims for World leadership in (Huang 2017, pp 340-349). In 2019 China became the world leader in international patents surpassing the USA, and are seemingly on their way towards the frontiers of knowledge.

## 4.2 USA

The US economic catch happened in the final decades of the 1800s. The USA is estimated to have grown on average close to four per cent per year between 1774-1909. The USA catch story is different from many others because the USA was in much closer proximity than the other case as USA GDP per capita was about 30% below that of Britain's world-leading economy (Gallman 2000).

USA first patent system was launched in 1790 by congress it was quite different from the British system. The USA patent system did not protect imported inventions in contrast to the British patent law, which requires new innovation to be eligible for a patent. Therefore entrepreneurs had free access to foreign innovations that had not been patented in the USA. Entrepreneurs in the USA therefore had a stronger incentive to seek US patents for foreign intervention. In 1793 legislation passed and only allowed US citizens to be able to make patent applications in the USA. This restriction was over time relaxed, but foreigners faced high application fees compared to low fees for USA citizens. In 1836 a major reform of US patents system was done in the patent act of 1836. Which required that the application had be examined by professional examiners, which resulted in the examiner staff of the US patent office was among the largest in the world (Odagiri et al. 2010, pp 34-37).

One of America's first modern industries was the textile industry which relied on large scale factory production. To get the American textile industry going, they relied heavily on technological transfer from the British textile industry, which was then modified by the American textile industry to fit its needs. Britain was dragged into the large European war during the early 1800s, making Britain put restrictions on transfer from the textile industry. It

was deemed of national importance and limited outward transfers of textile technology. One of the major policies was the restriction of skilled labour and exports of manufacturing equipment. However, the British did not deem it likely that the knowledge could be acquired by reading technical descriptions or patent covering their details. At the time, many of the inventions in cotton and yarn spinning and weaving were covered by patents. Americans went to Britain and obtained crucial information for the development of their own capacity. Another key source of knowledge transfer into the American textile industry was via migration many skilled British textile workers managed despite the restrictions immigrate to America and transfer their knowledge to the American textile industry (Odagiri et al. 2010, pp 38-41).

Between 1840 and 1870 USA saw a rapid increase in patents per person and eventually peaked in the early 1880s, which has been suggested to be the effect of increased IPR protection (Khan & Sokoloff 2001). However, it does not match up very well with the rapid rate of economic growth. As this development largely precedes the period of economic catch in the USA But this may have contributed to increased IPR protection as in 1891 USA started to recognise foreign patterns as the USA was becoming ever more reliant on its invention rather the imitations from abroad (Odagiri et al. 2010, pp 44-45).

### 4.3 South Korea

South Korea created its first patent law in 1908. however, the laws were removed in 1910 when Japan annexed, and South Korea was forced under Japanese patent law until the second world war. After the second world war, Korea was governed by the US military until 1948, and in 1946 the US imposed a patent law to protect IPR, which covered utility models, designs and patents and was in force until 1961. However, it did not contribute to economic catch and technological transfer as in 1950, the Korean war broke out. In 1961 reformed the patent law system as the country begun to catch up during the 1960s. Initially, South Korea relied heavily on foreign technology as the catch up was kicked off by imported old technology that was deemed so outdated by firms in the developed world and was public domain. South Korea had weak domestic innovations and the foreign investor had little interest in South Korea with no incentives to increase IPR (Lee 2005). Korea focused on developing its human capital, which in the 1960s was very poor. The enrolment rate for

primary school was 29.6.% secondary enrollment was 10.9%, and tertiary education was 2.6 %. By 1975 there had been a remarkable improvement, primary school enrollment had reached 106,6%, secondary education 56,35% and tertiary education 6,9%. In 1971 the South Korean government started a new graduate school of engineering and applied sciences to provide elite education for technological advancement. During the 1960s and early 1970s, The South Korean government made large reforms that would make it easier for and more attractive for foreign companies to do technological transfer and FDI. As a result, South Korea started to attract foreign investors trying to exploit the cheap labour cost in South Korea. However, this started the creation of Korean semiconductors, which would later be taken over by Samsung, which served as a critical local technological base. From the mid-1970s South Korean economy moved into chemical industries, and as results, the Chaebol groups were formed, which came to dominate the South Korean economy. (Odagiri et al. 2010, pp 140-144).

In the early 1980s, foreign firms were increasingly hesitant to give technological licenses to South Korean firms. Therefore South Korea had invested massively in its own R&D to create its own technological capacity. Which resulted in R&D expenditure increased from 0,42 % of GDP in 1975 to 1,41% in 1985. As South Korea started to adopt IPR protection up to international standards in the 1980s, foreign patents flooded the South Korean patent office and accounted for 70% of all patents. During this period. In 1979, Korea had become a member of the WTO (Odagiri et al. 2010, pp 147-150).

