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Do Property Rights matter for China's Private Sector?
A Panel Data Analysis, 1997-2007

Abstract: This paper examines the ambiguous property rights in China and if they affect the private sector development. The indicators for property rights include both broader property rights and intellectual property rights. The property rights theory offers a perspective as a fundamental component of a market economy to enable a growth of private enterprises. The incentives and constraints offered by the property rights regime is determining the outcome of how enterprises are performing and operating. Yet in China there has been a rapid development of the private sector, while the property rights stay inadequate. The private sector which is the dependent variable is measured by employment of private enterprises. The sample consists of 275 observations and is conducted cross-provincial with 25 Chinese provinces to examine the various contents of property rights regime and the private sector development. The data is collected from several Provincial Statistical Yearbooks, available at Chinese Statistical Database. A fixed effect model is performed, covering 10 years from 1997 to 2007. The main finding is that the four municipalities are at forefront driving the effect of intellectual property rights on size of the private sector while broader property rights does not have an effect. This implies that private firms find intellectual property rights protection essential when production is high-tech and innovative activities are prioritised. Other private firms find informal substitutions for weaker property rights.

Keywords: Property rights, Intellectual Property Rights, Private sector, China, Panel data

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1. Introduction

Institutional economics have become increasingly popular for numerous studies, due to new evidence that variation in economic growth is determined by the institutional setting. The definition of institutions by North follows; *"Institutions are the rules of the game in a society or, more formally, are the humanly devised constraints that shape human interaction"* (North, 1990 p 3), while an institutional framework composes of fundamental politics, legal and social rules which are affecting the production, exchange and distribution (Tan et al, 2007). Since China introduced a second institutional framework, limited market mechanisms to combine with the preservation of the socialist ideology, private firms have quickly expanded. The private sector is nowadays contributing to 68 percent of China's GDP (Nee and Opper, 2012). Since 1992, the private sector has been growing at an average rate of 30 percent. In 2005, there were around 4,30 million private enterprises, employing around 58 million people (Zheng and Yang, 2009). By 2008, there were around 100 million people employed in the private sector. The private sector is contributing to the economic growth in China with nonfarm-employment, profits and increasing incomes and taxes (Nee and Opper, 2012). Yet this combined dual-track system of two institutional frameworks has generated new opportunities of rent-seeking and higher transactions costs. As the property rights theory argues, well-established property rights are fundamental for private firm development as private owners responds to market incentives by increase productive investments to gain profits. On other hand, weakly protected property rights raise transaction costs when uncertainty increases among investors, resulting with decreased investments. Property rights are expected to define growth, yet the private sector has been expanding without operating in a market economy (Bardhan, 1997; Pejovich, 1999).

The expectations of an efficient legal system to be essential for private firms are dismantled by China (Lerner et al, 2016). Does an efficient legal system not matter for private firm development? The constitution in China was amended in 2004, where it modified the right to own and inherit private property. But the state allows itself to expropriate or acknowledge ownership of the property for public use with compensation. The central government shall support, encourage and guide the non-state sector (2004 P.R.C Laws article 22 cited in Zhang 2014). Inadequate property rights expressed in this way enables breed of corruption and vulnerability of unauthorised inference for entrepreneurs leading to a loss of long-term investments. Formal contracts are not reliable and even less reliable over a long term in an

unpredicted environment, which is a very harsh business environment for smaller private firms which are crucial for any transition economy (Bardhan, 1997; Roxas et al, 2008).

Moreover, the fiscal and administrative decentralisation has resulted in a mixed provincial environment whereas property rights regime differs too. China therefore, lends itself an analysis of local institutions role on the private firm development. In addition, the central government decided to introduce and allow marketisation of a higher degree in chosen parts along the coastal area (Zeng, 2011). This introduced a variety of incentives and constraints across China as local governments have different attitudes towards developing and granting private-owned enterprises resources. Few local governments are more benevolent to entrepreneurs than others, the preconditions for private firms are suffering of high inequality (Roxas et al, 2008). Resulting with several provinces which enjoy rapid improvement of property rights protection while others are barely making any progress (Croix and Konan, 2002). China is therefore an interesting case study, to examine if the private sector is expanding in provinces with stronger property rights and if the property rights theory is consistent even with the context of China.

1.1 Aim and Research Questions

The aim of this thesis is to examine the correlation between size of the private sector and property rights, both physical and intellectual property rights, at provincial level of China. As to analyse to what extent do property rights matter for an expanding private sector within China's provinces. Recent studies have shifted focus of property rights economics to explain firm performance but this thesis wish to highlight property rights on the size of private sector (Eicher and Newiak, 2013). Other studies highlight the importance of informal institutions as determining growth of firm's operations within transition economies (Steer and Sen, 2010). Yet, this paper wishes to examine the role of formal institutions which ought to be determining the long-run outcomes for private firm development. A cross-provincial study is a good basis for testing the property rights theory and bring more perspective to the puzzle of property rights importance for determining expansion of the Chinese private-enterprise system. Therefore, the research questions are formulated as below;

1. Does a larger private sector exist within provinces providing stronger property rights?

2. Are intellectual property rights essential for China's expanding private sector?

The first question addresses the issue of correlation between broader property rights and the size of private sector, as apart from the property rights theory, previous empirical evidence

conclude that the private sector has been developing more than property rights. The opinions vary of how defective the governance of property rights is. To further analyse the effect of ambiguous property rights, the details of existing regulations must be examined further as to analyse which parts are functioning better and which not, to reveal if any component is less important. This leads to include the second component, intellectual property rights. The second question fulfils the aim of examining specifically the role of intellectual property rights to China's private sector. The definitions and further perspectives of physical and intellectual property rights will be discussed in the next chapter.

1.2 Method and Limitations

A statistical analysis in form of a Panel data over time will form this thesis. The model will be based on primary Chinese data, compiled from Chinese Provincial Yearbooks (1998-2008). The panel data will cover 10 years from 1997 to 2007 because of the property rights data available. Further, several variables collected from Provincial Statistical Yearbooks suffer from divergent reporting and therefore limits the time frame for a panel data. In addition, this results in leaving six provinces and conclude a model with 25 Chinese provinces. Even though the time covered is short, the advantages of panel data are superior to cross-sectional data as panel data will capture both time and individual effects. In this case, the Chinese provinces have various individual characteristics which visualises the effect of institutional changes (Verbeek, 2004; Hsiao, 2003). A coverage of 10 years ought to be sufficient to capture the progress of property rights protection on the development of the private sector. As the private sector had its peak years during the years covered up to year of 2007 (Lerner et al, 2016). Since China's provinces are highly diverse, in subjects of economic development, policies and various institutional settings it is necessary to estimate the model at provincial levels. The provinces have adopted different attitudes towards market mechanism, such as private-owned enterprises and property rights. Therefore, the provincial data will be collected from Provincial Yearbooks as they report most thorough data. The provincial data is collected by several governmental institutions, both on national and lower level governments and various enterprises. A data collection from several resources increases the credibility as manipulation become rather difficult compared to one sole source.

Due to the limited coverage of property rights indexes, this thesis will not be able to measure the effect of the property rights law which was enacted 2007. Still, the constitution was amended in 2004 with an increased protection of private property rights. Moreover, the time

scope is covering several laws and amendments of intellectual property rights which were implemented around the millennium (Croix and Konan, 2002).

1.3 Outline

The second chapter covers theoretical framework and evaluation of previous literature. The chapter will first highlight the property rights theory before moving further to the details of developing and governing property rights in China. Starting with broader property rights followed by intellectual property rights. Chapter three consists of methodology and data description of the model and motivation for the selected variables. This is followed by descriptive statistics and the econometric approach with transformation of variables before regressing the final models. Chapter four provides the result of the panel data model and concludes with robustness checks outlined in more detail for each approach. Chapter five ends with conclusions of this thesis.

