The role of Intellectual Property Rights in Enhancing Regional Development

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Abstract: Intellectual property rights (IPRs) are recognized as a growth enhancing factor for the economy. IPRs can influence the growth process through the domestic and external sectors of an economy. Therefore, researchers are increasingly interested in the role of IPR protection in the economic growth of countries. In OECD countries, most industries rely on innovation with innovative technology, hence, the role of IPR is important in stimulating the diffusion of knowledge to foster innovation that contributes to the regional development. Based on the above-mentioned, the research aims to analyze the role of IPR protection in enhancing regional development in OECD countries. The study uses the latest data set from the OECD and World Bank. We found that IPRs have a positive and significant effect on regional economic growth in OECD countries. FDI is also highly significant effect on regional economic growth. The result of this study provides interesting results that will support policy makers in considering improving intellectual property rights of inventors when formulating policies for national and regional development.

Keywords: Intellectual Property Rights (IPRs), Patents, Regional Development, Economic Growth, FDI

1. Introduction

The economies of the world are open and classified as knowledge-based, and the development of a country or region is focused on the undertaking of innovation activities. Simultaneously, it is necessary to protect the inventor's invention or creativity. Therefore, Intellectual Property Rights (IPR) has become an important policy issue of regional development in most countries. There has been a lot of arguments among policy makers and academics on the issue of whether IPR stimulates economic growth and regional development (Gould & Gruben, 1997; Falvey et al., 2006). Especially since innovation is the engine of growth, IPR might be the booster of long-term growth of economies. This argument is widely accepted both theoretically and empirically. However, the connection between regional economic growth and IPR is still unclear in a closed economy (Gould & Gruben, 1997; Horii & Iwaisako, 2007; Furukawa, 2007).

In addition, over the decades, the evolution of IPR has invariably resulted in a shift in nations' perspectives on cultural and societal development (Adam, 2011). The role of IPR has become important in fostering scientific and technological capacity improvement, encouraging innovation, as well as in enhancing the level of growth in developing countries mostly (Barro & Sala-i-Martin, 2004; Laik, 2005; Zhylinska et al., 2020). However, academics (Bielig, 2015; Neves et al., 2021) have asked whether IPR is responsible for triggering innovation and, as a result, economic growth. Economists have paid close attention to the extent IPRs stimulates innovation and economic growth. The theoretical literature on the subject has grown significantly and empirical studies have been conducted to assess the effects of IPR on innovation and economic growth.

For example, Papageorgiadis & Sharma (2016) investigated the relationship between IPR and innovation using a panel of 48 countries between 1998 and 2011 and found that IPRs enhance economic growth. In another study Sweet & Maggio (2015) assesses the impact of rigorous IPR systems on innovation through an index of economic complexity of 94 countries from 1965 to 2005 and observed a positive impact on economic growth. On the other hand, Sattar & Mahmood, (2011) analysed the impact of IPR on economic growth using Ginarte and Park index of IPR in high, middle- and low-income countries during the period of 1975-2005 and concluded that IPR adversely affects economic growth. Yang, Huang & Lin (2014) analysed the role of IPRs protection on stimulating innovations in 42 countries by using panel threshold analysis and observed that IPR has no significant effect on economic growth in non-high-income countries. Neves et al. (2021) explored the relationship between IPR, innovation, and growth in developed and developing countries. Neves et al. (2021) showed that the impact of

IPR on economic growth varies with the level of economic development. The authors observed that the relationship is positive for developed countries but negative in developing countries. It is clear at this point that empirical evidence cited in the literature on the relationship between IPR and economic growth is not clear.

Therefore, the aim of this study is to attempt to fill this research gap, by investigating the role of intellectual property right in enhancing regional development in OECD countries and how intellectual property right affects regional growth in these countries. OECD countries are highly industrialised, relying on innovation which requires knowledge protection systems such as IPR to encourage innovation activities as a channel to promote regional development. It has therefore become imperative to investigate IPR and its effect on regional development in the context of OECD countries.

The paper is organized as follows. The second section provides theoretical background. The third section explains the data and methodology. The fourth section describes the empirical results, and the discussion of the result is described in the fifth section. Conclusions and limitations are offered in the sixth section.

