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Effects of intellectual property rights protection on economic growth of developing countries: Evidence from China

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Abstract
The intellectual property right is among of science and technology indicators, it is a public policy which has some influence or effects on the economic growth of countries. This empirical research analyses the current effects of intellectual property rights on the economic growth of china for fifteen years ago with endogenous growth model. The numbers of domestic and foreign patent applications have positive correlation and are significant with the nominal Gross Domestic Products of china**.** Having strong intellectual property rights protection motivate knowledge and innovations and also promotes research and development in developing countries. The intellectual property rights increase world welfare and they have positive effects on countries' economic growth.

Keywords: intellectual property rights, innovations, economic growth, knowledge

1. Introduction
The developing countries have the different quality and capacity of technical and scientific infrastructures. The patents are very important in encouraging the investments especially foreign direct investments and it plays a significant role in stimulating the local innovation. In developing countries economy, there has been a significant increase in the number of patent application by non-residents and residents, and many of those countries have reformed their laws governing intellectual property rights for twenty years ago [1]. The international trade economists generally presumed reforms in intellectual property rights in raising imitation costs diminish access to global information and put firms in developing countries at a competitive disadvantage in global markets [14, 15]. China is among the developing countries with middle economy level but it is the second largest economy of world by the nominal (GDP) Gross Domestic [3] and currently, China is globally the fast growing major economy [4]. In this research, we analyse empirically the effects of intellectual property rights and the foreign direct investment on the economic growth of China's economy for period of 15 years (2000-2014) with economic growth endogenous model.
This empirical research will answer the following question: (1) how does intellectual property rights affects the economy of China? (2) Which relationship between the foreign direct investments, intellectual property rights and economic growth of China?
The purpose of this research is to investigate the effects of the intellectual property rights in developing countries, especially in China in order to see how the number of patents applications of both residents and non-residents affect economic growth of China. The general objectives of this research are to investigate, analyse, and demonstrate how the intellectual property rights positively affect the economic growth of country. China is selected as the case study of this research since it is among of developing countries and it has the fastest economic development among those developing countries.
This study will be significant for some policy makers in developing countries especially those which have the economy of lower income level do not put efforts on the intellectual property rights policies as the basis and drivers of the strength the innovation and economic growth of their countries. In this empirical research it is expected that the economic growth and intellectual property rights protection of China have positive relationship. This paper is contained by (1) introduction (2) literature review (3) data and their sources (4) data presentation (5) econometric model and variables definition (6) regression model outputs and their analysis (7) findings (8) conclusion and recommendations and it is ended by the references.

2. Literature review
China has domestically and internationally acknowledged and protected the intellectual property since 1979, and the creation of comprehensive legal framework to protect both global and local intellectual property has been led by the law of intellectual property protection which has been established by its government legislation, decrees and administrative regulations in trademark, patent and copyright areas. Due to China's rapid economic development, it accessed the World Trade Organisation (WTO) in 2001and that has been the cause for major reforms in China's intellectual property law [5]. Some previous researchers argued that the intellectual property is a key in increasing economic development of countries. At microeconomic level, the various forms of intellectual property production such as trademark, copy rights, trade secrets, Patents and so on, provide the ways through which investors and innovators should recover the investment of money and time availability in order to create a

new product to the market, while at macroeconomic level, the foreign direct investment and domestic innovation are encouraged by the intellectual property rights protection then it promotes the economic development of the countries[6]. Other researchers in their empirical evidence argued that the multinational enterprises enlarge their technology flows in the course of licensing like domestic patents, and foreign direct investment are developed [7, 8]. Trough an empirical and theoretical study of innovation and intellectual property rights in developing countries, it showed that when in country there is facilitation of foreign technology imitation as its consequence it also declines the market power of overseas enterprises and local consumers' benefits, those countries have to enhance the intellectual property rights in order to promote the innovations of domestic firms [9]. In the developing countries, the benefits and costs of applying intellectual property policies should be explored [10]. The intellectual property costs are such as administrative and enforcement, increased royalty payments, displacement of pirates' opportunity, and increased research and development and anticompetitive effects costs [11]. On side of developing countries, Verspagen (1999a) argued that their patent system have not successes in making innovations in those countries due to their inadequate resources such as investment in frontier research, cumulated experience in research and human capital.