FDI did not play a significant role during the surge of foreign patents. The primary source of technological transfer during this period was the importation of machinery goods. From the mid-1980 to mid-1990s, the large domestic South Korean firms realised that licensing offered limited technology transfer and began establishing their own in-house R&D centres, which considerably grew domestic inventions. From the mid-1990s to today, South Korean firms have caught up to foreign patents and account for more than 75% today. However, the Chaebols account for more than 60% of domestic patents (Odagiri et al. 2010, pp 150-155).

## 5 Analysis

As figure one shows, China has dramatically increased its IPR protection since 1990 and is closing on both The USA and South Korea. China has today on paper one of the strongest IPR protection in the world in line with international standards. However, if when looking at The Office of the United States Trade Representative special report 301 that track enforcement of IPR from 1989 to 2020, there is another story. The report either classifies a country as on the priority watchlist, watchlist or not listed. China has been on the priority watchlist every year since 1996 and been list on either the priority watchlist or the normal watchlist since 1989. This suggests that China still has a long way to go in terms of enforcement IPR. However, this is likely because China is still in a stage where It relies on imitation of foreign technologies. In figure 2 it's evident that China has still far to go at roughly 17000 GDP per capita it's still more than three times behind that of the USA with 65000 GDP per capita. The growth rates in figure two also indicate that its able to capitalise on advanced foreign technology. But there has been a steady rise in R&D per GDP, which indicates that the Chinese economy is becoming more reliant on innovation.

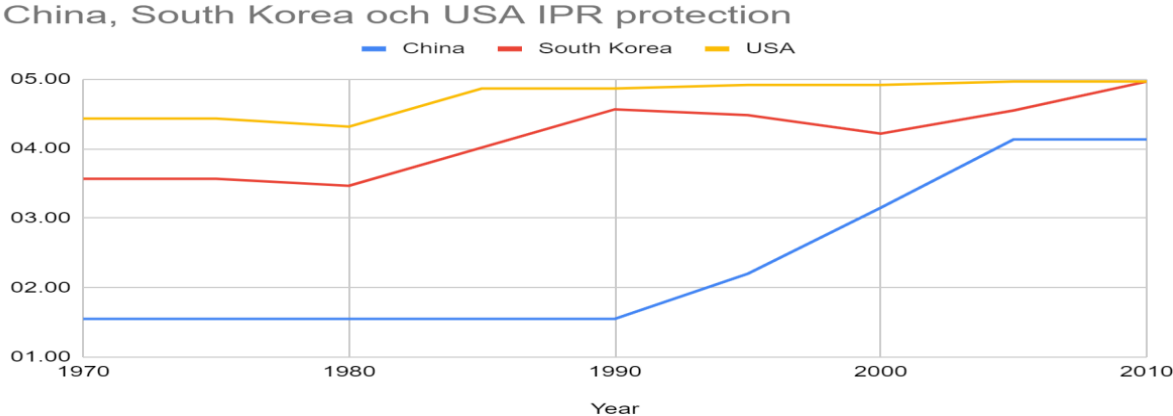


Figure:1

Source: Ginarte & Park 1999, Park 2008

However, if compare China with South Korea its becomes clear that they may no longer be in a phase of development where they rely on imitation rather than innovation. South Korea has not been listed on any of the lists in the special report 301 since 2009, and was last listed on the priority list in 2005 and are close in on the USA in IPR protection. This correlates with the slow down of growth rates in South Korea which has been around 2-3% in the last ten years. The figure shows that the R&D of GDP in South Korea has reached an incredibly high of 4,8%, most developed nations are around 2% R&D of GDP with The USA having 2,8. However the USA has a higher GDP and large population so the total spending is still much

higher. But it suggests that South Korea has transitioned into a country that relies on innovation rather than imitation and with that, enforcement of IPR increases.