2. Theoretical Background

IPR protection has long been an essential component of economic development in developed and developing countries (Sattar & Mahmood, 2011). IPR has been acknowledged as part of the infrastructure that supports investments in research and development (R&D), which leads to innovation and resulting economic growth (Bilbao-Osorio & Rodríguez-Pose, 2004; Guloglu & Tekin, 2012). In addition, IPRs have, in turn, become the basis and motivation for technological progress and new knowledge. The formation and deployment of new knowledge, innovations, and social welfare have led to the establishment of a structured IPR regime that encourages innovative and creative activities through incentive structures and exclusive copyrights for creators (Adams, 2011; Haydaroğlu, 2015).

The IPR regimes vary between developed and developing countries and the IPR regime protects all categories of intellectual property through strong mechanisms and has a well-structured management to create a situation that accommodates substantial R&D investments in developed countries (Neves et al. ,2021). The main idea is to encourage innovative and creative activities to stimulate economic growth (Falvey et al., 2006a). In developing countries, imitation is the main source of technological development; lower IPR protection is the best way to encourage more financially viable internal activities and to ensure long-term economic growth (Falvey et al., 2006b).

IPR protection plays a key role in countries' economic growth. Nevertheless, it also has drawbacks because the incentive requirements are determined by market power, and the welfare gain is frequently jeopardized (Gilbert & Shapiro, 1990; Maurer & Scotchmer, 2002). To spread technical knowledge to imitators, the scope and duration of IPR protection should be limited to lead society to more innovative economic development and prosperity (Towse & Holzhauer, 2002). IPR protection may also jeopardize the dissemination of new knowledge, innovation, and growth because the spread of innovative ideas is hampered by monopoly effects (Henry & Stiglitz, 2010). In addition, the creation and diffusion of knowledge is often considered a major source of technological progress (Prokop et al., 2021). Knowledge is an important mechanism underlying endogenous economic growth (Grossman & Helpman, 1991; Vollebergh & Kemfert, 2005).

In addition to international trade, foreign direct investment (FDI) was considered as an important source of knowledge dissemination for a long time before the introduction of R&D-driven growth models (Romer, 1990; Kayani et al., 2021). A country's growth is closely related to its use of the knowledge embodied in FDI, as well as the formation of physical and human capital (Romer, 1990). FDI can facilitate the process of diffusion of knowledge not only directly through supplier training, but also indirectly through labour mobility (Mallick & Zdražil, 2018) and imitation (Furukawa, 2007).

FDI is perceived as a significant driver of economic growth because it improves technology, trade expansion, job opportunities, and global market integration (Osano & Koine, 2016). Growth in FDI leads to an increase in capital stock, which in turn leads to economic development in developing countries (Zang & Baimbridge, 2014; Maune, 2019). New growth theories focus on the importance of FDI on economic growth by financing new investment and technology transfer (Osano & Koine, 2016). The literature shows a positive effect of FDI on economic growth (Agrawal, 2015; Zekarias, 2016). Similarly, another study conducted by Sukar, Ahmed & Hassan (2011) observed

a marginal contribution of FDI to growth. According to Arabi & Abdalla (2013) the effect of FDI on economic growth depended on the level of human capital. Furthermore, strand empirical studies proposed the importance of trade openness in economic growth (Shahbaz et al., 2011; Mishra et al., 2019). Trade openness can increase economic growth by enhancing the scale of spillover (Romer, 1990; Stejskal et al., 2018).

Scholars have investigated the impact of IPRs on regional economic growth. Park & Ginarte (1997) examined the effect of IPRs on growth in a cross-section of countries for the period 1960–1990 by using a quantitative index of IPRs. They found that IPRs have an indirect impact on economic development by encouraging the accumulation of factor inputs such as R&D and physical capital. In particular, the positive impact of IPRs on the overall volume of R&D capital has limited the analysis of a general measure of property rights. Schneider (2005) observed the role of high-technology trade, IPRs and FDI using a unique panel data set of 47 developed and developing countries from 1970 to 1990 in determining a country's rate of innovation and economic growth. In their findings, IPRs have a greater effect on local innovation in developed countries and have a negative impact on innovation in developing countries. This means most of the innovation in developing countries is imitation or adaption. Kim et al. (2012) analysed the role of patents and utility models in innovation and economic growth by using a panel dataset of over 70 countries. They found that patent protection is an important determinant of innovation, and patentable innovations contribute to economic growth in developed countries, but not in developing countries. Another scholar, Adams (2009), who focused on developing countries, found that strengthening IPRs has a negative effect on economic growth. Hudson & Minea (2013) used a panel smooth threshold regressions model to perform the estimation of IPR level on innovation by using a dataset of 62 developed and developing countries. They concluded that IPR exerts a complex effect on innovation and that the relationship is a U-shaped curve. Moreover, Hu & Png (2013) concluded that stronger patent rights were associated with faster growth in more patent-intensive industries, and the effect is greater in higher income countries. Likewise, Zhang et al. (2015) and Mrad (2017) found a positive and stronger IPR effect on innovation and economic growth.