2. Theoretical Framework
2. 1 Theory

Property rights are essential for market economies to solve conflicts of scarce resources among individuals. Property rights specify the rights to use a resource, consisting of four fundamental rights. Rights for the owner are following; to use the economic good, to take decisions regarding the property, the right to handle profits and losses of the property and the right to rent or sell it further to another party. Well-established property rights will by its own nature solve possible conflicts of resource competition, as one resource cannot be used simultaneously. However, an individual may not have all the rights of the resources. For example, in China, the real estate may be privately owned while the land underneath belongs to the state. This address one of the crucial issues with the absence of clear property rights, when it deals with private and public sectors where the bundle of rights may be shared. Another form of property rights is communal rights, where neither the state nor individuals have the right to exclude another part from using the good. For example, a park or public roads are all public used without anyone having the right to exclude a person. The issue of communal rights occurs when the resource needs to be taken care of, and no clear owner is present to be in charge, for example the common issue of pollution. The structure of property rights and how well it defines the owner results in to what degree an owner responds to political or market incentives. For example, private firms are more likely to respond to market incentives if enjoying private property rights compared to state-owned enterprises

(Alchian and Demsetz, 1973). Private property rights will allow owners of firms to retain all earnings and gain incentives for profit maximisation. Clear property rights will channel resources towards productive investments. It is therefore a powerful mechanism to either be used for defining growth or to impede development as the structure of property rights impacts the value of resources (Fennell, 2013). Therefore, property rights affect resource allocation and economic efficiency.

An absence of well-defined property rights in China, increases transaction costs because of legal difficulties. Transaction costs cover informational, legal and communication costs and it is the extra cost of market imperfection when exchanging a good between two parties. For example, less transparency increases search costs and in combination with bureaucracy, it increases communication cost. Further, legal difficulties increase costs of contracts. In the case of China, it is therefore costlier to try to secure and protect property rights. With legal difficulties present, incentives for inducing informal exchanges between actors will rise with induced risk of forming contracts. If property rights do not clearly define the owner, the private property with rights to exclude others, receives unrestricted access (Feder and Feeny, 1991). Incentives for investments in innovation decreases as soon there is a risk for expropriation. It may decrease potential of high-tech production as expropriation is a constant potential threat from the government or other observant individuals. Therefore, a weak protected property rights regime will reduce possibilities for productive investments and restrain private firm development. The institutional setting of property rights is therefore affecting firm's behaviour and decisions (Alchian and Demsetz, 1973). Moreover, as scarcity of resources increases, it demands an improving protection of private property. Some factors, such as population density and high technology development increases the benefits of protecting private property, as it reveals opportunities for profits. If this is beneficial for national governments, the formal institutions of property rights will improve (Feder and Feeny, 1991). For instance, as technology advancement increases in China, protection of broader and intellectual property rights becomes more significant.

If right preconditions are set, not only will privatisation grow but a competitive market leaves innovative firms to survive. A study conducted of 500 largest manufacturing industries across the world, finds that mixed enterprises perform worst and hints the conflict of shared public and private ownership. Private firms are significant improving profitability's as they are enjoying market incentives compared to state-owned enterprises. Concluding, the private

sector is a vital component within an economy and is dependent on a good protection of property rights (Boardman and Vining, 1989).

2.2 Broader Property rights in China

Several contributions to the property rights theory do not only point out a complete content of rule of law but likewise, the governance of property rights is vital. For example, Russia has an independent judiciary and stronger property rights than China, yet investors in China rate the institutional environment higher than Russia during the 90's, based on self-perception when investors were asked how safe they feel about their investments (Rodrik, 2004). The sense of security feeds from various norms in the Chinese economy, such as co-operations with informal ties or with local governments to receive protection (Huang et al, 2017). These norms are being shaped as the property rights in China are gradually changing, from not being granted at all to entrepreneurs, to be weakly protected. The aim of the amended property rights in 2004 was to increase protection of property rights, but the practice still has its exceptions. One example is the situation of land rights. Land is owned by government and there is no private ownership. Individuals have only the right to use the land and draw benefits by paying the government a certain yearly fee, to keep using the land. The insecurity is the limit of how long the land-use right will be allowed. As for real estate, individuals have the right of private ownership and to sell, exchange or give it away as a gift of the property. The land-use rights will shift with the exchange from one party to the other, yet the land still belongs to the government. The buyer receives the land-use right for a period, as original assigned to the first party and by law it remains unclear whether the new party may receive a renewal of time for usage or whether there will be certain fees to pay. The automatic renewal of time and conditions for fees was accounted first within the property rights law of 2007 (Zhang, 2014). Another example of diffused property rights in practice, are the township- and village enterprises, which had both private entrepreneurs and local governments claiming property rights of it (Nee 1992). Entrepreneurs shared their profits and the local government officials did not have any motivation to expropriate their business as their growth led to increased profits. With clear private property rights, the small firms would not have to co-operate with the local governments to avoid expropriation. As the private sector and economic development has been growing in spite of the property rights in China, there are fewer incentives present to hurry up with reforming it (Aron, 2000; Huang et al, 2017).

Property rights is gradually changing, in combination with the "Opening door" policy from 1978, the discrimination towards private enterprises slightly decreased by the introduction of

market mechanisms and the growth of private sector was initiated (Nee and Opper, 2012). Yet, the private enterprises are still lacking access to resources as they are monopolised by the governments. The governments keep control of the economic activity by, either co-operating or expropriate the firms as it fits. This power tool is used by the central government to be able to control the resource allocation. The governments maintain control of deciding the following; licenses, firm structures, major operations and decisions of the firm, prospects for future operations, profit distribution and the business domain (Tan et al, 2007). These factors raise the legal difficulties for the Chinese private enterprises.

The property rights are not only weak in China, but are unequal across provinces and intensifies a high inequality among regions. The coastal area and urban cities have attracted far more investments. The Eastern provinces are enjoying higher economic growth and a more developed private sector (Zhu and Lin, 2007). One main factor for the uneven distribution of private firms is the decentralisation. China implemented fiscal and administrative decentralisation, consisting of many levels such as; central, provincial, prefectural/cities, county, township and village level of government. The central government has different attitudes for allowing privatisation and a clear division can be seen comparing West and East China. The non-state sector is larger in coastal provinces, while the Western provinces keep a substantial proportion of state-owned enterprises. In practice, different demands have been set by the central government by requiring different development achievements for local governments. For example, local governments in Eastern China have incentives for helping smaller private firms to grow and as so, they do not impede marketisation. Contrary, the Western provinces respond less to market incentives since the central government wish to keep many state-owned enterprises located there. The decentralisation has brought up a disparity of regional activities and outcomes as property rights institutions vary, for example, investments in science and innovations are clustered (Zhu and Lin, 2007). A study conducted by Song (2009) has found correlation between property rights in China and increasing investments, for example of R&D expenditures. This evidence is based on a study conducted on 18 cities across China with various levels of property rights protection. Property rights are measured by self-perception of entrepreneurs. Yet a study only covering cities may be questionable as China does already invest more on urban development. They further report that the private sector does rely on written contracts but not on help from courts in case of disputes where property rights protection is in conflict. This implies that even in a transition economy, entrepreneurs will continue to prefer a formal

contract and thus demand an increasing legal protection. It has additionally found that protection of property rights is still important even for smaller firms across China and that broader property rights are still crucial as an additional complement to the protection of intellectual property rights consisting of; patents, copyrights, trademarks and design (Song et al, 2009). A recent firm-level study, from the years of 1998 to 2008, concludes that property rights indeed causes firms to survive, as regions which enhance property rights decreases the probability of exit. Reasons are, either less government intervention or improved laws and market intermediates (Shi et al, 2017).

Several studies confirm that sub-national institutions, by the delegation of economic power to lower level governments, have had positive effects on stimulating privatisation because of new incentives for achieving economic development (Tse et al, 2006; Tan et al, 2007). Montinola, Qian and Weingast (1995) referred to this as "Federalism, Chinese style". The central government received a limited interventionist role and sub-national governments received more impact of their regions. By keeping the national government out, the provinces are limiting distortions and rent-seeking from the central government. This has ensured an improved stability for economic activities within the province. However, the more developed regions have enjoyed better conditions to reach economic growth by stronger property rights while other poorer regions have not had efficient local governments (Montinola et al, 1995). The higher performed regions are attracting entrepreneurs to locate their firms there and it is an ongoing cycle. A province which already enjoys an expanding private sector by providing protection of property rights is further attracting new start-ups and keep improving their protection of property rights. Though these studies report different outcomes of private firms depending on institutional settings, they do not specify if property rights are any more necessary in few locations than others. Rather they conclude the importance of property rights in whole China (Tse et al, 2006; Song et al, 2009; Tan et al, 2007). Further, the previous empirical evidence stays rather inconclusive, whether property rights affect development or if economic growth leads to an increasing protection of property rights (Eicher and Newiak, 2013; Maskus, 2000).

