

Soon Ho Shin

Martin School of Public Policy and Administration

The impact of intellectual property on provincial unemployment rates in South Korea

By: Soon Ho Shin

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Advisor: Dr. JS Butler

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Abstract

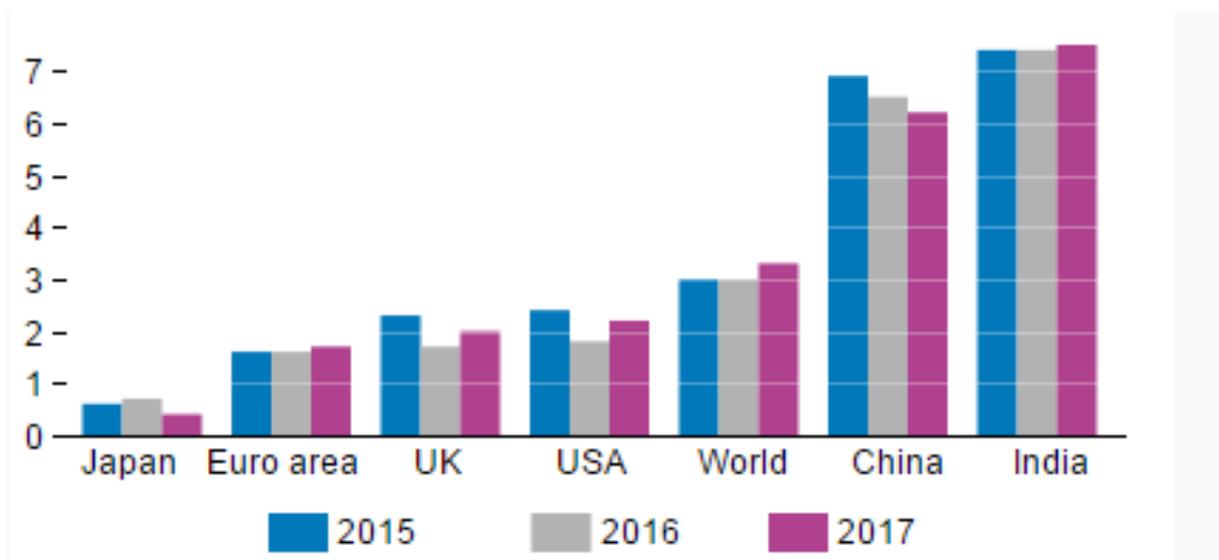
Intellectual property is drawing attention as an important policy tool to lower the unemployment rate in low-growth economies. The Korean Intellectual Property Office (KIPO) provides services that facilitate companies to effectively create intellectual property by operating local intellectual property support centers in connection with local governments. In this context, this research examines how the differences of intellectual property registration affect provincial unemployment rates by analyzing 10 years (2006-2015) of panel data with a fixed-effects regression model. According to my estimation results, intellectual property registrations have a statistically significant impact on provincial unemployment rates in South Korea. Since the reduction of unemployment rate is an important task for the reelection of the provincial governor, these results may suggest that the local governments should reconsider the weight of the IPR policy as a crucial part of job creation strategies for the local economy. In this regard, local governments need to establish their own strategies to facilitate the creation of intellectual properties in line with the characteristics of local industries and the comprehensive innovation strategy of the region.

Furthermore, in order to assess the genuine impact of intellectual property, it is necessary for government agencies related to statistics, employment, and intellectual property to cooperate and conduct systematic long-term follow-up research on how the firms raise performance and employment with registered intellectual property over time.

1. Introduction

In the modern market economy, intellectual property rights, as critical intangible assets, seem to carry out a variety of functions in economic growth, mostly by forming capital and obtaining exclusive rights. According to the OECD (Organisation for Economic Co-operation and Development), “the global economy is stuck in a low-growth trap”. Indeed, according to the OECD, the change in real GDP growth in 2017 for large economies such as the US, Japan, and China, is expected to be lower than in 2015 (See Figure 1). In this situation, both developed and developing countries are paying attention to the growing importance of intellectual property policies and promoting diverse policies and projects on intellectual property as part of their policies to promote industrial innovation and improve industrial productivity and employment.

