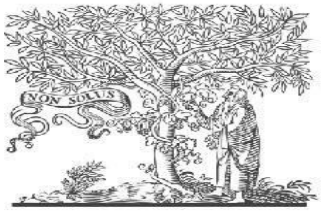
International Journal for Innovative Engineering and Management Research
PEER REVIEWED OPEN ACCESS INTERNATIONAL JOURNAL
www.ijiemr.org

COPY RIGHT



ELSEVIER SSRN

IJIEMR Transactions, online available on 16th Oct 2020. Link :http://www.ijiemr.org/downloads.php?vol=Volume-09&issue=Issue 11

10.48047/IJIEMR/V09/I10/29

Title **Intellectual Property Rights , Innovation and Economic Growth**

Volume 09, ISSUE 10, Pages: 89-109

Paper Authors **Rashi Singhal, Anuradha Jha**

USE THIS BARCODE TO ACCESS YOUR ONLINE PAPER

To Secure Your Paper As Per UGC Guidelines We Are Providing A Electronic Bar Code

International Journal for Innovative Engineering and Management Research
PEER REVIEWED OPEN ACCESS INTERNATIONAL JOURNAL
www.ijiemr.org

Intellectual Property Rights , Innovation and Economic Growth

Rashi Singhal[1] & Anuradha Jha[2]
[1] Student at University School of Law & Legal Studies, GGSIP University
[2] Faculty at Guru Gobind Singh Indraprastha University

ABSTRACT

Over the last twenty-five years, the analysis of economic growth has resurfaced as one of the most important issues in economic theory. Innovation is often seen as one of the driving forces for a sustainable long-term economic growth of any country. To achieve long-term sustainable growth, innovation is very important. Following the agreement on Trade Related Intellectual Property Rights (TRIPS), all the member countries of the World Trade Organization (WTO) are urged to establish high standards of intellectual property rights and this protection of intellectual property rights has been a major incentive to innovate.

This paper elaborates on the fact that technological innovation is considered as a major force in economic growth. It also touches on the relation between intellectual property rights and its influence on innovation in a country. In particular, the paper examines the relationship between intellectual property rights and economic growth of a country. For this, the paper deals with study of economic growth in Gulf Cooperation Council(GCC)countries with respect to their intellectual property rights.

The existing literature on the relationship between the strength of a country's intellectual property rights and rate of growth is still inconclusive. The previous studies on IPRs and economic growth, although quite comprehensive, overlooked the resource-based economies. The role of IPRs in innovation and economic growth in the GCC is expected to be different from that in non-resource-based economies, this is because that the resource-based economies of GCC countries exhibit the characteristics of the 'rentier states'.

The present study deals with the ongoing debate over the relationship between intellectual property rights (IPRs) protection and economic growth by providing empirical evidence from the GCC petro-states. To ensure the robustness of the empirical results, the study employs three different approaches of estimations: constant coefficient approach (ordinary least squares (OLS)), the fixed effects approach, and the between effects approach. This study estimates and

analyses the effects of IPRs on the economic growth of the GCC petro-states from 2008 to 2013. It provides empirical evidence on the effect of the level of IPRs on the economic growth of the GCC petro-states; in particular, it looks at the role of level GCC countries' IPRs in stimulating innovation and economic growth.

INNOVATION AND ECONOMIC GROWTH

The recent history seems to show us that innovation is one of the most important factors for economic growth. History explains us that economic growth was always a goal for human beings, for a society and for a nation. The journey of invention from wheel to internet demonstrates how humans are thriving towards innovating new goods, new services, and new production process as well. Innovation of new products or production processes is critical to a country's long-term economic growth and higher standard of living. Today developed countries spending on research and development is higher than the developing and underdeveloped countries. That's the one of the main driving forces that makes developed countries more developed and leader countries, compere to the other countries those are the follower countries. To become a leader country, long term sustainable economic growth is one of the most desired goal for any country. A country can achieve this goal by increasing the output of the country.

GDP is the measurement of a countries output in a given period of time usually it is one year. There is some controversy about GDP as a measurement of economic growth but still this paper recognizes that GDP is a measurement of the economic growth. In order to increase the GDP there are two ways:

1. By increasing the no. of inputs that we use into the production process.
2. By increasing the productivity of inputs. Productivity can be increased by innovating new products or by innovating new production processes.