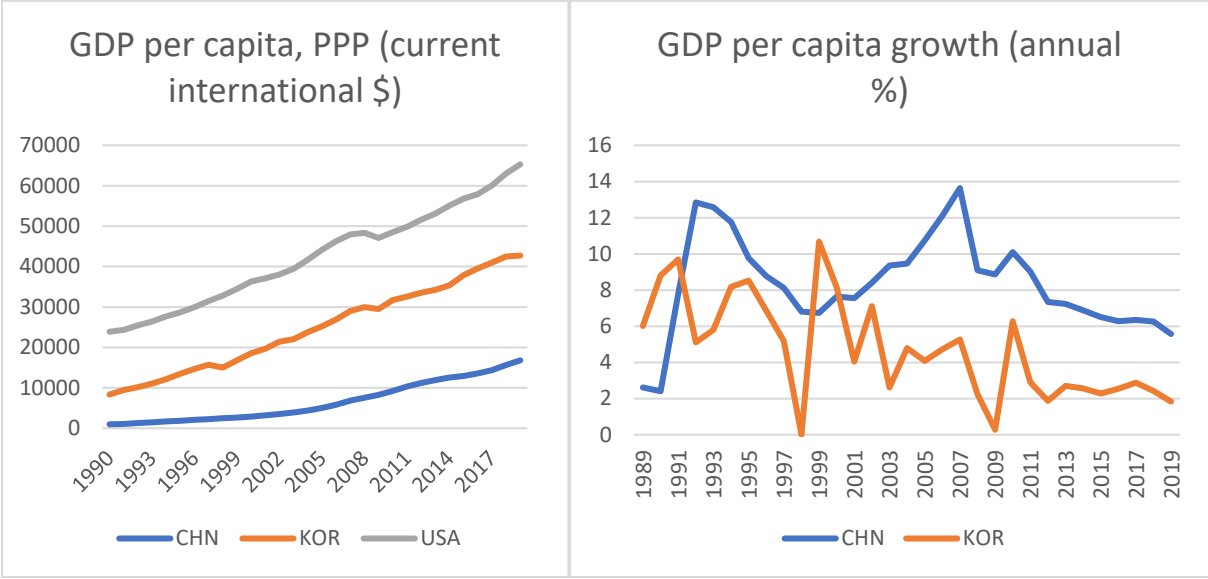


Figure: 2

Source: Worldbank

When comparing FDI and IPR protection In China, there seems to be a strong correlation between the two. However, which has been mentioned previously when foreign firms in China were surveyed, the main reason for investing in China was not the increased IPR protection but the access to exploit cheap Chinese labour. But the increase rapid increase in FDI did however not happen until the Chinese Patent system was reformed in 1992, and it was still one of the considerations for firms when investing in China, however not the most important. The South Korean case but not to the same degree, and FDI has played a small role in the South Korean Case. The relevance of FDI in China has decreased drastically since 1994.

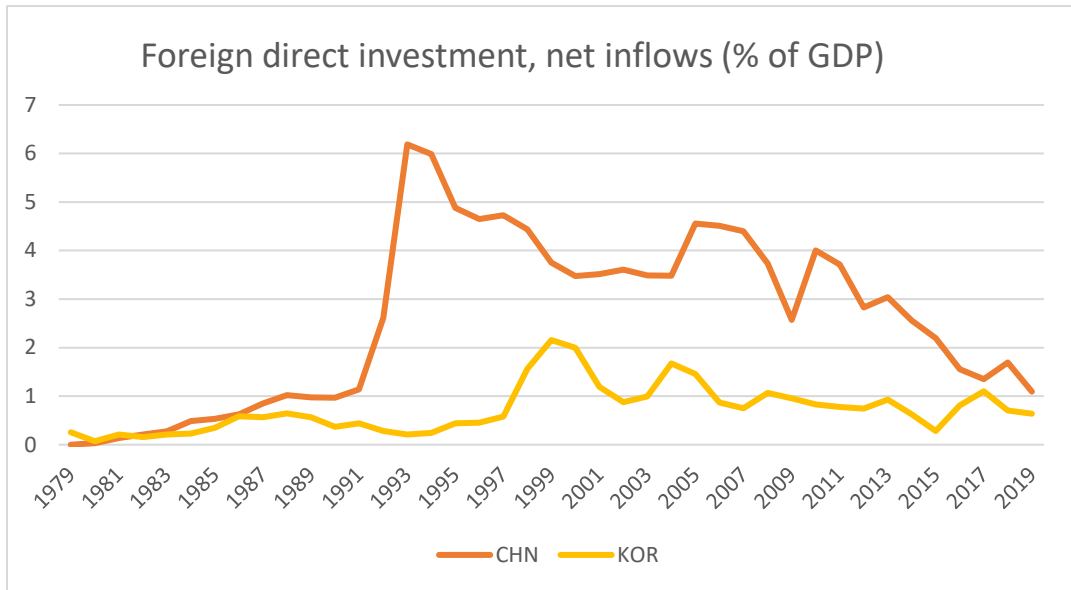


Figure:3

Source: Worldbank

Figure 4 suggest that since the reform of patent law in China in 2001, when the Chinese patent law was improved to be up to international standards, Patent applications started to rise and have skyrocketed ever since. However, at the same time, China also launched incentives to increase patent applications, and R&D spend. It's hard to determine if the rise in patent applications and R&D is correlated one way or the other but likely both have contributed to the rise in patent applications in China. There is unclear how well IPR protection is enforced within China. This study has no methods to analyse that but was still able to facilitate a rapid rise in both patent application and R&D spending. There should exist an environment that allows innovators and investors to benefit from their inventions and research. It may be similar to that of the USA in the 1800s where there was strong enforcement of domestic patents and weak enforcement of foreign.