In the light of the above, the main aim of the paper is to analyse the role of IPRs in enhancing regional development in OECD countries.

3. Data and Methodology

The data for the paper is collected from the OECD and World Bank database. Annual data on GDP growth, patent count, number of researchers, FDI, export and imports, GDP, gross domestic expenditure on R&D and population with tertiary education is sourced from the OECD data base and World Bank. The data spans from 2005 to 2018. This is a country level data on twenty-two OECD countries (Austria, Canada, Czech Republic, Denmark, Estonia, France, Germany, Greece, Hungary, Ireland, Italy, Japan, Korea, Latvia, Mexico, Netherlands, Poland, Portugal, Slovak Republic Turkey, United Kingdom, and United States).

We used annual percentage growth rate of GDP as a dependent variable which is taken from the World Bank, Patent applications as an independent variable from OECD database. The other variables are foreign direct investment inflow, number of researchers, trade openness and R&D expenditure. Population with tertiary education is used as a proxy for human capital.

Table 1: Variable Descriptions

Variables	Description	References
GDP growth	GDP growth	Falvey et al. (2006)
Patents	Number of patents	Kim et al. (2012)
Researchers	Number of Researchers	Izushi and Huggins (2004)
FDI	Foreign Direct Investment	Schneider (2005)
Openness	Trade openness	Schneider (2005)
GERD	Gross domestic expenditure on R&D	Gumus & Celikay (2015)
Tertiary (human capital)	Population with tertiary education	Murthy and Chien (1997)

In the paper, quantitative research method was employed. the quantitative method tries to find to get precise and consistent measurements that permit a statistical analysis (Queirós, 2017). According to Sukamolson (2007), quantitative research is a social research that employs empirical methods and empirical statements. In the analysis, at first panel regression models used to estimate the impact of IPR on Regional development. The panel regression technique is helpful in examining the effect of IPR variations on growth. However, after analysis,

based on the result, we made the decision to use quantile regression analysis to see the changes of significant effect on each quantile period (Lee et al., 2013). From Figure 1 where the scatter plot is presented, one can observe that the data has outliers. This is an indication that fitting a regression line to capture the average relationship between patent and growth cannot be completely captured. This is an agreement with Mosteller & Tukey (1977) who argue that regression line which captures average relationship is not ideal for highly dispersed data. In consonance with Coad & Roq (2006) who argue that dispersed data is the best fitted by quantile regression. The study fitted the data using quantile regression estimation technique.

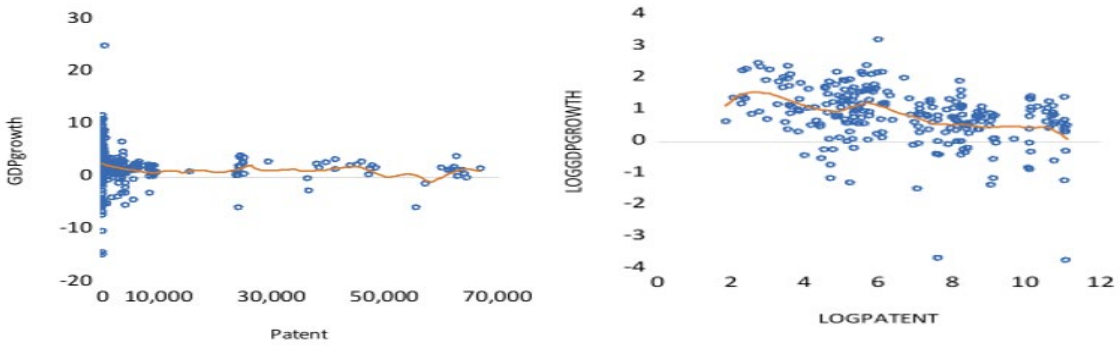

Figure 1: Scatter Plot

4. Experimental Results

Table 2 presents a panel regression analysis of the effect of IPR on GDP growth. The control variables in the regression model includes number of researchers, foreign direct investment, trade openness, R&D expenditure, and population with tertiary education. In the first model, the analysis describes that two-year lag patents regressed on LOGGDPGROWTH indicated as a positive and significant level at 1%. The regressor LOGFDI is positive and significant at 10%, and LOGRESEARCHER is positive and significant at 1%. Surprisingly, LOGOPENNESS and LOGGERD are negative and significant levels at 10%. However, two-year lag LOGTERTIARY indicated as an insignificant result in the first model. Moreover, the R-squared suggested that 23% of the GDPGROWTH is explained by the regression model. The intercept is significant at 10% level, but it has a negative sign.