Essentially, what Abramowitz did was to measure the growth in the output of the American economy between 1870 and 1950. Then he measured the growth in inputs (of capital and labor) over the same time period. He then made what were thought to be reasonable assumptions about how much a growth in a unit of labor and how much a growth in a unit of capital should add to the output of the economy. It turned out that the measured growth of inputs (i.e., in capital and labor) between 1870 and 1950 could only account for about 15% of the actual growth in the output of the economy. In a statistical sense, then, there was an unexplained

residual of no less than 85 %.[1] It is difficult to measure innovation but there is some variable that can explain the innovation of a country like number of patents, technological advance, spending in education.

The advantages offered by the globalization, the development of information technology and media represent the premises for economic growth and for the improvement of companies' financial performance.[2] Thus, we mention that innovation and technology, the increase in research and development expenditures are the prerequisites for ensuring competitiveness and progress, and through them a sustainable economic growth.

Furthermore, a sustained training level of workforce, an increase in the level of investments, facile access of investors to stock markets will generate positive effects, firstly, on the private and public sectors development and secondly, on the improvement of standards of living of the population.

We consider relevant the assumptions of Gurbiel[3], according to which the innovation potential of an economy is influenced by both macroeconomic and microeconomic factors: GDP/capita, R&D expenditures, international trade, competitiveness, technological gap, level of profit recorded by foreign companies in a country.

Moreover, we focus our attention on the Schumpeter mentions, that refer to the concept of "creative destruction", according to which innovations replace old products and technologies, having a positive impact on the turnover evolution. Therefore, the competition in the market caused by the entry of new innovations and the exclusion of old technologies, comes to support the strengthen of economic growth.[4]

The literature review highlights the importance and necessity of innovation for economic growth of a country.

The Organization for Economic Cooperation and Development (OECD) emphasizes that long run economic growth depends on the creation and fostering of an environment that encourages innovation and application of new technologies. Innovative activity underpins economic productivity and growth. Countries that generate innovation, create new technologies, and encourage adoption of these new technologies grow faster than those that do not.[5]

[1] Nathan Rosenberg, "Innovation and Economic Growth".

[2] OECD (2007), "Innovations and growth: Rational for an innovation strategy", p. 3-29.

[3] Gurbiel, R. (2002), "Impact of innovation and technology transfer on economic growth: The Central and Eastern Europe Experience", *Warsaw School of Economics*, pp. 1-18
[4] Aghion, P., Harmgart, H., Weisshaar, N., "Fostering growth in CEE countries: a country-tailored approach to growth policy", *European Bank for Reconstruction and Development*, Working Paper, no. 118/2010, pp. 1-29.
[5] Atun, R. A., Harvey, I., & Wild, J. (2007), "Innovation, Patents and Economic Growth". *International Journal of Innovation Management*, 11(2), 279-297.

In modern thinking on economic growth, a central tenet is that growth is endogenously sustained by technological change. Unlike private goods, however, the use of innovation is non-rival and possibly nonexcludable, rendering it inherently susceptible to misappropriation. Thus, the incentive to innovate, and hence the rate of economic growth, depends on the extent to which innovators can reap the benefits from their creative efforts. An important institution that regulates the incentive to innovate is intellectual property (IP) rights.[6]

A rather new aspect which has not been dealt with in depth in economics literature is the role of technical standards for economic growth, although the importance of technological activities as an essential determinant of the economic performance of industrialized economies is generally acknowledged today.

In contrast, the role of the patent system in economic growth received greater attention, beginning with Nordhaus in 1969[7]. Blind, K., & Jungmittag, A. (2008).[8] Performed a quantitative analysis on the relationship between technology and economic development of over twenty countries from the beginning of the 19th century till the end of the twentieth century. He found a high correlation between patents and per capita income and allows the positive effect of technological innovation on economic development to be seen. Ortiz Villajos, J. M. (2009)[9]. He also found regressions between the time series of patent applications in Spain between 1826 and 1985 and some economic variables indicate in similar fashion that there is a positive correlation between both variables, especially between patents and Gross Fixed Capital Formation.