Figure 1. Real GDP growth forecast in the largest economies (annual changes in %, 2015-2017)

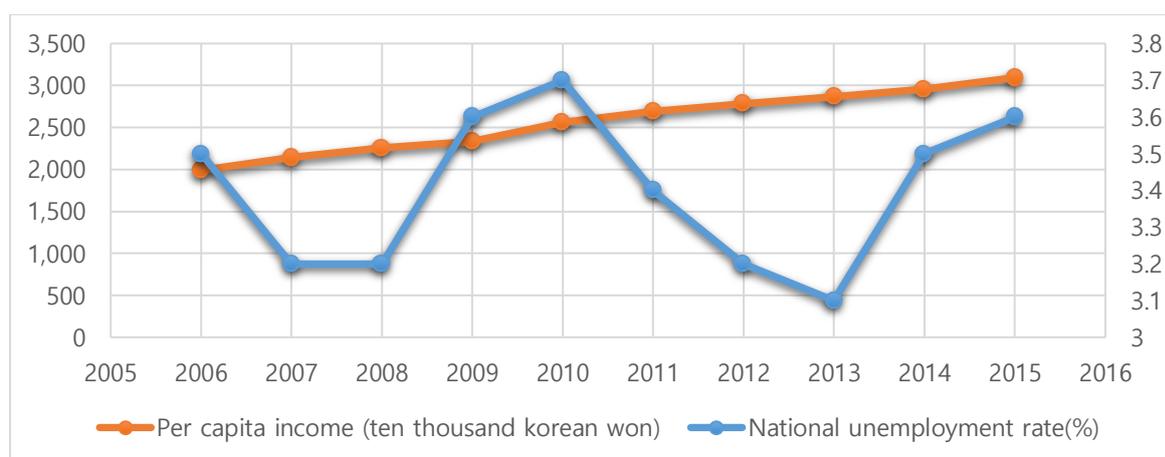


Source: OECD, Economic outlook

Since economic growth is slowing globally as the economic environment deteriorates, employment creation is an important policy task for governments in the 21st century. The Global Intellectual Property Center (GIPC), an affiliate of the US Chamber of Commerce, released *IP Creates Jobs for America Report* in 2012. In the report, GIPC states, “it is leading a worldwide effort to champion intellectual property rights as vital to creating jobs, saving lives, advancing global economic growth, and generating breakthrough solutions to global challenges.”

Economically advanced areas such as the US and Europe are actively monitoring the performance of intellectual property policies by analyzing and quantifying the level at which intellectual property contributes to the economy and employment. In this respect, in South Korea, it is necessary to examine whether the differences of intellectual property registration affect the unemployment rate, because the unemployment rate is getting worse in the recent low-growth period.

Figure 2: The trend of per capita income and unemployment rate in South Korea (2005-2015)



Source: KOSIS (Korean Statistical Information Service)

Background

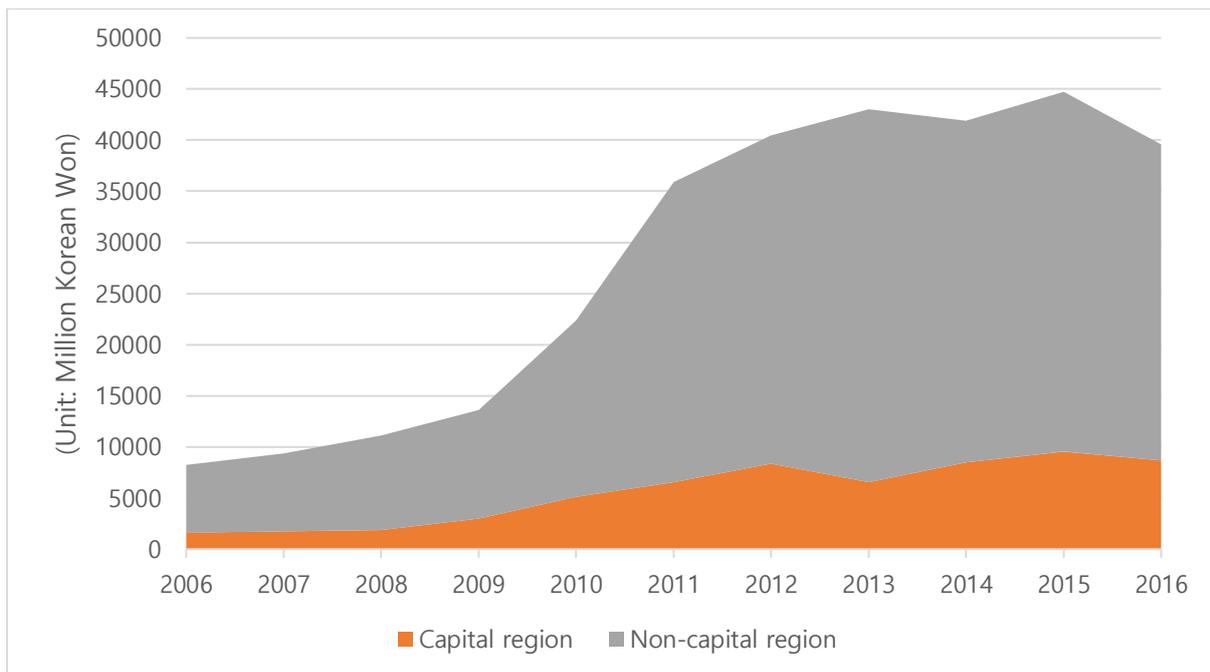
Conventionally, the main functions of national intellectual property offices are the examination and registration of intellectual property rights. However, the Korean Intellectual Property Office (KIPO) redefined their traditional role and has been implementing various support projects for SMEs (Small and medium-sized enterprises), which are under the mission of supporting technological innovation and industrial development by promoting the creation, protection and utilization of intellectual property rights (KIPO, 2015).