The decentralisation has brought up competition among provinces. To attract production factors, skilled labour and foreign capital, local governments compete by providing and develop infrastructure and access to markets. It creates an internal demand for improved protection of property rights to enhance investments and further economic development. This is evidently for benevolent governments in more developed provinces while other provincial

governments enjoy incentives of rent-seeking (Montinola et al, 1995). But even with well-defined property rights, protecting property rights is an ongoing progress and is rather viewed as an evolutionary process constantly shaped by market and social movements enforced by the state (Rapaczynski, 1996; Milhaupt, 1998). However, several researchers conclude that property rights are still not sufficiently secured and the gradual change is slow (Montinola et al, 1995; Zhang and Bruun, 2017). Yet the role of independence for the firms is assumed to be a minor or larger obstacle depending on provincial location. As even with benevolent governments, the private firms are not in power to claim private property rights. Still the fundamental decisiveness enforced property rights have on the private sector, ought to hold which leads to the first hypothesis:

H1: "Property *rights are positively correlated with employment in the private sector."*

The first hypothesis wishes to imply that formal institutions are determining the size of private sector, even if informal institutions may be complementary for private firms in transition economies (Steer and Sen, 2010). With stronger property rights, Chinese firms increase their probability to survive and the employment is more sustainable (Shi et al, 2017).

2.3 Intellectual Property Rights in China

The competition among firms today is the knowledge they obtain, for example; management practices, technology innovations and business strategies. With global competition and the information revolution it is more imperative than ever to protect intellectual property rights. Intellectual property rights, IPR, are the rights to use and sell knowledge and inventions. It consists of four main categories such as; patents, copyright, trademarks and design. IPR is a tool for increasing innovation as there is a reward for companies which initiate an innovation. Protected from theft of innovation, the company receives monopoly rights for their innovation, which is the main advantage. Grasping market shares by keeping up with innovative activities induces incentives for investments. Without protecting intellectual property rights, goods will be classified as public goods, to be non-rival and allow usage for anyone. Consequently, incentives for innovation decreases and purposely delays of production choices or scientific publications may occur, which introduces inefficiency of knowledge improvement within the economy (Greenhalgh and Rogers, 2007).

Regional variation of IPR regimes is evidently as well. Eastern provinces enjoy better protection than their Western counterparts. A recent contribution, revalued if improved property rights have an effect for Chinese private firms. The study conducted patent data

before and after major IPR laws were implemented. They argue that Chinese firms do not immediately respond to shifts of IPR regimes, as their experience of ambiguous institutions have led to greater reliance on informal practices (Huang et al, 2017). The ambiguous IPR institutions feeds from inefficient policies and definitions. For example, the levels of protection do not match the rapid industrial development. The laws implemented at early stage, were basic and left room for courts to use their own interpretation. The infringements on companies' brands and technology have proceeded and the government has not taken effective measures to protect companies. The firms exposed to infringements are from various industries. The trust for IPR protections are low from many different parties (Zhang and Bruun, 2017). It takes time after an improvement of IPR protection for Chinese private firms to be even more likely to respond to a formal institution instead (Huang et al, 2017). When the legal system is not enough, other alternatives are possible. An in-depth study collected interviews from foreign firms in China to examine how firms try to protect themselves when IPR protection is paradox. The interviews conclude that firms adopt strategies to raise the barriers of imitation, such as making the process of the product or service provided more complex, which would take time and be costly to imitate. Other strategies involve educating the staff the importance of protecting IPR for the firm, or build up networks internal and external as to have informal protection in case of dispute, for example having a good relationship to the local government (Keupp et al, 2010). Moreover, the ambiguous institutions lead to uncertainty and decreased transparency which is harsh on smaller firms. The smaller private firms are suspected to not have much information about the IPR system or even if they acquire a patent, they may not have resources to further commercialise the innovation. In a case of dispute, they are neither believed to have the capacity or trust the courts for solving disputes (Greenhalgh and Rogers, 2007).

Several papers have thereupon studied the protection of IPR in more detail to break down the puzzle of combatting ambiguous intellectual property rights. Researcher, agrees that return to patents, trademarks and copyrights may have different outcomes and opens the possibility of conclusion that they may not be equally important. Studies of IPR extended towards the developing world, analysing 54 countries, shows protection of IPR, particularly patent protection, is positively correlated with economic development but where the degree of IPR enforcement is the determining factor (Eicher and Newiak, 2013). A study conducted by Fai (2005) confirms that foreign investors in China perceive that infringement on patents is lower than it is for copyright or trademarks. Patents are granting commercialisation of the

innovation and allows to extract economic rents from the innovation. If successful, it may be one of the most rewarding advices (Keupp et al, 2010). Another paper, reports as well that infringements of intellectual property rights have been more severe on copyrights, specifically software piracy (Kshetri, 2009). Requiring a patent is a long and costly process and is therefore the most competitive advice as it is signalling innovative skills of a company. The company has already a first-move advantage at the market and can improve the quality of the product. Therefore, patent protection is of a higher value for private firms. Returns to trademarks are evident too as it helps solving information asymmetry between a seller and a buyer and may as well imply good signalling of a reputable company, while copyright is a right that is automatically rewarded to the author (Greenhalgh and Rogers, 2007).

Yet the reports from the same authors discusses that lower protection of IPR, for example copyrights, may be beneficial as it enables low-cost imitation of production, implying that infringements of copyrights do not necessarily have negative effects (Greenhalgh and Rogers, 2007). As China has been an importer of technology for decades, it has sparked new opportunities for Chinese entrepreneurs to adapt the western technology and develop further ideas. But as China becomes more innovative, it will require more robust institutions as a study concludes, that informal norms completing the inefficient legal system have a limit. Innovation, measured by patent stocks, is shown to be higher in regions with higher IPR protection. The protection of IPR has yet to improve if China wishes to move further from investment-led growth to increase domestic production and innovations (Lerner et al, 2016). The Chinese private sector is already more innovating than the state-owned sector and China has potential to shift further to a more innovative economy if intellectual property rights keep improving (Wei et al, 2016). Moreover, the study by Eicher and Newiak (2013) reports that both dimensions of physical and intellectual property rights have equally determining power on economic development. But if protection of property rights is not developing it has no effect on the development, implying that only an increase of protection of the property rights regime, will have positive externalities towards economic growth or marketisation. This is concluded while addressing the possible endogeneity issue of reversed causality by using an instrument variable for IPR.

Moving towards the practice of IPR, China has joined many international conventions of IPR since 1980, but relished a slow progress. A new trademark and copyright law was enforced in 2000 to meet the agreements of TRIPS standard, trade-related aspects of intellectual property rights, while the Patent law was amended during the same time to meet WTO standards.

Moreover, the Patent Law has been the most successful enforced among the various components of intellectual property rights, such as the copyright regulations. With the "Opening door policy", China enacted a Patent Law early as 1984 to promote science and encourage innovations (Zhang, N. 1997). Promoting science and innovations are not in conflict with any political constraints and seems to be a reason for why the Patent Law is better enforced than for example copyright or trademark regulations, which induces capacity for mimicking and censorship by the central government as it is weakly protected (Zhang, N. 1997). The increase of patent applications rose from 80,000 in 1995 to over 120,000 in 1998 and R&D expenditures as a share of GDP doubled during 1995-2005. Especially the number of patents are highly uneven distributed, whereas the coastal provinces are granted major of patents, showing that patents are very clustered in China (Sun, 2000). Higher number of produced patents are correlated with increasing economic activity and information about increasing patent stocks attract firm's decision for location. In turn, a growth of firms may increase number of applied patents (Kshetri, 2009; Fai, 2005). Further, China has implemented specialised IPR courts in few provinces to raise competence of specialised judges within conflicts of IPR (Croix and Konan, 2002). However, these courts are placed in more developed provinces such as; Beijing, Tianjin, Shanghai, Fujian, Guangdong, Jiangsu and Hainan. The location of the courts is based where more disputes occur. To illustrate the importance of implementing specialised courts, between the years of 1991-1995, there were in total 15'543 lawsuits where 96 percent received a final judgement (Zhang, N. 1997).