However, it is difficult to measure the innovation and its effect on the economic growth. But no of patent rights and increased research and development spending can explain the economic growth of the country.

[6] Hu, A. G., & Png, I. (2013), "Patent rights and economic growth: evidence from cross-country panels of manufacturing industries", *Oxford Economic Papers*, 65(3), 675-698.
[7] William D. Nordhaus, *The American Economic Review*, Vol59, No. 2, Papers and Proceedings of the Eighty-first Annual Meeting of the American Economic Association. (May, 1969), pp. 18-28.
[8] Blind, K., & Jungmittag, A. (2008), "The impact of patents and standards on macroeconomic growth: a panel approach covering four countries and 12 sectors", *Journal of Productivity Analysis*, 29(1), 51-60.
[9] Ortiz-Villajos, J. M. (2009), "Patents and Economic Growth in the Long Term: A Quantitative Approach",

Brussels Economic Review, 52(3/4), 305-340.

Bronwyn Hall[10] discussed in his paper that has established several facts about changes in the patenting behaviour of U.S. firms during the past twenty years, some more precisely and robustly than others.

First, there is clear to the right-hand side variables, evidence of a structural shift to a higher growth rate in overall patenting in the United States between 1983 and 1984, one that is driven for the most part by U.S. firms, but with some contribution from Asia and Europe. Second, this shift is largely accounted for by firms in the electrical and computing technology sectors, although patenting by U.S. inventors has risen in all technology classes. Although R&D has also increased in this sector, this cannot explain the size of the increase in patenting.

Chen, M. X., & Iyigun, M.[11] explored the link between the optimal patent length and economic growth and find that the equilibrium investment in technology development and thus the expected rate of technological progress exhibit an inverted U-shape relationship with respect to the legal patent length.

A. C. Chu[12] analysed the effects of patent policy on growth and inequality; it developed a quality-ladder model with wealth heterogeneity and elastic labour supply.

The model predicts that strengthening patent protection increases:

a) economic growth by stimulating spending on research and development and
b) income inequality by raising the return on assets.

The growth of output depends not only on productivity growth, but also factor accumulation. Some growth accounting studies show that growth in physical capital accounts for a large share of the growth in output, even in developed countries.

[10] Bronwyn H. Hall, (2005), "Exploring the Patent Explosion", *The Journal of Technology Transfer*, Springer, vol. 30(2_2), pages 35-48, 01.
[11] Chen, M. X., & Iyigun, M. (2011), "Patent Protection and Strategic Delays in Technology Development: Implications for Economic Growth", *Southern Economic Journal*, 78(1), 211-232.
[12] Chu, A. C. (2010), "Effects of Patent Policy on Income and Consumption Inequality in a R&D Growth Model", *Southern Economic Journal*, 77(2), 336-350.

INTELLECTUAL PROPERTY RIGHTS AND INNOVATION

Until the last decade of the 20th century, intellectual property law was a small branch of legal research and practice, focusing mainly on *copyright*, with a relatively small group of practitioners and a tiny segment of scholarly writings. The wider public was hardly aware of intellectual property (IP) altogether. The technological revolution of the Internet and

accompanied technologies resulted in a huge increase in informational goods and intellectual creations that became potential candidates for the protection of Intellectual Property Rights (IPR). Parallel changes characterize *patents*, the value of which was increasingly acknowledged with the significantly accelerated pace of technological advancement and the growing number of patent disputes.

Intellectual property law became one of the fastest growing fields of law. The increasing overall interest in intellectual property, and in particular the growing economic interest, is a by-product of the information age. In the age of information economy[13], creative works and inventions are claimed to be the single most important factor driving growth and affecting the wealth of nations. As intangible goods such as software, drugs, film and music constitute an increasing percentage of the gross national product (GNP) of industrial countries, there is a growing interest in the economic implications of intellectual property. IPR grant exclusive entitlements over informational works and since the volume and pace of information production is rapidly growing, the stakes involved in intellectual property are rising. The world discovered that intellectual property is the new most significant source for wealth and economic growth.