In fact, KIPO has been providing comprehensive consulting services for the creation of intellectual property by operating local intellectual property support centers since 2004. In order to promote the creation of intellectual property in the region, local intellectual property support centers have been providing professional consulting and information services for small and medium-sized enterprises based on matching funds provided by KIPO and the local governments. This intellectual property support service model depend on cooperation between the central government and local governments and is considered as a best practice for other countries seeking better ways to promote the creation of intellectual property.

However, even though the matching budget for local intellectual property support centers was gradually growing during the period from 2006 to 2016 (See Figure 3), little attention has been given to identifying how intellectual property contributes to the creation of local employment. There is apparently no study analyzing such effects at the provincial level in South Korea. This is because the history of the local autonomy system is so short that local governments have a strong tendency to rely on the policy leadership of the central government

in most policies¹. In this context, it is very timely to examine the impact of intellectual property on provincial unemployment rates.

Figure 3: The budget for local intellectual property support centers (2006 – 2016)



Source: KIPO (Korean Intellectual Property Office)

Therefore, the main goal of this study is to verify whether the increase in intellectual property has the effect of lowering the provincial unemployment rates in South Korea. If these

¹ Korea 's local autonomy system was introduced for the first time in 1952, but it failed to work properly due to various deferred regulations and political circumstances. In 1995, it started in earnest thanks to a political change.

effects are statistically verified, they will be meaningful support for policy development and resource allocation adjustments.

The scope of IP (Intellectual Property)

The WIPO (World Intellectual Property Organization) suggests that intellectual property is divided into two categories: (1) Industrial Property includes patents, trademarks, industrial designs and geographical indications, (2) Copyright covers literary works (such as novels, poems and plays), films, music, artistic works. And according to the WIPO, “In all countries where the Berne Convention standards apply, copyright is automatic, and need not be obtained through official registration with any government office”. In fact, South Korea joined the Berne Convention in 1996. Therefore, it is reasonable to exclude copyright in this study due to its limited data reliability. In addition, according to the Korean trademark law, geographical indications, which mean sign used on products that have a specific geographical origin and possess qualities or a reputation that are due to that origin according to the WIPO, are included in the area of trademarks. For this reason, this paper will focus on industrial property (See Table 1: The scope of Intellectual Property in this research).

Table 1: The scope of Intellectual Property in this research

	Definition
Patents	A patent is an exclusive right granted for an invention. Generally speaking, a patent provides the patent owner with the right to decide how - or whether - the invention can be used by others. In exchange for this

	right, the patent owner makes technical information about the invention publicly available in the published patent document.
Utility models	A utility model is an exclusive right granted for an invention, which allows the right holder to prevent others from commercially using the protected invention, without his authorization, for a limited period of time. The requirements for acquiring a utility model are less stringent than for patents.
Trademarks	A trademark is a sign capable of distinguishing the goods or services of one enterprise from those of other enterprises. Trademarks date back to ancient times when craftsmen used to put their signature or "mark" on their products.
Industrial designs	An industrial design constitutes the ornamental or aesthetic aspect of an article. A design may consist of three-dimensional features, such as the shape or surface of an article, or of two-dimensional features, such as patterns, lines or color.

* Source: WIPO (<http://www.wipo.int/about-ip/en/>)

2. Literature Review

The impact of Intellectual Property Rights (IPR) on the economy

This study presupposes that intellectual property may affect economic growth in a positive way (Gould and Gruben, 1996; Hall, 2007). In this context, the impact of Intellectual Property Rights (IPRs) on the economy is an important part of the academic background for this study. In this respect, I examine the previous studies analyzing the relationship between IPRs and economic growth. From an economic theory point of view, intellectual property will provide incentives for new inventions, thereby promoting technological innovation, leading to

increased productivity and competitiveness of enterprises and industries. In cross-country studies, it appears that there is a difference in whether IPRs have a positive effect on economic development, taking into account the stage of economic development of the country and the nature of innovation.