Thus, a broader increase of IPR protection is not only encouraging innovation and competition, but clearly is a tool for decreasing information asymmetry which further would decrease transaction costs. Concluding that protection of intellectual property rights is crucial, as laws of IPR were enforced in an early stage of market reforms. Leading to the second hypothesis:

H2: "*Increasing protection of IPR is correlated with employment within the private sector.*"

The second hypothesis is based on previous research, but also the empirical evidence of the gradual process China has taken forward to improve the protection of IPR. It is clearly a progress ongoing and the demand both from domestic entrepreneurs and international partners are pushing for an improvement, specifically over the years covered in this thesis. This should hint that protection of IPR is vital for entrepreneurial activities and the private sector.

3. Methodology

3. 1 Data

The data is retrieved and compiled from several editions of Chinese National and Provincial Yearbooks. The Chinese Yearbooks are published yearly and are usually containing 24 chapters, covering national accounts such as GDP to more detailed statistics of contract disputes solved by courts. Most of the data is based on provincial yearbooks which provides more details of the province such as number of lawyers. On the other hand, the provincial yearbooks differ somewhat from each other, for example some provinces are better at reporting consistently over the years. Because of shortage of data on lawyer counts the following provinces are excluded; Inner Mongolia, Guangxi, Hainan, Xizang, Shaanxi and Gansu, leaving 25 provinces out of 31[1]. The restrain on years covered and the choice of dropping six provinces results in a balanced panel data. Therefore, the panel data is a balanced panel data with no missing observations. All panels (provinces) contain exact same time periods for each variable. A balanced panel data is more efficient as it accounts for individual heterogeneity which is obvious for this cross-provincial study and therefore decreases the risk of noise, compared to using an incomplete panel data (Verbeek, 2004).

The control variables are carefully chosen fitting the Chinese context. To measure property rights on private firm development as accurate as possible, it is necessary to account for the various regional differences as well as other disadvantages the private sector suffers from which may have an impact on the regional distribution. The disadvantages are access to financial institutions, access to infrastructure, access to lawyers, access to human capital and access to technology advancement (Zhu and Lin, 2007). Studies of transition economies cover several important indicators to measure distribution of firm growth and influences on the business environment, such as financial institutions, legal framework, human capital, technology advancement, infrastructure as well as economic development (Brown et al, 2005).

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[1] Provinces included: *Beijing, Tianjin, Hebei, Shanxi, Liaoning, Jilin, Heilongjiang, Shanghai, Jiangsu, Zhejiang, Anhui, Fujian, Jiangxi, Shandong, Henan, Hubei, Hunan, Guangdong, Chongqing, Sichuan, Guizhou, Yunnan, Qinghai, Ningxia, Xinjiang.*

3.2 Variables

3.2.1 Dependent Variable

The dependent variable measures number of Employed Persons in Private Enterprises and Self-employed persons. The private enterprises are defined as economic units owned by private persons. Included in this category are following; private limited liability corporations, private share-holding corporations Limited, private partnership enterprises and private-funded enterprises registered in accordance with the Corporation Law, Partnership Enterprises Law and Interim Regulations on Private Enterprises. The employed person must be aged 16 and earn monetary benefit for the employment. This variable will be derived per 10 000 capita and it will present the distribution of the private sector by looking at how many are employed within the private sector. This measure was more consistently reported than number of private firms and in addition, the number of employed people estimates directly the proportion of the population working for a private enterprise. Contrary, number of private enterprises may be few but larger private enterprises in a province or many but smaller private enterprises which is not as specific (China Statistical Yearbook).

3.2.2 Main Independent Variables

The property rights variables are collected from NERI Index of Marketization of China's Provinces 2009 Report (Chinese Edition). The NERI, National Economic Research Institute, indexes measure the progress of institutional transformation of China's provinces. It covers five main topics; the relationship between the government and the market, the development of the non-state sector, the development of the markets, the development of market intermediaries, and the legal environment (Gang and Fan, 2009). The index for broader property rights is on a scale from 1-10 and is based on 23 indicators of institutional arrangements of the five major fields mentioned. The indicators are collected from statistics or enterprise and household's surveys to show a relative comparison across the provinces. It is not to be interpreted as any ideal of state to score 10, as no market economy is fully operating without market failures and continuous progress of marketisation. The larger value of the property rights, the stronger is the property rights regime. The property rights indexes are already adjusted for respectively size of GDP on provincial level and are weighted equally. As China experienced rapid shifts of negative and positive development, some provinces may take a value below 0 or above 10 to illustrate the progress (Wang et al, 2007). This thesis covers both broader property rights and intellectual property rights indexes. Both

property rights indexes will be derived in lagged values to account for path dependence since institutions take time to reform (Williamson, 2000).

(1) Property Rights

Broader property rights measure the development of the five major fields. By the NERI index it is calculated as;

Figure. 1

$$S_{ij} = \frac{V_i - V_{min}}{V_{max} - V_{min}} \times 10$$

Figure 1 is retrieved from (Wang et al, 2007). Sij is the province of interest. Vi is the current value of province i examined. V-min is the minimum base year value which is 1997 of the province i and Vmax is the maximum value of the province with highest score that year.

(2) Intellectual Property Rights

This index measures average of two factors to measure the degree of legal protection for innovation and intellectual property rights. The two factors calculated are average of the number of patents application divided by the number of science and technology personnel and number of patents granted divided by the number of science and technology personnel (Wang et al, 2007).

3.2.3 Control Variables
Lawyers

The legal situation suffers of high disparity among the provinces where some enjoy a more pronounced legal structure than other provinces. To control for the legal situation a proxy ought to be number of lawyers. A legal system is necessary to define property rights and lawyers serve the role as market intermediaries (Williamson, 2000). Provinces which keep provide improved protection of IPR, prepares Chinese private firms to be more likely to respond to IPR regulations. Over time, firms rely more on the quality of formal institutions (Huang et al, 2017). A stronger legal framework might imply an increasing demand for lawyers. The variable measure total lawyers for each province respectively, both part-time lawyers and full-time lawyers are combined. Because of inconsistency, it is not possible to measure them separately cross-provincial (China Provincial Yearbook, 2008). Lawyers will be measured per 10 000 capita to account for size of the provinces.

Total Loans in Financial Institutions

As mentioned before, financial constraint ought to be one of the greater effect on smaller private enterprises within transition economies (Brown, Earle and Lup, 2005). Within the Chinese context this may be an important control variable if the survival of smaller firms is depending on access to financial markets. It is not possible to accurately measure the amount of total loans from financial institutions to private enterprises however, this variable may present indirectly how much capacity financial markets operate within each province. The imperfections of financial markets are crucial in China as the central government controls for resource allocation and which industries of interest should survive the markets (Poncet et al, 2010). It is therefore interesting to examine if the proportion of formal financial institutions may have an indirect effect of the distribution of the private sector (McPherson and Rous, 2010). To measure the credit capacity of formal financial institutions in each province this control variable will be derived per 10 000 capita, in million Yuan each year, covering loans to industrial, agriculture and commercial enterprises plus fixed assets. This might provide an impression of how large financial institutions are in each province (China Yearly Provincial Macro-Economic Statistics).

Technology

Innovations are highly correlated with regional development, as patent stocks are higher in more developed provinces. In China, it is the private firms which innovate more than state-owned firms (Lerner et al, 2016). It is relevant to measure technology and control for it since technology ought to improve faster with a more innovative private sector. However, the technology gap across regions is one main factor explaining the different rates of development. Measurement of technology advancement has typically two approaches. It is either measured through number of patents, viewed as the output of the technology or it measures R&D institutions as input to technology development (Fai, 2005). Due to the inconsistency of R&D institutions, this thesis will measure total patents granted per 10 000 capita in each province respectively. The patents cover 3 subcategories; inventions, utility model and design. Inventions are defined as new technical proposals to method or to the product or both. Utility models are proposals on structure or shape of the product or combined. Design is defined as new designs applied to the industry's products such as colour, shape or structure. These three categories are also ranked whereas the first mentioned is the most beneficial for regional development as inventions are sustainable for long-term

development while designs only have effects lasting for short-term (China Statistical Yearbook on Science and Technology, 2008).

GDP

Economic development may determine prospects of business environment or the output of investments. China suffers from high regional inequality whereas the coastal area is more prosperous and attracts more investments and entrepreneurs, which further leads to economic development (Zhu and Lin, 2007). The differences of economic development across provinces might as well give an indication of how many policies, institutions and speed of market reforms have taken place and how successful they might have been (Fan et al, 2001). Since the private sector in China has led to economic development it may be correlated with the size of private sector as well. This variable will be derived per 10 000 capita and is measured in million Yuan yearly (China Yearly Provincial Macro-Economic Statistics).