The increasing significance of intellectual property laws generated a growing interest in the economic analysis of intellectual property. Intellectual property has not been a serious focus of the science of economics until the current technological revolution. Yet, in the last two decades, we have witnessed an emerging economic literature on intellectual property, innovation and technological advancement, both empirical and theoretical.

The rise of *Law and Economics* as a dominant movement for the analysis and evaluation of the law has been accompanied by an increased economic discourse related to intellectual property policy debates. The economic discourse seemingly offers an objective ground, which enjoys a scientific basis, and provides a methodology for promoting societies' shared goals.

[13] Information economy is defined as the 'new economy' – an economy based on information as its primary resource. The main characteristic of the information economy is rapid innovation, in which networks and network-economics are playing very substantial roles (Shapiro 1999).

However, while traditional economic studies defer the determination of these social goals to policymakers, the law and economics approach attempts to provide a grand theory of which normative analysis (setting the social goals) is an integral part. Thus, the increasing economic discourse, and especially the law and economics analysis of intellectual property, weakened other discourses, such as rights discourse, or justice discourse, which are perceived as relativist,

often sectarian, and not providing objective criteria for resolving conflicting claims

Several studies have analysed the impact of the level of IPR protection on the level of innovation to determine whether IPR protection is a necessary condition for innovation and whether it is a linear or a nonlinear relationship.

A study of 50 countries was conducted by Varsakelis[14] to analyse the factors that affect R&D activity. He found that patent protection is the most important factor affecting the intensity of the R&D. The result shows that a critical factor in the decision to invest in the R&D is the ability to create a monopoly advantage. It has critical impact on the design of economic policy, especially in the least developed countries. The government must adopt a strong patent protection framework to ensure the monopoly profits of the innovator. Lerner (2002) studied 177 patent reform events in 51 countries over a period of 150 years. The reforms include the enactment of patent laws, changes in the duration of the rights and fees, and limitations on the patent rights (e.g., compulsory licenses). On average, he found that the number of patents filed by residents before the reforms was not significantly different from that after the reforms.

Kanwar and Evenson[15] investigated a sample of 29 countries over from 1981 to 1990. In the estimated equation, they introduced the IPR index and its squared term to test the hypothesis of a nonlinear relationship between IPR protection and innovation as measured by investment in the R&D. They also showed that IPR protection promotes technological change in monotonously since the coefficients relating to the IPR index and its square are positive. These results imply that the lack of a stimulating structure can be a significant factor that impedes technological change.

[14] Varsakelis, N. "The impact of patent protection, economy openness and national culture on R&D investment: a cross country empirical investigation", *Research Policy*, volume 30, (2001): 1059-1068.
[15] Kanwar, S and Evenson, RE. "Does intellectual property protection spur technological change?", *Oxford Economic Papers*, 55 (2), (2003): 235-264.

Chen and Puttitanun[16] conducted a study of 64 Patent Examiner Data Systems (PEDs) from 1975 to 2000. They showed that innovations in the developing countries increase with increasing IPR protection.

Branstetter, Fisman and Foley[17] examined the patent reforms in 12 PEDs between 1982 and 1999. They found that the reforms did not mention significant responses in the filing of patents by the residents.

Kanwar[18] used data from 44 developing and developed countries from 1981 to 2000. He found

that the robustness of protection has a large positive influence on the R&D spending.

Qian[19] assessed the influence on patent protection on innovations in the pharmaceutical sector in 26 countries from 1978 to 2002. He found there is an optimal level of IPR regulation beyond which innovation activities decline. In fact, the author concluded that a relationship in the form of an inverted U exists between the level of protection of IPR and innovation.

In the study conducted by Loukil[20] the results revealed a significant influence of the threshold of the intellectual property rights on innovation. In other words, the impact of protection by the Institute of Pacific Relations on innovation is significant, which implies a nonlinear relationship. It was also shown to play an indirect role by increasing the impact of human capital and economic development on innovation. These results have important implications for designing economic policy. In the emerging country, a minimum level of protection by the institute of pacific relations is needed to ensure an incentive encouraging technological innovation. Therefore, there is an inverse-U relationship between the intellectual property rights and innovation.