3. Data and their sources

The data used as variables of endogenous growth model are for fifteen years (2000-2014). Those variables are (1) the dependent variable is the yearly nominal Gross Domestic Products (GDP) of China and this GDP we assume that is influenced by the following independent variables (2) the total of application of patent both residents and non-residents patent application, (3) the foreign direct investment, (4) among government controls include as a percentage of secondary school enrolment which is a proxy of human capital in the total population; government consumption as a share of GDP; economic freedom or the openness of China which is measured as a total of both imports and exports over the nominal GDP in year and it is a proxy of trade ; and inflation.
The sources of data used in this paper are obtained as follows: the researcher consulted the two online data bases of UN Comtrade [13] and World Bank [12]. Through World Bank online database we have the statistics data of the nominal GDP, inflation, number of patent applications for residents and non residents, foreign direct investment and percentage of secondary school enrolment while the total of exports and imports per year of China are from UN Comtrade statistics online data base.

4. Data presentation

This paper has the purpose of study the effects of the intellectual property rights on economic growth of China during fifteen years ago. Time series data of 2000 to 2014 will be analysed. The data is at statistics reliability of cronbach's alpha 0.169 and based on standardize items 0.856, validity case of 100 percent and they are presented by the following figures:

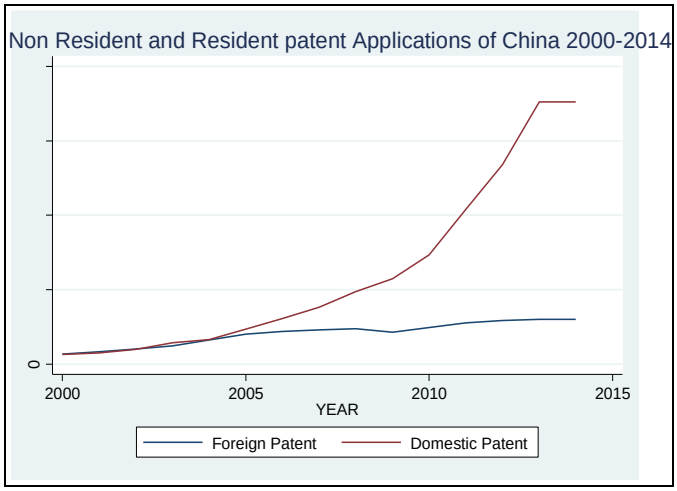

Fig 1

From Figure1, the numbers of patents applications mainly vary at any time but the comparison between data of domestic and foreign patent applications of China from 2000 up to 2014 shows that in China, number of domestic patent applications is greater than the number of foreign patent applications.

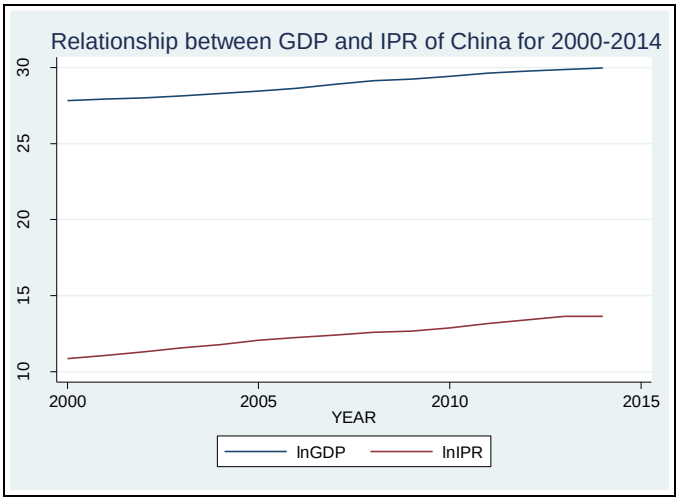

Fig 2

The relationship between logarithm of nominal gross domestic product and the one of intellectual property rights is positive correlation. Nominal GDP changes from year to year due to the change of physical output and market price of goods, and number of patents applicants also should be increased or decreased due to new technology and innovation.

5. Econometric model and variable definitions

Some researchers argued that Strengthened intellectual property rights should assist in improving the export performance of importer firms [16]. This empirical research applies endogenous growth model in studying the effects of intellectual property rights on the economic growth of china and SPSS, STATA software will also used as the analysis tools. The theory of endogenous growth describes long-run originating from the economic actions that create innovative rational knowledge. The following equation will be applied:
Equation 1

$$\ln GDP_{CNt} = B_0 + B_1 \ln IPR_{CNt} + B_2 \ln FDI_{CNt} + B_3(\ln FDI_{CNt} * \ln IPR_{CNt}) + B_4 \ln CONTROLS_{CNt} + E_{CNt}$$