The second model represented in Table 2 showed that the two-year lag patents are positive and significant at 5%. However, the LOGFDI in this model is not significant. LOGRESEARCHER contributes to the positive and highest significant level. At the same time, LOGOPENNESS is significant at 1%. LOGGERD is the highest significant level, but it does have a negative sign. In this model, the control variables, country, and period are significant however there is no significant sign in LOGTERTIARY. Furthermore, R-squared describes the 50 % of the regression model, but the intercept is not significant.

Table 2: Panel regression analysis

Variable	Model 1	Model 2
PATENT (-2)	1.02E-05 (0.0840) *	0.000100 (0.0338) **
LOGFDI	0.556107 (0.0000) ***	-0.269892 (0.5014)
LOGRESEARCHER	0.378559 (0.0694) *	1.598287 (0.0084) ***
LOGOPENNESS	-0.392709 (0.0379) **	2.215867 (0.1190) *
LOGGERD	-0.714230 (0.0004) ***	-1.287835 (0.0196) **
LOGTERTIARY (-2)	-0.143691 (0.4094)	0.832042 (0.2756)
C	-1.556386 (0.0232) **	-3.084301 (0.2826)
Country fixed effect	yes	Yes

Variable	Model 1	Model 2
Period fixed effect	yes	Yes
R-squared	0.232004	0.504000
Adjusted R-squared	0.208373	0.392098
F-statistic	9.817935	4.503924
Prob(F-statistic)	0.000000	0.000000
Mean dependent var	0.748762	0.748762
S.D. dependent var	0.884219	0.884219
Durbin-Watson stat	1.760097	2.132922

*** significant at p<0.01; ** significant at p<0.05; * significant at p<0.10. Legend : () – Pvalue

Table 3 shows the quantile regression analysis for the six quantile periods. Two-year lag PATENT is positive and significant level at 1% in Q4 and 10% in Q5 period, however there is no significant in other periods. Surprisingly, LOGFDI is positive and significant in all quantile periods with a level of 10%. LOGRESEARCHER is also a positive and significant level at 1% in Q3, 5% in Q5 and 10% in Q4 and Q6. Moreover, LOGOPENNESS provides a significant result in Q1, Q2, Q3, and Q6, but has a negative sign. Similarly, LOGGERD has a negative and significant level of 1% in Q2, 10% in Q3, Q4, Q5, and Q6. The two-year lag LOGTERTIARY contributes negative and significant in Q4, Q5 and Q6. The intercept is negative and significant in only Q1 and Q2, but it has no significant result in other quantiles.

Table 3: Quantile regression analysis

Variable	Q1 (0.1)	Q2 (0.25)	Q3 (medi)	Q4(0.75)	Q5(0.8)	Q6(0.9)
PATENT (-2)	1.60E-05 (0.1995)	9.90E-06 (0.3167)	7.11E-06 (0.3166)	8.07E-06 (0.1449)*	1.06E-05 (0.0407)***	6.78E-06 (0.2624)
LOGFDI	0.815674 (0.0001)***	0.639086 (0.0002)***	0.323371 (0.0122)***	0.325633 (0.0090)***	0.371018 (0.0022)***	0.397940 (0.0244)**
LOGRESEARCHER	0.205860 (0.6239)	0.340676 (0.2182)	0.375889 (0.0829)*	0.570965 (0.0081)***	0.508311 (0.0237)**	0.719456 (0.0045)***
LOGOPENNESS	-0.712680 (0.0510)**	-0.465679 (0.0957)*	-0.340034 (0.0966)*	-0.174809 (0.3413)	-0.066233 (0.7009)	-0.348160 (0.1348)*
LOGGERD	-0.675882 (0.1933)	-0.561809 (0.0927)*	-0.676293 (0.0058)***	-0.817568 (0.0003)***	-0.763426 (0.0008)***	-0.857010 (0.0018)***
LOGTERTIARY(-2)	0.118130 (0.7272)	-0.046186 (0.8652)	-0.125624 (0.5278)	-0.379611 (0.0340)**	-0.451996 (0.0170)***	-0.484741 (0.0289)**
C	-4.223444 (0.0001)***	-2.589385 (0.0069)***	-0.619699 (0.3761)	0.374647 (0.5532)	0.664231 (0.3023)	0.415647 (0.6662)
R-squared	0.173382	0.119133	0.087556	0.146108	0.161370	0.177504
Adjusted R-squared	0.147947	0.092030	0.059481	0.119835	0.135566	0.152197
Mean dependent var	0.748762	0.748762	0.748762	0.748762	0.748762	0.748762
S.D. dependent var	0.884219	0.884219	0.884219	0.884219	0.884219	0.884219