[16] Chen, Y and Puttitanum, T. "Intellectual property rights and innovation in developing countries", *Journal of Development Economics*, (78) (2005): 474493.
[17] Branstetter, L., Fisman, R., & Foley, F, "Do stronger intellectual property rights increase international technology transfer? Empirical evidence from U.S. firm-level data", *Quarterly Journal of Economics*, 121(1), (2006).
[18] Kanwar, S. "Business enterprise R&D, technological change, and intellectual property protection", *Economics Letters*, 96, (2007): 120-126.
[19] Qian, "Y. Les lois nationales sur les brevets stimulent-elles l'innovation nationale dans un environnement de brevets mondial? Une analyse transnationale de la protection des brevets pharmaceutiques, 1978-2002", *The Review of Economics and Statistics*, 89 (3), (2007): 436-453.
20 Kamilia Loukil "Protection des droits de propriété intellectuelle et innovation technologique: Cas des pays émergents" presented at the 2013 ASECTU FORUM.

INTELLECTUAL PROPERTY RIGHTS AND ECONOMIC GROWTH

There is enormous interest from economists in explaining sources of economic growth across countries and over time. The existing literature has identified a number of engines of economic growth; probably none of them has received as much attention as the role of innovation in economic growth.[21]

Indeed, the issue of intellectual property rights (IPRs) is gaining worldwide importance as economies move increasingly toward knowledge-based activities.[22] The attention paid by economists to the role of IPRs in economic growth issues has been revived by the development of new growth theory, and this attention has recently increased because of the inclusion of the

Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPs) in the membership requirements of the World Trade Organization. Since then, the study of the relationship between IPRs and economic growth has become a prominent topic in the literature of economic growth.

In general, the existing empirical and theoretical literature on the relationship between the strength of a country's intellectual property rights and rate of growth is still inconclusive (Gould and Gruden[23]; Koléda[24]; Falvey, Foster and Greenaway[25]; Horii and Iwaisako[26]; Furukawa[27]).

The new growth theory emphasized the role of innovation in economic growth; the theoretical work of Romer[28], Grossman and Helpman[29], Rivera Batiz and Romer[30], and

[21] Hudson, J. and Minea, A., "Innovation, Intellectual Property Rights, and Economic Development: A Unified Empirical Investigation", *World Development*, 2013, Vol. 46, pp.66-78.
[22] Fink, C. and Braga, C. A. P., "How stronger protection of intellectual property rights affects international trade flows", 1999, *World Bank Policy Research Working Paper no. 2051*, Washington, DC.
[23] Gould, D. M. and Gruden, W. C., "The role of intellectual property rights in economic growth", *Journal of Development Economics* 1996, Vol. 48, pp.323 350.
[24] Koléda, G., "Northern and Southern Patent Novelty Requirements Harmonization, Growth and Trade", DEG1T Conference Papers, Dynamics, Economic Growth, and International Trade, 2005.
[25] Falvey, R., Foster, N. and Greenaway, D., "Intellectual Property Rights and Economic Growth", *Review of Development Economics*, 2006, Vol. 10, pp.700.
[26] Horii, R. and Iwaisako, T., "Economic Growth with Imperfect Protection of Intellectual Property Rights", *Journal of Economics*, 2007, Vol. 90, pp. 45 85.
[27] Furukawa, Y., "The protection of intellectual property rights and endogenous growth: Is stronger always better?" *Journal of Economic Dynamics & Control*, 2007, Vol. 31, pp.3644-3670.
[28] Romer, P. M., "Endogenous Technological Change", *Journal of Political Economy*, October, 1990, Vol. 98, pp.71-102.
[29] Grossman, G. and Helpman, E., "Trade, knowledge spill overs, and growth", *European Economic Review*, 1991, Vol. 35, pp.517-526.
[30] Rivera-Batiz, A. and Romer, M., "International trade with endogenous technological change", *European Economic Review*, 1991, Vol. 35, pp.971-1001.

Helpman[31] indicated that the rate of economic growth depended upon the rate of innovations and the stock of knowledge.