Human Capital

Human capital is a vital investment and determinant for sustainable economic growth. Increasing human capital of educational levels, explains a higher increase of investments in innovative activities (Romer, 1990). The measure of human capital is student enrolment of higher education. It does not present how many graduates but reveals the capability of universities. However, private enterprises have been competing with state-owned enterprises for human capital without a fair competition, implying that private enterprises most likely possess modest educational background, such as secondary school graduates (McPherson and Rous, 2010; Opper and Nee, 2012). This variable will measure the higher education of human capital due to the positive externalities, for example innovation and technology advancement, which affects the whole society. Human capital will also be derived per 10 000 capita (China Yearly Provincial Macro-Economic Statistics).

Freight Traffic

Infrastructure, more precisely water and land transportation, is correlated with regional economic development in China. Regions have various priorities for investments on infrastructure (Wang Q, et al, 2011). Transportation infrastructure is a good prerequisite for firms to expand operations and thus improves market exchanges between buyers and sellers. Thus, it may be correlated with size of the private sector as good infrastructure attracts investments. Likewise, it is relevant to control for infrastructure since it is a key determinant for factor mobility and ought to be more used in more developed regions with a higher

economic activity (Qian et al, 2012). Moreover, private enterprises might still be discriminated from accessing public infrastructure for private transportation and therefore is interesting to control for. The freight traffic will be measured per 10 000 capita as a larger population ought to have a larger volume of freight traffic for use. This variable covers railroads, highways and waterways combined in number of tons. The effect of specific transportation is not essential (China Yearly Provincial Macro-Economic Statistics).

State-owned enterprises

During the transition, the central government decided to allow few provinces more marketisation whilst other provinces keep a higher proportion of state-sector. Even if the state-owned enterprises are unviable firms, the central government chose to protect some industries of interest. Further implying there may be provinces sustaining more of the state-sector whilst other regions are experimenting with a non-state sector. The regions with a higher share of non-state sector are assumed to enjoy better property rights protection (Lin, 2013; Zeng, 2011). As regions become more competitive towards each other, the interest of increasing the private sector and protect property rights is induced and motivated (Tse et al, 2006). The variable measures amount of state-owned enterprises in each province and will be derived per 10 000 capita. As so, controlling for number of state-owned enterprises will sort out provinces enjoying allowance with experiencing marketisation (China Yearly Provincial Macro-Economic Statistics).

3. 3 Econometric testing

The panel data will cover 25 provinces over a 10 years period. Panel data have several advantages, it allows for more data observations and thus increases the degrees of freedom, it decreases the risk of multicollinearity among the variables and therefore it results in more efficient estimators. Estimating a cross-provincial panel data with fixed effects allows to account for unobserved individual heterogeneity, provincial-specific characteristics, that may not already be included in the model. Every province is therefore observed as an independent unit (Verbeek, 2004). This section will cover the approach of econometric testing with the several procedures. Starting with a further explanation of the panel data model.

Panel data specification:

$Y_{it} = \alpha it + \beta' X it + \varepsilon it$

The outcome variable will be number of employed persons in private firms per capita of China's provinces. The main independent variables are broader property rights and

intellectual property rights in lagged values. These will be estimated separately first and combined to compare any possible variation. The control variables covered in the vector of Xit are; *human capital, GDP growth, lawyers, freight traffic, total loans in financial institutions, total patents granted and number of state-owned enterprises*. The Alpha covers provincial fixed-effects which are constant over time and the error term is assumed to be normal and identically distributed over individuals and time and thus assumed to have properties as constant variance and mean zero. Since the panel data will treat alpha as a parameter with fixed unknown numbers, the model will be estimated as a fixed effect model. Further implies that the dependent variable is affected by the specific provincial characteristics as well, $E\{y_{it}|x_{it}, \alpha_i\} = x_{it}\beta + \alpha_i$ (Verbeek, 2004).

A suspected reversed causality will not be examined as the independent variables of property rights are derived in lagged values and so the time dimension is not a fit for estimating a reversed causality. Dynamic panel data will not be covered in this thesis as adding endogeneity in the equation is subject to endogeneity bias unless correctly specified with number of lags to avoid correlation with the error term. Receiving endogeneity bias is of a higher risk within shorter panel data and was the result of adding one lag of the dependent variable. Adding more lags does not make more theoretical sense, implying that the size of private sector would depend on the size of the private sector of more than 2 years ago, rather than be affected by various policies and geographical differences of China. Lastly, several robustness checks will be performed. Since there were few missing observations of lawyers for province, Hebei, 2005 till 2007, extrapolation was conducted to approximately find values for these years. However, the uncertainty is even higher since extrapolation was performed on each forecasted value and hence increases the risk of wrong approximated values. Therefore, Hebei will also be excluded from the sample as a robustness check.

3.3.1 Descriptive statistics

This section will provide an overview of statistics used in the dataset, which contains 275 observations over the years of 1997-2007 of Chinese provinces. The descriptive statistics is displayed in table 1 below. The variables are derived per 10 000 capita.

Table 1. Descriptive Statistics

Variables	Obs	Mean	Std. Dev.	Min	Max
Dependent Variable					
Private Sector per Capita	275	315,6255	234,7057	14,2	1373,6
Main Independent Variables					
PR	275	3,708764	1,976014	-0,46	10
IPR	275	3,289164	5,126637	-0,24	40,47
Control Variables					
Human capital per capita	275	35,26247	28,93692	0,82	147,23
GDP per capita	275	126,0049	101,8515	22,34699	605,4502
Freight traffic per capita	275	14,25648	8,280983	3,325189	45,72998
Lawyers per capita	275	1,143854	1,137156	0,1594649	9,185561
Loans in Financial institutions per capita	275	146,433	189.788	21,129	1521,917
Patents per capita	275	1,339042	2,536105	0,0934603	22,87518
SOE per capita	275	0,380306	0,4586517	0,0031285	3,495161

From table 1, the variety of provincial differences is indicated by the sample minimum and sample maximum values. The variety is high for most variables. Interesting point is the high variety of the proportion of the private sector across the provinces, taking values from 14,2 employed people in the private sector per 10 000 capita to 1373 per 10 000 capita and further emphasises a skewed development of the private sector among the provinces. IPR has a high disparity too, from -0,46 to a score of 40 and can be compared relatively across the provinces. To further illustrate the development of the employment, see figure 2.
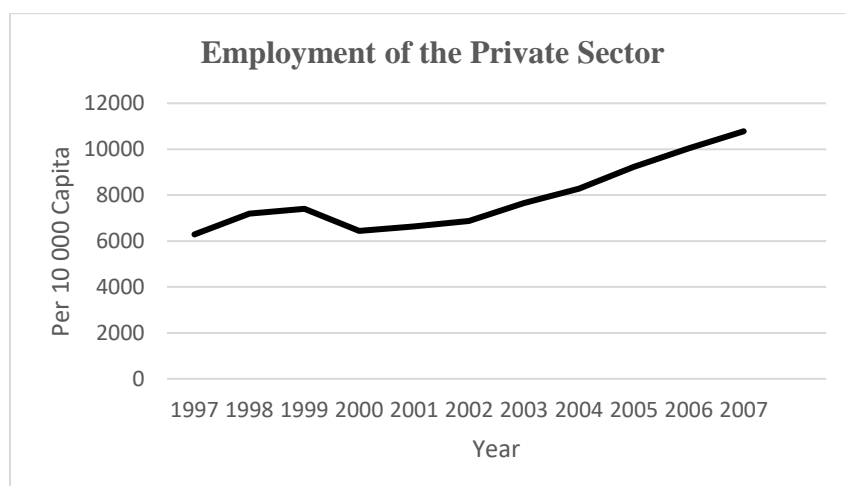
Figure 2. Employment within the private sector from 1997-2007.