*** significant at p<0.01; ** significant at p<0.05; * significant at p<0.10. Legend : () - Pvalue

5. Discussion

The results of the data analysis in Table 2 represented that there is a strong significant and positive relationship between IPR and GDP growth. This result was confirmed by a study of (Hu & Png, 2013) who used panel data from up to 54 manufacturing industries in up to 72 countries to argue that stronger IPR is related to faster economic growth. Moreover, this effect is stronger in patent intensive industries and higher income countries. This is because stronger IPR could increase the returns to innovation. Higher returns could stimulate more R&D activities and higher productivity growth, which can lead to regional development. In addition, our study is also consistent with Neves et al. (2021), who found that IPR has a positive effect on growth. In that our study is also in line with Kashcheeva (2013) and Kim et al. (2012), who reported a positive and significant effect of IPR protection on growth using a measure of IPR in country-level analysis. It is clear that a stronger level of IPRs leads to a higher level of economic growth.

However, our results challenge the findings of previous studies which have been identified as a negative effect on economic growth (Maskus, 2000; Adams, 2009). At first, gains and losses are determined by the competitive market, as well as by the effectiveness of the market rules. As a result, the nature of IPR is likely to vary across

countries based on their economic and political institutions, as well as their ability to engage in and distribute R&D (La Croix & Konan, 2006). In the quantile analysis, not all periods have significant IPRs for the data.

In our analysis, trade openness is significant and negatively related to growth. This finding is consistent with the finding of Hye & Lau (2015), who found that trade openness negatively impacts economic growth eventually. In fact, trade openness can increase the flow of technological knowledge through human capital. If the domestic human capital system is unable to effectively absorb the innovative knowledge generated by trade openness (Rivera-Batiz & Rivera-Batiz, 2018), it can have a negative impact on growth in this case. FDI is significant and is positively related to growth. This is confirmed by a study (Agrawal, 2015). Meanwhile, human capital is negative and has a significant relationship with growth. Our finding is against the finding of Ogundari & Awokuse (2018), who found that human capital has positive effects on economic growth. Researchers also contribute a positive impact on regional economic growth; however, R&D expenditures have a negative and significant impact on growth.

6. Conclusion

The main aim of this paper is to analyse the role of IPR on regional development. We started by focusing on the importance of IPR on regional economic growth. We performed the regression analysis. First, we employed panel regression analysis to see the total effects. Our research showed that the two-year lag patent is positive and significant on growth in panel regression analysis. FDI, number of researchers, trade openness, and R&D expenditure are also significant. However, we did not find any significant effect of human capital on growth. Also, we doubted that the effect can change based on the period. Therefore, we used quantile regression analysis as a second step. We found that IPR does not have a significant effect in all quantile period. We firmly confirmed that it is due to the level of economic development in each period and the funding for R&D activities to undertake innovation (Prokop & Stejskal, 2019; Sein & Prokop, 2021). Additionally, we could see the variation of the effect of other variables.

The policy implication is that the role of IPR is important for regional economic growth. Therefore, it is necessary to support technological development to undertake more R&D activities for innovation because innovation and IPR are complementary in nature (Schneider, 2005). Once innovation is higher, it will certainly contribute to the regional development. Another fact is that IPRs which enhance regional growth depend on the extent to the trade openness (Gould & Gruben, 1997). Therefore, trade policy should be well structured, updated, had more transparency to achieve a desired impact on technological development, which leads to innovation and higher economic growth in a region. There is a limitation on this study. Only one input variable is applied to evaluate the effect on regional economic development. To conclude, more input variables can be added, and a different analysis method can be used in the future.

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