Where CN means China, T means time (Year), GDP_{CNt} is the nominal Gross Domestic of china, IPR_{CNt} is total of patent application of both non residents and residents per year, FDI_{CNt} is Foreign Direct Investment inflows as a share of GDP and $\ln CONTROLS_{CNt}$ is human capital, government consumption, freedom degree of economy and inflation**.**

6. Regression model outputs and their analysis

The regression model is defined by the R-square of 99.8 percent and R of 99.9 percent; it is significant. The following table shows us data descriptive statistics:

Table 1: Descriptive Statistics

	N	Minimum	Maximum	Mean		Std. Deviation	Variance
	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Statistic
LNGDP	15	27.81772	29.96898	2.8882662E1	.19553017	.75728511	.573
LNFID	15	24.37131	26.39634	2.5518731E1	.19278654	.74665908	.557
LNIPR	15	10.85719	13.62330	1.2346880E1	.23380075	.90550642	.820
LNIPRFID	15	2.64604E2	3.59605E2	3.1569023E2	8.26523746E0	32.01112705	1.025E3
LNHC	15	4.06092	4.52623	4.2745650E0	4.67162946E-2	.18093143	.033
LNGC	15	2.78064	3.06640	2.9416761E0	2.30281684E-2	.08918771	.008
LNINF	15	-2.23571	2.09669	.9281073	3.06626771E-1	1.18756038	1.410
LNOP	15	-.96021	-.43891	-7.0932574E-1	4.55403645E-2	.17637707	.031
Valid N (listwise)	15						

Table 2: Inter-Item Correlation Matrix

	LNGDP	LNFID	LNIPR	LNIPRFID	LNHC	LNGC	LNINF	LNOP
LNGDP	1.000	.968	.989	.990	.994	.533	.003	-.048
LNFID	.968	1.000	.972	.985	.953	.357	.168	.135
LNIPR	.989	.972	1.000	.998	.972	.461	.042	.059
LNIPRFID	.990	.985	.998	1.000	.975	.441	.075	.068
LNHC	.994	.953	.972	.975	1.000	.578	-.029	-.129
LNGC	.533	.357	.461	.441	.578	1.000	-.494	-.653
LNINF	.003	.168	.042	.075	-.029	-.494	1.000	.580
LNOP	-.048	.135	.059	.068	-.129	-.653	.580	1.000

From this correlation table, logarithm of human resources or labour (LNHC) and logarithm of total number of patents applicants (LNIPR) have strongest and positive correlation with the logarithm of Gross Domestic Product (LNGDP) China.

Table 3: Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	13.338	1.562		8.537	.000
	LNFID	.016	.119	.016	.132	.898
	LNIPR	.290	.087	.348	3.079	.005
	LNHC	2.625	.708	.627	3.708	.006
	LNGC	.093	.268	.011	.348	.737
	LNINF	.000	.014	.000	-.033	.975
	LNOP	.073	.172	.017	.426	.681

a. Dependent Variable: LNGDP

The last column of the coefficients table shows us that human resources and total of patent application numbers are significant with the nominal GDP of China.

7. Findings

The intellectual property right is a public policy but it is sometimes considered as commercial or economic, human rights. The direct impact of intellectual property protection is to promote financially those who have inventive power and knowledge, and to increase the costs of access to that new knowledge without right. In general, the developing countries are characterised by weak technical and scientific infrastructures, the benefits in the form of the motivation to domestic improvement or innovation will be muted, although they will still face the costs arising from the protection of technologies or innovation from abroad. In consequence, the costs and the benefits of the system as a whole may not be fairly dispersed. If most developing countries have weak technological base which could not benefit from Intellectual Property protection, those countries do not have traditional knowledge and genetic resources, which have value to their economic development or economic growth.

In case of China, it is a developing country with upper income level; it currently is second largest economy in the world, but

with global highest population. However, China is among developing countries, it has strong scientific and technical infrastructures, the innovation and knowledge is loud, the costs from the intellectual property rights are not so higher and it has genetic resources and traditional knowledge which have value to both its economic growth and economic development of world in general.

8. Conclusion and recommendations

Intellectual property right is among very crucial public policies, the authorities or policy makers in developing countries should put their efforts and emphasis on the intellectual property which is a field of law which deals with property rights in non-tangible things such as business reputation or Goodwill and innovations in various activities. To have strong intellectual property rights protection motivate knowledge and innovations and also promotes research and development in developing countries. The intellectual property rights increase world welfare and they have positive effects on countries' economic growth.

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