Figure 2 above, is in line with the previous literature of China's private sector growing since beginning of the 1990 (Zheng and Yang, 2009). In addition, amendment laws of IPR protection occurred around the millennium and may be correlated with the rapid development of the private sector which appear in the graph. A study concludes that the effect of property rights was more significant after 2002 when China admitted to several deregulations to meet WTO standards (Shi et al, 2017). The smaller decrease around 1999 might have occurred after the financial crisis 1997 in East Asia. As China had constrained financial markets the crisis had not as poor impact compared to other East Asian economies (China.org.cn, 2017a) The provinces which experienced most development are the following; Beijing, Tianjin, Shanghai, Jiangsu and Zhejiang, while provinces as Hunan, Hebei and Jilin even decreased. The two provinces which barely made any progress and still sustain same proportion of size of the private sector is Guangdong and Heilongjiang. But overall, the peak years of private sector seems to be covered, where the Eastern provinces show most development (Chinese Provincial Yearbooks).

Figure 3. Property rights development from 1997-2007.
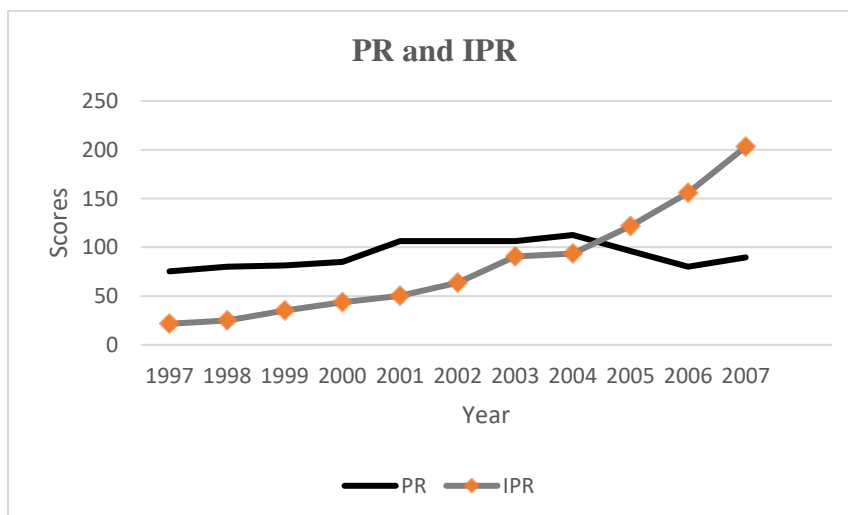
The relative development of broader property rights and intellectual property rights are displayed in figure 3 above. Some provinces even experienced a decrease of broader property rights. Most of the provinces have experienced a rapid development of IPR compared to broader property rights, indicating that IPR protection may be more of value for private firms than broader property rights. For example, Beijing went from a score of 5 to score 11 from 1997 to 2007, indicating a doubled development of protection, while broader property rights during the same time only went from a score of 3 to 5. Shanghai scored broader property

rights from 4 to 8 while the same development for IPR went from a score of 0.91 to 40 in ten years (Gang and Fan, 2009).

Back to table 1, descriptive statistics, the other two variables which show among the highest variation is GDP levels and loans in financial institutions. From the whole sample, it is employment in private sector, IPR protection, GDP and loans in financial institutions that varies the most among provinces. These are the four indicators from the sample, that seem to be the most relevant determinants. Human capital endures a high variety as well among the provinces, measuring student enrolments within higher institutions. Since the disparity is high for every variable, logarithmic transformation will be used to transform all variables as to achieve a more normal distribution. The exception is for the property rights indexes which take negative values and so logarithmic transformation is not possible.

Next step is to examine collinearity among the variables. This is crucial to deal with possible multicollinearity issue. If there exists a high correlation, it will result in high standard errors and unreliable parameters which may bring wrong interference (Verbeek, 2004). A multicollinearity test is conducted and the VIF-values confirms no concern of severe multicollinearity. The correlation matrix and a VIF table can be found in Appendix, table A respective table B. The higher correlation is among the control variables which are less of a concern rather than the case of high collinearity among the independent variables which are both much lower than the control variables (O'Brien, 2007; Allison, 2012). The control variables may show higher correlation as they indirectly move towards the same direction as economic development. The highest VIF values concerned 3 variables; GDP, human capital and total loans in financial institutions. The result of dropping each of these variables, which may be found in table D, did not much affect the main result. In China, these 3 variables are relevant as they differ a lot between provinces and it still make theoretical sense to include them.

3.3.2 Unit root test

It is reasonably to suspect the included variables of being trending and growing over time which results in nonstationary series. Therefore, unit root tests are conducted by Lewin-Lin-Chu, LLC test. Since the provinces are suspected to be highly different from each other it may impose heterogeneity in the panel data. This stresses the importance of having stationary data. Further, the issue of several unit root tests for panel data concerns the hypothesis of having nonstationary while the opposite hypothesis of stationarity is enough to accept if one

individual in the sample is significant. Thus, the test may result in accepting stationarity while it in practice does not apply to all the provinces in the sample. (Verbeek, 2004). Since the LLC tests have a common autoregressive (AR) parameter it implies for all panels to be treated homogeneously, as a panel either contain or do not contain a unit root for a specific variable. The result of the test shows that all variables are stationary except human capital and so this variable needs further transformation such as first difference. Testing human capital again with first differences confirms stationarity.

The equations for the final model:

(1) $\ln \text{Private Sector}_{it} = \alpha_i + \beta 1 \text{ Broader Property rights}_{t-1} + \beta 2 \ln X'_{it} + \beta 3 \Delta \ln (\text{Human capital})_{it} + \varepsilon_{it}$

(2) $\ln \text{Private Sector}_{it} = \alpha_i + \beta 1 \text{Intellectual Property rights}_{t-1} + \beta 2 \ln X'_{it} + \beta 3 \Delta \ln (\text{Human capital})_{it} + \varepsilon_{it}$

(3) $\ln \text{Private Sector}_{it} = \alpha_i + \beta 1 \text{ Broader Property rights}_{t-1} + \beta 2 \text{ Intellectual Property rights}_{t-1} + \beta 3 \ln X'_{it} + \beta 4 \Delta \ln (\text{Human capital})_{it} + \varepsilon_{it}$

All variables are in logarithmic values except the property rights indexes which are transformed into lagged values. Human Capital is the only variable transformed into first differences.

4. Results
4.1 Benchmark Results

This chapter will discuss the results of the final model outlined in previous chapter followed by several robustness tests. Table 2 below, presents the results from the final model. The first two models are separated with each property rights variable and the third model combines them. The results from separating or combining the property rights do not differ much and can be seen below in table 2.

4.1 Table. 2 Benchmark Results

VARIABLES	(1) Private Sector	(2) Private Sector	(3) Private Sector
Broader Property rights t-1	0.0194		0.00291
	(0.0205)		(0.0176)
Intellectual Property rights t-1		0.0339***	0.0334***
		(0.00567)	(0.00669)
Human Capital	-0.429**	-0.363*	-0.367*
	(0.200)	(0.201)	(0.212)
GDP	0.647*	0.646**	0.645**
	(0.314)	(0.311)	(0.309)
Freight Traffic	-0.700	-0.703	-0.702
	(0.472)	(0.477)	(0.475)
Lawyers	0.164	0.118	0.117
	(0.179)	(0.176)	(0.174)
Loans.Fin	0.297	0.274	0.270
	(0.241)	(0.225)	(0.225)
Patents	0.0819	-0.0216	-0.0210
	(0.0829)	(0.0701)	(0.0707)
State-owned Enterprises	-0.00617	-0.0166	-0.0173
	(0.0212)	(0.0228)	(0.0232)
Constant	4.262***	4.179***	4.175***
	(0.785)	(0.757)	(0.759)
Observations	250	250	250
R-squared	0.440	0.480	0.480
Number of Provinces	25	25	25

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The benchmarks results, table 2, shows that intellectual property rights are highly positively correlated with the size of the private sector. One increase of a score of intellectual property rights increases the employment within the private sector on average with 0,033 percent. Contrary, broader property rights are not significant at all. It implies that the protection of intellectual property rights is more of a concern for the private sector than broader property rights. It further explains why there has been a rapid development of the protection of intellectual property rights compared to broader property rights, which have stayed at similar levels over the years studied. In addition, the panel data covers the years when many regulations of trademark, copyright and a Patent Law were enacted and shows a positive result for the employment of the private sector. However, the Property rights Law was first enacted 2007. The first hypothesis may not be significant as, even previous research has stated, the economic decentralisation and the sub-national institutions may be a recipe for handling ambiguous property rights. This implies that combatting obstacles of property rights is possible to work around with informal norms, while the same does not apply with intellectual property rights. IPR receives a more imperative status and the second hypothesis

is accepted by the conducted fixed effect model. IPR is crucial and is of a higher value to private firms as they have incentives to innovate and are in more need of protection from expropriation rather than state-owned firms (Wei et al, 2016).