For example, Kim, Lee, Park and Choo (2011) use panel data from more than 70 countries to determine that patent protection is an important determinant of innovation and patented innovation contributes to economic growth, but only in developed countries. They concluded, therefore, that patent protection can boost innovation and economic growth only in countries that have the capacity to undertake innovative research.

In addition, Manca (2010) analyzed the effects of institutional qualitative differences in the process of cross-border technology catch-up. His empirical analysis shows that countries with better legal institutions, such as those that protect IPRs, have higher total factor productivity growth rates and faster technology adoption rates. On the contrary, countries lacking a minimum institutional support level failed to catch up.

In fact, there exist some arguments that the strengthening of intellectual property rights among more recently developed or developing countries can reduce their ability to imitate technologies freely. Even so, empirical studies in South Korea have consistently agreed that IPR has a positive impact on economic development. For example, according to KDI (2003), a 1% increase in the rate of growth of knowledge capital, measured by the increase in patent applications, increases the economic growth rate by 0.11 percentage through empirical analysis.

Because Korean firms have focused on strengthening internal R&D capabilities since the 1980s (Korea Institute of Intellectual Property, 2012), these efforts led to the increase of

both product quality and Intellectual Property Rights (IPRs), thereby contributing to national economic growth.

The impact of Intellectual Property Rights on employment

As mentioned above, much literature regards intellectual property as an important tool of innovation. In fact, there are conflicting views as to whether innovation will have a positive effect on employment growth. Notably, Coad and Rekha used the number of patent applications as an innovation index and suggested that innovation has a positive effect on job creation for high-tech industries (Coad and Rekha, 2007). Their results show that innovation in large firms is more connected with the growth of employment than innovation performed by smaller firms.

Government agencies in the US and Europe analyze and quantify the level of intellectual property contribution to the national economy in order to monitor the performance of intellectual property policies and lay the groundwork for future policy directions. Remarkably, the US Department of Commerce (2012) suggested that IP-intensive industries directly accounted for 27.1 million American jobs, or 18.8 percent of all employment in 2010. They also argue that these industries led to indirect employment in connection with 12.9 million jobs in 2010. In fact, Band and Gerafi (2013) raised the criticism that foreign firms are not the main beneficiaries of intellectual property policy in that the foreign firms are high in the intellectual property-intensive industries. Despite this criticism, this research is important as a first example of empirically verifying the contribution of intellectual property to job creation at the national level.

Based on the methodology of the US Department of Commerce, the Korea Institute of

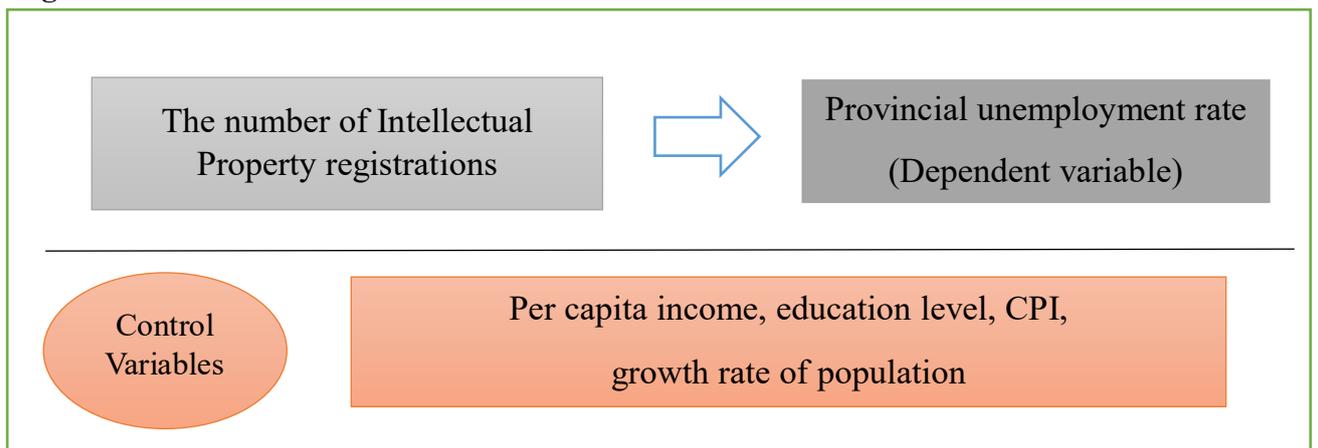
Intellectual Property (2014) performed an analysis of intellectual property-based industries. It indicates that intellectual property-based industries positively contribute to employment growth. More precisely, in 2010, the intellectual property-intensive industries contributed to 37.2% of GDP, and its contribution to employment was 19.6%.