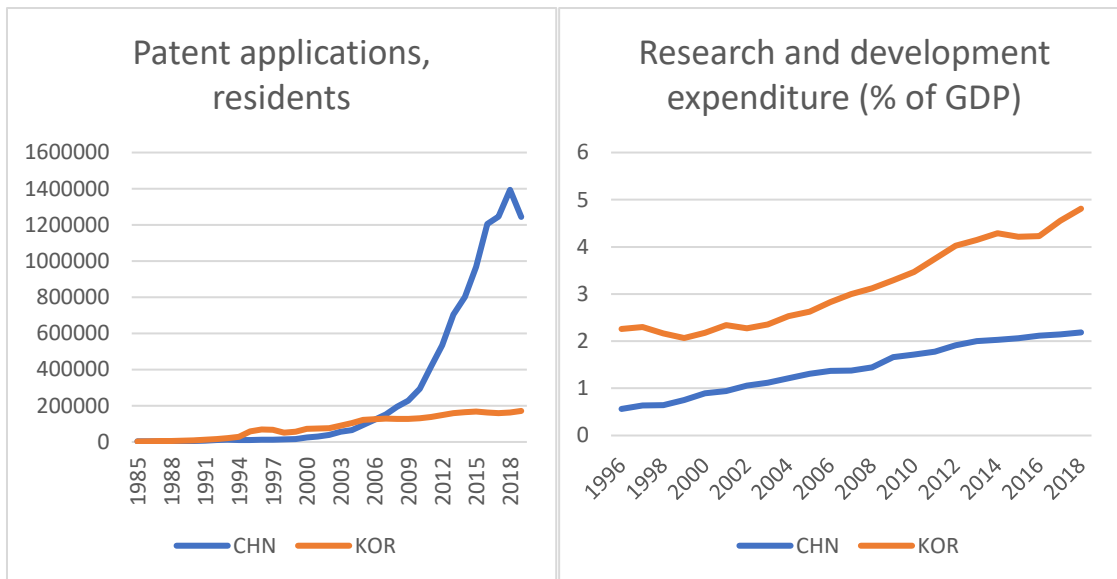


Figure: 4

Source: Worldbank

In the 3 cases, there have been several similarities. In both China and South Korea saw their increase in FDI mainly because they were nations where cheap labour could be exploited to reduce cost for foreign firms. However, the stronger IPR protection did help to attract FDI, but it was not the determining factor. China and South Korea have both face limitations in licencing where foreign firms have been afraid to transfer their technology. All cases show that developing nations go through a face where they relay imitation rather than innovation and violate foreign IP to facilitate their own technological stock. However, the evidence indicates that in all cases, as innovation becomes more important to the economy, IPR protection becomes stronger. In the American and Chinese case, the importance of migration in technological transfer is evident. So is the relationship between social capabilities and catch up as it has been one of determining factors in the rise of South Korea and China. In all case, the IPR law has allowed special expectations for crucial sectors. China and South Korea have moved much quicker towards harmonisation with the world leader in IP than the USA.



## 6 Conclusion

This paper has discussed the relation between IPR Strength and economic catch-up In China compared to the USA and South Korea. The relationship between IPR and the economic catch is complex and complicated. There are several gaps in and research methods. There needs to be a development of methods to measure enforcement of foreign IPR and domestic IPR likely. There may exist such a difference in China as they have been able to facilitate massive increase innovations. Chinese enforcement of IPR, both domestic and foreign, needs further study. Additional more means to measure technological absorption capacity is necessary.

This paper finds that developing countries' social capabilities are crucial for developing countries to exploit foreign technology and catch up. The paper finds that the FDI increase in China and South Korea was not directly a result of increased IPR strength, the determining factor was low labour cost. Additional, what seems to be driving IPR strength is the nations own ability to invent. When nations become more reliant on innovations, they increase IPR strength and improve enforcement. When Nations are reliant on imitation, they have weaker IPR regimes and relax enforcement of IPR. The finds suggest that nations should adopt their IPR regimes according to the domestic capabilities to maximise technological gain. This papers recommendation to developing nations is that they should construct IPR protection according to their own needs. Being a violater of IPR is not a bad thing for a developing country it's necessary to achieve economic catch-up. What really matters is developing the domestic capabilities to achieving catch-up and it will be different for each nation.

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