Although the control variables are not of interest, the one interesting significant finding is human capital which is negatively correlated with an increase of the private sector. This variable is transformed into first differences and so is interpreted as a growth rate rather than levels. Human capital measures student enrolments of higher institutions, and these highly skilled students are more likely to work for the government of China (Nee and Opper, 2012). The finding is that growth of the student enrolments decreases on average the private sector with 0,36 percent. Further implies that the employed persons of private sector in China probably do not have higher education than secondary school. Another significant finding is GDP. It confirms that economic development and increase of protection of IPR are connected and as moving towards the same direction they have positive effect on employment.

4.2 Robustness Tests

Following robustness tests will subgroup various provinces by different criteria's, based on geographical and institutional factors, which are the two main factors dividing China's provincial development as most. One of the robustness tests with Hebei excluded from the sample may be found in the appendix, table C. A regressed panel data, table D may be found in the appendix, which contains regression without the 3 variables with highest correlation, to further prove the main result still holds for the main variables.

4.2.1 Subgroup by West and East China

As previously mentioned, China suffers from high inequality. The inequality is both within provinces and among the provinces, but the trend of increasing inequality is significant across provinces more than within provinces (Ying, 1999). Moreover, the inequality among Eastern provinces compared to Western provinces is more pronounced than the North and South inequality, in terms of private firm development (Wang Q, et al, 2011). The exact categorisation of West and East may be found in appendix, table E. The 25 provinces studied are equally distributed where West contains 13 provinces and East covers 12 provinces.

The positive attitude towards marketisation and development of a non-state sector is more pronounced along the coastal area covering provinces as; Shanghai, Tianjin, Zhejiang and Guangdong which are some of the coastal provinces which experiences a very high development of marketisation. Contrary, the Western, inland provinces have received very

little attention for developing marketisation and is relatively underdeveloped. The business environment is less attractive for private enterprises (Wang Q, et al, 2011). During the 90's, the inequality between East and West became more significant than the inequality of North and South China (Ying, 1999). The coastal provinces belong as well to the top innovative provinces and stand for more than half of the total patents applications during the 90's (Sun, 2000). This might hint that the Eastern provinces enjoy improved protection of property rights more than the Western provinces, as data show faster development of both marketisation and rapid development of patents applied and granted. The subgrouping between West and East rather than the North and South seems more convincing in the study of the private sector.

Table 3. Estimation Results of Subgrouping West and East

	WEST	EAST
VARIABLES	Private Sector	Private Sector
Broader Property rights t-1	0.00260	0.00311
	(0.0135)	(0.0274)
Intellectual Property rights t-1	-0.0384	0.0423**
	(0.0359)	(0.0121)
Human Capital	-0.364**	-0.0384
	(0.164)	(0.520)
GDP	0.327	-0.286
	(0.300)	(0.349)
Freight traffic	-0.214	-0.575*
	(0.343)	(0.317)
Lawyers	-0.0899	0.785*
	(0.0780)	(0.416)
Loans.Fin	0.421*	0.234
	(0.225)	(0.185)
Patents	-0.114	0.177
	(0.0948)	(0.120)
State-owned Enterprises	0.000617	-0.0388
	(0.0272)	(0.0254)
Constant	6.935***	7.972***
	(0.825)	(0.735)
Observations	130	120
R-squared	0.613	0.499
Number of Provinces	13	12

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The results from table 3 shows that after subgrouping by East and West, broader property rights are still insignificant which confirms that these property rights are not correlated with size of the private sector in China. Intellectual property rights hold for the Eastern provinces but with a decreased significance level, from 1 to 5 percent, which means after subgrouping

some effect is fading. For the Western provinces, IPR is insignificant which may be explained as the Western provinces sustain a larger proportion of a state-sector. Their smaller private sector may not produce high-technology goods and therefore the importance of increasing protection of IPR is reduced, compared to the competition many coastal provinces are experiencing which pushes for technology advancement. The courts specialised in disputes of intellectual property rights are all located in Eastern provinces. This might hint that protection of IPR is more demanded within the Eastern provinces which still sustain a larger employment within the private sector. Looking at the data of property rights, the only considerable increase of IPR for a Western province is Chongqing. In addition, many of the Western provinces receives a decreasing broader property rights development. Contrary, for the Eastern provinces, there are several provinces which have considerably high increase of both property rights measures (Gang and Fan, 2009). This is in line with the theory that private property rights are essential for market economies with incentives for investing in technology development which is the approach coastal provinces have obtained.

Other significant findings for the coastal provinces are positive correlation of lawyers and negative correlation of freight traffic. Freight traffic is negatively correlated, which may imply that the use of freight traffic is mostly for the state-owned firms. Further, may pinpoint that private firms are smaller and their production is towards local markets.

For the Western provinces, the significant findings are human capital and total loans in financial institutions. The negative correlation between human capital and the private sector seems to slightly increase as the proportion of state sector is higher, while total loans in financial institutions is positively correlated with size of private sector. Previous studies have mentioned, developing financial institutions are vital for economic development and may explain why the Western provinces show this effect.

4.2.2 Excluding Municipalities

China has a very complex geography of developed and relatively underdeveloped provinces. China has furthermore provinces with an autonomous status or special economic zones. Therefore, there are more interesting robustness checks to conduct. Starting with the four municipalities which are cities but with an equal status of a province. These four municipalities are under direct administration of the central government. The four municipalities with a provincial status are following; Beijing Tianjin, Shanghai and Chongqing (China.org.cn, 2017b). The IPR courts within the four municipalities are more

efficient as they are separated from more autonomous local governments that may incorporate with rent-seeking such as ambiguous property rights (Huang et al, 2017). The municipalities are assumed to have an efficient governance of property rights protection.

Table 4. Estimation results with Municipalities excluded

VARIABLES	Private Sector
Broader Property rights t-1	-0.00741
	(0.0126)
Intellectual Property rights t-1	0.0142
	(0.0142)
Human Capital	-0.337
	(0.208)
GDP	-0.0119
	(0.298)
Freight traffic	0.506
	(0.459)
Lawyers	-0.111
	(0.108)
Loans.Fin	0.162
	(0.127)
Patents	-0.0600
	(0.125)
State-owned Enterprises	-0.00390
	(0.0247)
Constant	5.224***
	(1.164)
Observations	210
R-squared	0.374
Number of Provinces	21

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The estimation results from table 4 show no significant findings. The four municipalities are in first place driving the IPR effect, the employment of the private sector is responding to increasing protection of IRR. Another reason ought to be that China attracts foreign investors in Beijing and Shanghai and due to external demand for an improved protection the pressure for an efficient legal system occur. However, a large employment of the private sector is still considerable in Zhejiang and Guangdong with firms as Alibaba, Tencent and Huawei. Either the sample cannot capture this effect or because elsewhere in China, the production is not as high-tech or weakly enforced that substitutive alternatives are more reliable. The next robustness test will exclude the special economic zones where a large private sector is still existing.

4.2.3 Excluding Special Economic Zones

The special economic zones in China is a result of a gradual experiment of opening up towards implementing market policies in order to achieve economic development without risking social instability of rapid change. The special economic zones in China are Fujian and Guangdong and the attitudes toward privatisation have been liberalised. Moreover, during the 90's, the Pudong New Area in Shanghai received similar status and has received even more ambitious policies towards marketisation compared to Fujian and Guangdong which were the two first experiments (Ge, 1999). Provinces with more marketisation ought to promote improved property rights protection. Thus, the robustness test first excludes Fujian and Guangdong followed by excluding Shanghai in addition, to compose an interesting comparison.