3. Research Design

Analysis Model

The primary goal of this paper is to assess the impact of intellectual property on unemployment rate at the provincial level in South Korea (See Exhibit 1: The theoretical framework).

Figure 4: The theoretical framework



And it is reasonable to assume that each province may have its own individual characteristics that may influence the number of intellectual properties. For example, the

administrative system of a particular provincial government could have some effect on the number of registered intellectual properties. With this in mind, my model is designed to control for the variables and isolate the effect of the time-invariant characteristics that are unique to the province. In this context, I use a fixed effects panel regression model to control fixed unobservable omitted variables. In order to estimate the coefficients on variables which are presumably supposed to vary over time, panel data can be an ideal solution to this study.

The following fixed effects panel regression was used:

$$Y_{it} = \beta_1 \text{Growth rate of population}_{it} + \beta_2 \text{Per capita income}_{it} + \beta_3 \text{Education level}_{it} + \beta_4 \text{CPI}_{it} + \beta_5 \text{Number of intellectual property registration}_{it-1} + \alpha_i + \varepsilon_{it}$$

Where Y is the unemployment rate for i province for t year; α_i is the provincial fixed effect; and ε_{it} is the error term.

Particularly, in this fixed effects regression model, I assume that the change in the registration of intellectual property may affect the unemployment rate with a time lag of one year because registered intellectual properties are expected to take at least one year to be commercialized in real businesses. A summary of each variable may be seen in Table 2.

Table 2: Summary Statistics

Variable	Obs	Mean	Standard Deviation.	Min	Max
Unemployment rate (%)	160	3.012	0.908	1.3	5.1
Education level (fraction)	160	0.349	0.068	0.212	0.510

CPI	160	91.988	6.889	79.174	100.154
Per capita income (Million Korean won)	160	13.94	2.21	9.92	20.0
Growth rate of population (%)	160	0.351	0.759	-3.16	2.09
IP registration (IP/1,000,000)	160	0.011333	0.019931	0.000352	0.086675

Data Collection and Variables

(1) Data collection

This study utilizes 10 years (2006-2015) of panel data on 16 provinces in South Korea. I collected the number of intellectual property registrations through the website of Korean Intellectual Property Office (KIPO), which is from 2007 to 2015. For the missing data of 2006, I obtained it by requesting the data from the regional intellectual property team of the Korean Intellectual Property Office (KIPO). The other data were obtained from the website of Korea Statistical Information Service (KOSIS).

(2) Variables

Unemployment rate is used as the dependent variable in this research. According to KOSIS (Korean Statistical Information Service), this data means the percentage of the unemployed individuals in the labor force. To control for other factors that could influence the dependent variable, this study includes other control variables such as the growth rate of population, per capita income, education level, and CPI.

First, the growth rate of population accounts for the demographic transition affecting

the size of the labor force. Secondly, per capita income is total income divided by the population at the province level. This variable accounts for the differences in the provincial economy. Thirdly, education level rate refers to college graduation rate which is provided by KOSIS (Korean Statistical Information Service) for the population of ages between 25 and 64. This represents a measure of human capital. Lastly, CPI is included to adjust for inflation.

These control variables represent the socio-economic factors affecting the provincial unemployment rates.

Table 3: The description of variables

	Variable	Measurement	Source
Dependent variable	Unemployment rate (%)	The number of unemployed ÷ the number of all individuals in the labor force	KOSIS
Explanatory variable	Growth rate (%)	The growth rate of population	KOSIS
	Per capita income (Million Korean won)	Total income divided by the population at the province level	KOSIS
	Education level (fraction)	People graduated from college ÷ the number of people between 25 and 64	KOSIS
	CPI	Consumer Price Index	KOSIS
	IP registration	Number of intellectual property registration divided by 1,000,000	KIPO

*KOSIS (Korea Statistical Information Service), KIPO (Korean Intellectual Property Office)

4. Findings

Table 4 shows the estimation results for the impact of intellectual property on provincial unemployment rates from 2006 to 2015.

Table 4: Estimation Results

Unemployment rate	(1) Whole provinces	(2) Provinces in capital area	(3) Provinces in non- capital area
Education level (fraction)	6.354** (2.688)	3.553 (11.29)	8.070** (3.034)
CPI	-0.0434* (0.0208)	-0.0733 (0.0946)	-0.0403 (0.0272)
Per capita income (Million Korean won)	0.0899 (0.0788)	0.0408 (0.0989)	0.254 (0.216)
Growth rate of population (%)	0.0562 (0.0604)	-0.351 (0.196)	0.103 (0.0641)
Lagged IP registration (IP/1,000,000)	-19.07*** (3.821)	-22.41* (6.591)	-35.83 (37.24)
Constant	3.725*** (0.924)	6.918 (3.568)	3.284*** (1.065)
Observations	144	27	117
Number of Provinces	16	3	13
R-squared	0.111	0.445	0.103

Robust standard errors in parentheses

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

Based on these estimation results, there are several things to look at. First of all, it should be noted that the differences of intellectual property registrations have a statistically significant impact (coefficient -19.07) on the provincial unemployment rates during the period from 2006 to 2015. This indicates that the increase of intellectual property registrations may reduce the provincial unemployment rates. In detail, we can see that intellectual property has a statistically significant effect on the provincial unemployment rates in the capital area, while in the non-capital area, intellectual property has a statistically insignificant effect on the provincial unemployment rates.

Moreover, interestingly, the higher the education level, the greater the unemployment rate observed. This is probably due to the fact that highly educated people have a tendency to take on relatively long unemployment until they get the job they prefer.

5. Limitations

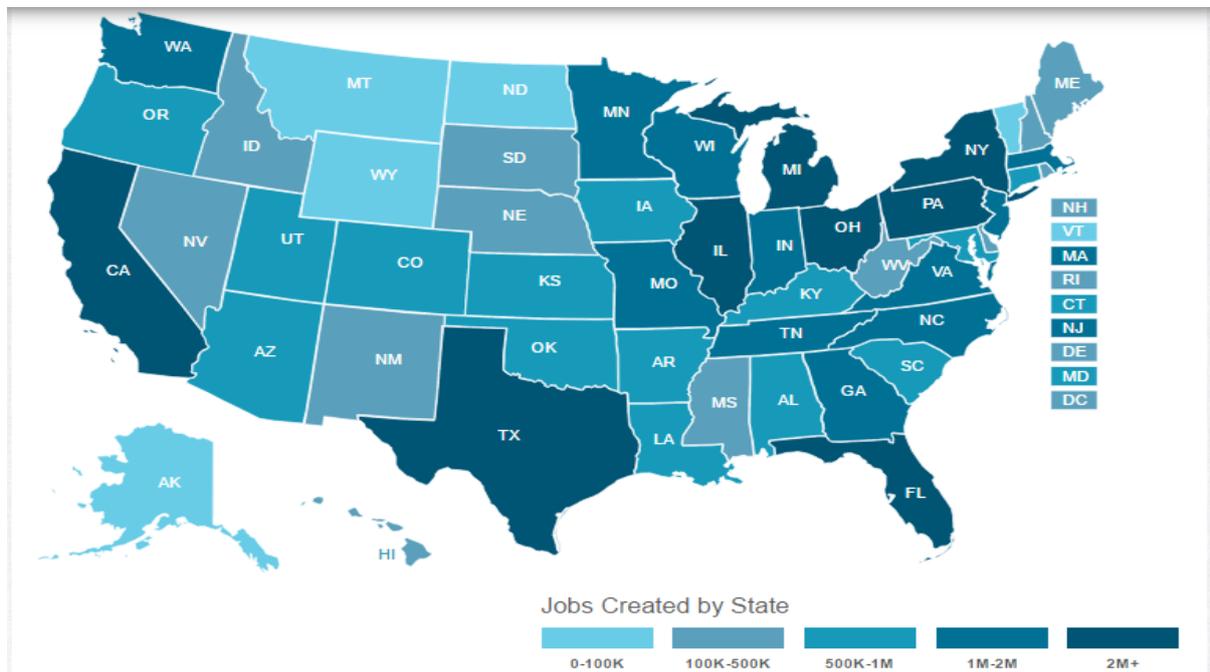
There exist some limitations in this research. First, the time lag between the registration of intellectual property and commercialization may vary. In the case that a patent is strong enough to change the existing industrial structure, the actual commercialization will require a longer period of time than other patents. Secondly, this study does not take into account the quality of the registered intellectual properties. Even though it is highly difficult to value the quality of intellectual property, a presumably good quality intellectual property would have a greater impact on the employment growth of the firms. In addition, the data range of the capital area is small, which limits its validity.

6. Conclusion and Recommendations

As shown in the above results, the increase of intellectual property registrations has the statistically significant effect of lowering the provincial unemployment rates. The reduction of unemployment rate is an important task for the reelection of the provincial governor, which may suggest that the local governments should reconsider the weight of the IPR policy as a crucial part of job creation strategies for the local economy. In this regard, local governments need to establish their own strategies to facilitate the creation of intellectual properties in line with the characteristics of local industries and the comprehensive innovation strategy of the region.