Table 5. Estimation Results excluding the Special Economic Zones

	Excluding SEZ	Excluding Shanghai
VARIABLES	Private Sector	Private Sector
Broader Property rights t-1	-0.00619	-0.0219
	(0.0158)	(0.0162)
Intellectual Property rights t-1	0.0317**	0.0290
	(0.00793)	(0.0167)
Human Capital	-0.355	-0.367
	(0.221)	(0.225)
GDP	-0.153	-0.0957
	(0.264)	(0.259)
Freight traffic	-0.694	-0.739*
	(0.410)	(0.406)
Lawyers	-0.0354	-0.0136
	(0.126)	(0.126)
Loans.Fin	0.921***	0.902***
	(0.281)	(0.278)
Patents	-0.0487	-0.0612
	(0.110)	(0.117)
State-owned Enterprises	-0.0118	-0.00437
	(0.0202)	(0.0208)
Constant	8.237***	8.379***
	(1.002)	(0.982)
Observations	230	220
R-squared	0.501	0.474
Number of Provinces	23	22

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Even when special economic zones are excluded, the correlation of IPR still holds. The interesting finding is that intellectual property rights drops its significance first when

Shanghai is excluded as well. This implies that Shanghai holds most of the effect of the correlation between intellectual property rights on size of the private sector, which makes sense as Shanghai is one of the most developed cities in China as well as a financial and a business centre. Shanghai did experience the most rapid increase of IPR scores where even broader property rights doubled during the 10 years covered (Gang and Fan, 2009). It could be possible for a bias of Shanghai as the significance of IPR is fading once Shanghai is excluded and the evidence may be found in appendix table F, as excluding Shanghai from the whole sample still results with significance of IPR. Another interesting finding is the significance of loans in financial institutions for both models and is highly positively correlated. It might hint that financial markets are in progress for even allowing the private sector more credit and further providing investments.

5. Conclusions

The results indicate that an increasing protection of IPR is correlated with the size of the private sector in China. The main result is that the effect of IPR is mostly pronounced within the four municipalities, which implies IPR cannot be substituted by other informal norms. The rest of the provinces covered may not experience IPR protection as essential, since many of the private firms are either smaller and produce only for local markets or they do not produce high-tech goods. The demand for increased protection is evidently in the four municipalities and complies with empirical evidence that IPR protection is necessary within more innovative economies (Lerner et al, 2016; Wei et al, 2016). The result confirms the second hypothesis partially as the Western provinces may not have the need of increasing IPR yet for their private sector. The weaker property rights regime in the West decreases incentives for innovation as innovation levels are clearly at forefront in the East. The protection of IPR must do more with choice of production rather than the size of the private sector.

On basis of the data collection, broader property rights have barely experienced an improvement. As IPR protection is less necessary for many Chinese provinces and private firms, the same may be said for broader property rights. Many of the provinces may therefore work around property rights by informal norms. A further research, to conclude the necessity of IPR for smaller private firms would require a more detailed in-depth survey than the panel data performed in this thesis. For example, examining production choices and the degree of property rights protection. Worth mentioning is one of the limitations for analysing the

broader property rights during these years is that a Property rights Law was enacted 2007 while protection of IPR were initiated as early as during 1980. These results are the opposite to some previous research that have found that broader property rights are equally important to intellectual property rights (Song et al, 2009; Eicher and Newiak, 2013). The difference of analysis is that this thesis is drawing conclusions based on the measure of Chinese reported property rights which differ from several of the previous papers mentioned, which are all using own instrument variables to measure property rights protection. Yet the conclusions of IPR are similar. Intellectual property rights protection is vital for market economies and less imperative for an institutional framework based on state allocation and possible infringements by the central government.

Moreover, the property rights theory does not state in detail which component of the property rights are outweighing the others. It is outdated, as previous empirical evidence show patent protections is more important due to the signalling of competitiveness. In addition, the conducted panel data can confirm this as the measures of IPR covered patents; applied and patents granted. Less can be said about the effect of enforced copyrights, as they may have a minor devastating effect. Although property rights protection is a fundamental component, a lower protection does not necessarily impede size of the private sector. Lower barriers for copyrights and trademarks may as well encourage initiatives for entrepreneurs to mimic production, while protection of patents has a value of signalling competitiveness. Both the panel data conducted and previous literature, confirm that protecting a patent system is more important as the opposite do not encourage innovative activities. Moreover, this thesis cannot state what an efficient limit of protections are. Yet a clear remark is that an increase of the IPR protection would increase domestic private production and innovations, which may be evidently in the future as China tries to shift its economy.

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Appendix

Table A. Correlation Matrix

	Private Sector	PR	IPR	Humcap	GDP	Ftraffic	Lawyers	Loans.Fin	Patents	SOE
Private Sector	1.0000									
PR	0.4746	1.0000								
IPR	0.6420	0.5519	1.0000							
Humcap	0.5454	0.3668	0.5179	1.0000						
GDP	0.7324	0.5249	0.6968	0.7593	1.0000					
Ftraffic	0.5541	0.3617	0.4974	0.6467	0.7600	1.0000				
Lawyers	0.5906	0.4799	0.5129	0.6322	0.7740	0.7100	1.0000			
Loans.Fin	0.6782	0.5285	0.6637	0.8193	0.8292	0.7628	0.8346	1.0000		
Patents	0.6702	0.5312	0.6946	0.7222	0.8330	0.6124	0.7220	0.7781	1.0000	
SOE	-0.1404	0.0066	-0.1633	-0.1691	-0.1158	0.0847	0.1652	0.0009	-0.0757	1.0000

Table B. VIF Values

Variable	VIF	1/VIF
GDP	13,26	0,075406
Loans.Fin	10,67	0,094172
Humcap	4,61	0,217028
Lawyers	4,27	0,234186
Patents	4,07	0,245402
Ftraffic	2,76	0,361962
IPR	2,59	0,385706
PR	1,64	0,61112
SOE	1,32	0,759427
Mean VIF	5,06	

Table C. Excluding Hebei from the sample

VARIABLES	(1) Private Sector
Broader Property rights t-1	0.0175
	(0.0124)
Intellectual Property rights t-1	0.0316***
	(0.00505)
Human Capital	-0.494**
	(0.180)
GDP	0.457
	(0.286)
Freight traffic	-0.672*
	(0.342)
Lawyers	0.176
	(0.149)
Loans.Fin	0.252
	(0.226)
Patents	-0.0961
	(0.109)
State-owned Enterprises	-0.0204
	(0.0215)
Constant	8.075***
	(0.834)
Observations	240
R-squared	0.524
Number of Provinces	24

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table D. GDP, Loans in Financial Institutions and Human capital excluded

VARIABLES	(1) Private Sector	(2) Private Sector	(3) Private Sector
Broader Property rights t-1	-0.000764	0.0115	0.00192
	(0.0142)	(0.0180)	(0.0162)
Intellectual Property rights t-1	0.0365***	0.0378***	0.0386***
	(0.00732)	(0.00757)	(0.00718)
Human Capital	-0.465**	-0.323	
	(0.214)	(0.210)	
Freight Traffic	-0.322	-0.479	-0.500
	(0.443)	(0.462)	(0.460)
Lawyers	0.164	0.183	0.128
	(0.202)	(0.172)	(0.169)
Loans.Fin	0.368		0.230
	(0.241)		(0.204)
Patents	-0.000576	-0.0595	-0.0828
	(0.0980)	(0.114)	(0.117)
State-owned Enterprises	-0.0305	-0.0149	-0.0138
	(0.0302)	(0.0220)	(0.0213)
GDP		0.528*	0.390
		(0.289)	(0.303)
Constant	7.284***	7.605***	7.627***
	(1.109)	(1.122)	(1.119)
Observations	250	250	250
R-squared	0.427	0.422	0.429
Number of Provinces	25	25	25

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table E. Western and Eastern provinces

West	East
Shanxi	Beijing
Anhui	Tianjin
Jiangxi	Hebei
Henan	Liaoning
Hubei	Jilin
Hunan	Heilongjiang
Chongqing	Shanghai
Sichuan	Jiangsu
Guizhou	Zhejiang
Yunnan	Fujian
Qinghai	Shandong
Ningxia	Guangdong
Xinjiang	

Table F. Excluding Shanghai from the sample

VARIABLES	(1) Private Sector
Broader Property rights t-1	-0.00138
	(0.0162)
Intellectual Property rights t-1	0.0395*
	(0.0148)
Human Capital	-0.371*
	(0.216)
GDP	0.363
	(0.305)
Freight traffic	-0.556
	(0.442)
Lawyers	0.158
	(0.165)
Loans.Fin	0.234
	(0.199)
Patents	-0.0811
	(0.121)
State-owned Enterprises	-0.0107
	(0.0238)
Constant	7.844***
	(1.074)
Observations	240
R-squared	0.415
Number of Provinces	24

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1