Furthermore, in order to assess the genuine impact of intellectual property, it is necessary for government agencies related to statistics, employment, and intellectual property to cooperate and conduct systematic long-term follow-up research on how the firms increase performance and employment with registered intellectual properties over time, as in the case of the United States. In the United States, government agencies closely collaborate with each other to systematically manage related data on intellectual property-based industries in order to identify the size of employment creation and check the changes in each state (See Figure 5: The data map about job created by state).

Figure 5: The data map about job created by state



Source: GIPC (<http://www.theglobalipcenter.com/ip-employs-innovation/>)

In conclusion, this research has laid the groundwork for future research on local-level intellectual property policy.

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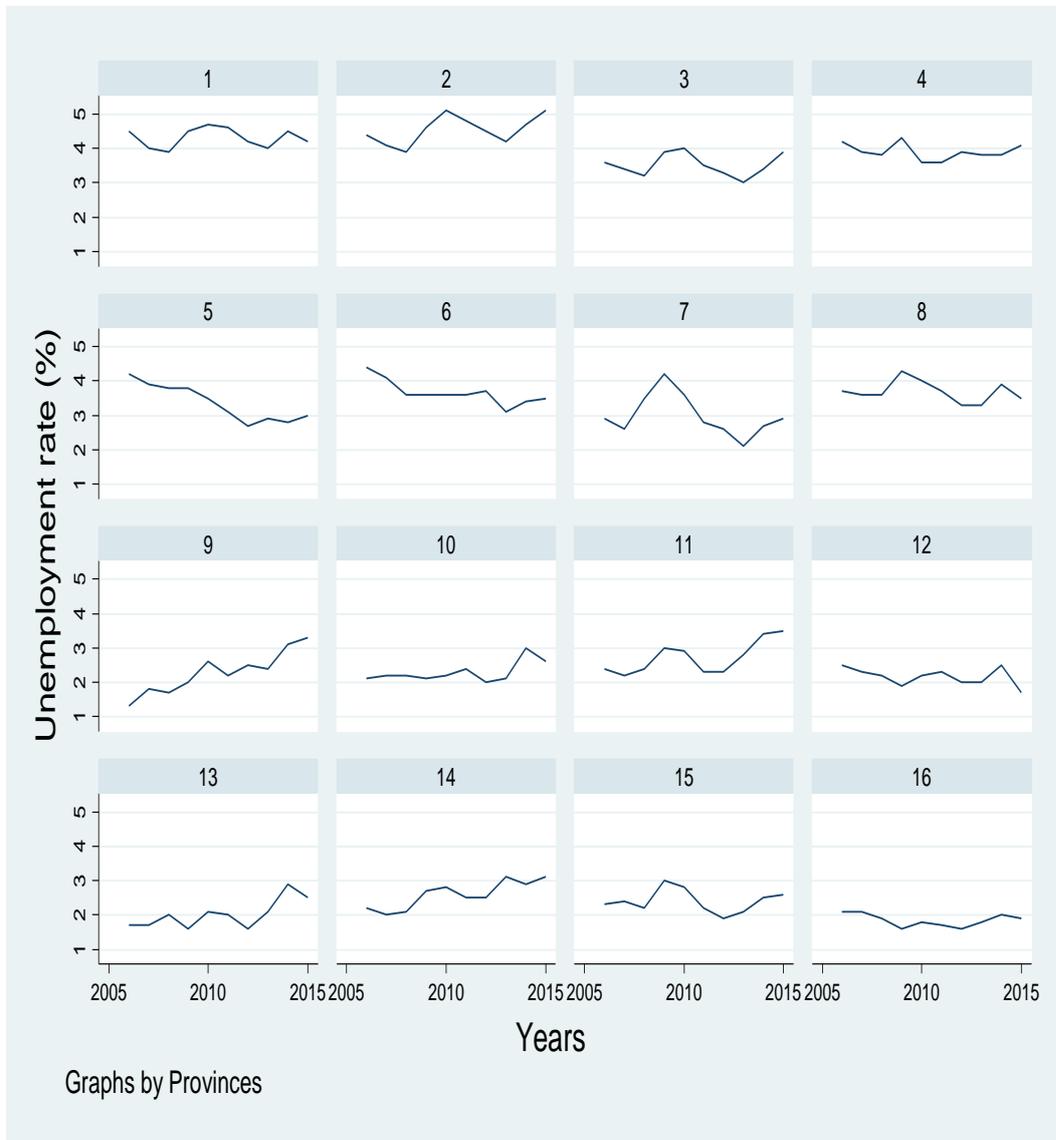
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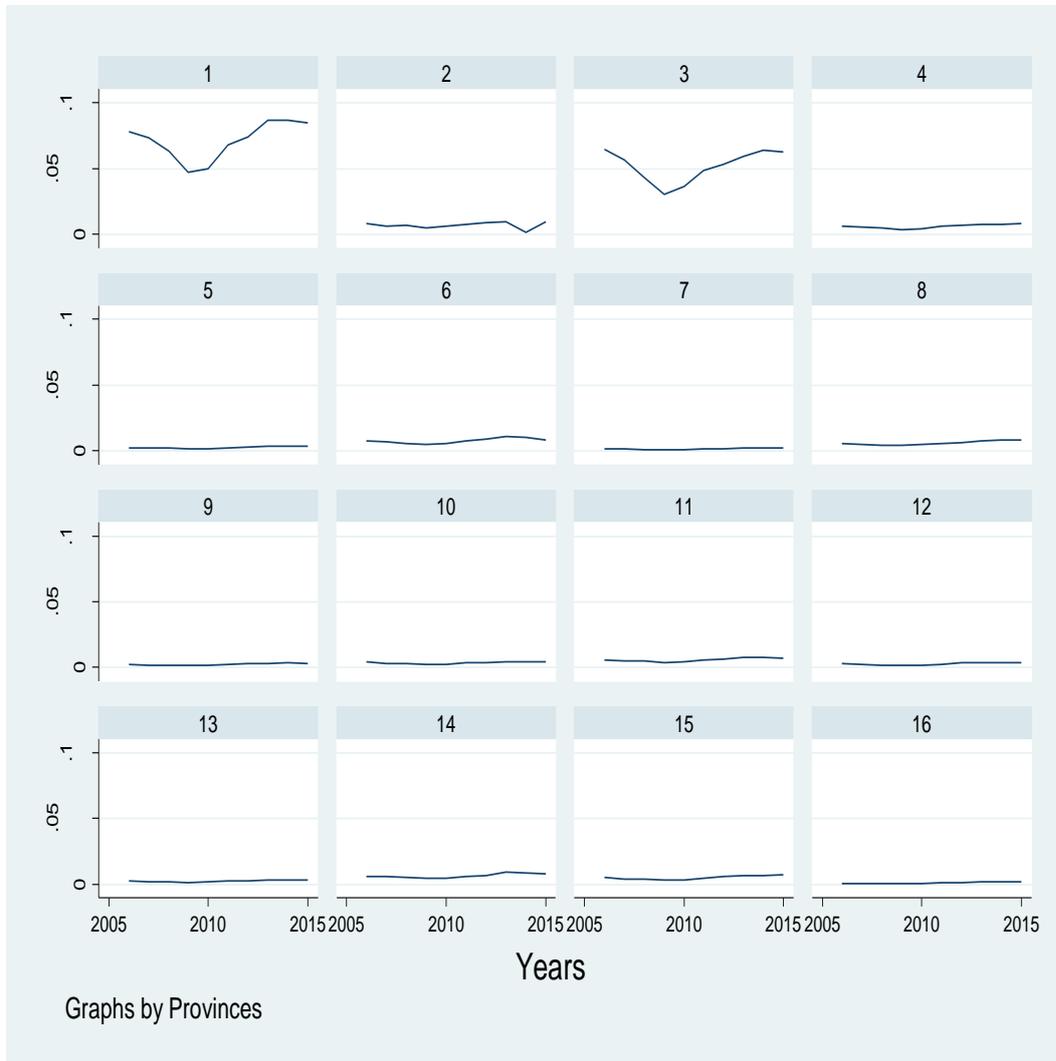
Appendix

Figure 6: Time trend analysis on unemployment rate from 2006 to 2015



*1 Seoul;2 Incheon;3 Gyeonggi;4 Busan;5 Daegu;6 Gwangju;7 Daejeon;8 Ulsan;9 Gangwon;10 Chungbuk;11 Chungnam;12 Jeonbuk;13 Jeonnam;14 Gyeongbuk;15 Gyeongnam;16 Jeju

Figure 7: Time trend analysis on IP registration (IP/1,000,000) from 2006 to 2015



*1 Seoul;2 Incheon;3 Gyeonggi;4 Busan;5 Daegu;6 Gwangju;7 Daejeon;8 Ulsan;9 Gangwon;10 Chungbook;11 Chungnam;12 Jeonbuk;13 Jeonnam;14 Gyeongbuk;15 Gyeongnam;16 Jeju