Following the work of Helpman[32], there have been many studies of how IPRs protection has affected economic growth. These studies have concluded that tightening IPRs enhanced innovation and economic growth. An example of a theoretical study that concluded that IPRs promoted economic growth was the research by Kwan and Lai[33], which incorporated the exogenous imitation rate into a lab-equipment version of variety expansion models to examine how IPRs protection affected welfare and growth. Iwaisako and Futagmi[34] showed that extending patent length enhanced economic growth in the variety expansion model of Romer[35]. These models concluded that strengthening IPRs always enhanced economic growth.

On the other hand, strong IPRs protection did not always yield higher levels of innovation and

growth because giving innovators too much protection might limit the spread of new ideas and lead to monopoly.[36] An example of a study that did not support the role of IPRs in economic growth on a theoretical basis was the research by Horii and Iwaisako[37], which found it difficult to find a positive relationship between IPRs protection and the growth rate. Gould and Gruden[38] also identified a "weak" relationship between IPRs protection and the growth rate. Koléda[39] showed that the effect of patent novelty requirements on growth could be inverse U-shaped, which implied that tightening IPRs protection dampened economic growth for a range of stronger novelty requirements. The recent work of Furukawa[40], which investigated the effects of IPRs protection on economic growth in a variety expansion model of endogenous growth, concluded that IPRs protection might not enhance economic growth in an endogenous growth model with costless imitation, such that "stronger is always better" was incorrect.

The empirical evidence on the role of IPRs in economic growth also revealed mixed results, confirming the conflicting theoretical predictions. Empirical studies that concluded that IPRs

[31] Helpman, E., "Innovation, imitation, and intellectual property rights", *Economica*, 1993, Vol. 61, pp.1247-1280.
[32] *Ibid*.
[33] Kwan, K. and Lai, E., "Intellectual Property Rights Protection and Endogenous Economic Growth", *Journal of Economic Dynamics & Control*, 2003, Vol. 27, pp.853-873.
[34] Iwaisako, T. and Futagmi, K., "Patent policy in an endogenous growth mode", *Journal of Economics*, 2003, Vol. 78, pp.239-325.
[35] *Supra* note 26.
[36] Maskus, K. E., "Intellectual Property Rights and Economic Developmen", *Case Western Journal of International Law*, 2000, Vol. 32, pp.471-506.
[37] *Supra* note 26.
[38] *Supra* note 23.
[39] *Supra* note 24.
[40] *Supra* note 27.

had a positive effect on economic growth include Falvey[41], Gould and Gruden[42], Park and Ginarte[43], Thompson and Rushing[44], Kanwar and Evenson[45], and more recently, studies by McLennan and Le[46], Andrés and Goel[47], and Sattar and Mahmood[48]. More recently still, Hudson and Minea[49] concluded that the effect of IPRs on innovation was more complex than previously thought, displaying important nonlinearities depending on the initial levels of both IPRs and per capita GDP.

Other empirical works on IPRs and economic growth were sceptical about, or completely against, the positive effect of IPRs. Examples include a study by Lerner[50], who found little positive impact of protecting patents on innovations and economic growth. Boldrin and Levine[51] argued that protecting innovative activities was only important for the "discovery"

period, and concluded that in the long run, protecting IPRs might be damaging because of diminishing returns and the extent to which less developed economies could imitate the imported products. A study, in 2011, by Samuel[52] found that the impact of IPRs on economic growth was actually negative for the countries of Sub-Saharan Africa (SSA), because most innovation in SSA might be imitative or adaptive in nature; thus, providing stronger IPRs might have protected foreign firms at the expense of domestic firms of SSA.

In summary, while the existing literature has highlighted the potential importance of IPRs protection for innovation and growth, it has also suggested that there could be important differences in the relationship across countries depending on, inter alia, country-specific determinants of economic growth.

[41] *Supra* note 25.
[42] *Supra* note 23.
[43] Park, G. and Ginarte, J., "Intellectual property rights and economic growth", *Contemporary Economic Policy*, 1997, Vol. 15, pp.51-61.
[44] Thompson, M. and Rushing, F., "An Empirical Analysis of the Impact of Patent Protection of Economic Growth: An Extension", *Journal of Economic Development*, 1999, Vol. 24, pp.67-76.
[45] Kanwar, S. and Evenson, R., "Does intellectual property protection spur technological change?", *Oxford Economic Papers*, 2003, Vol. 55, pp.5-264.
[46] McLennan, P. and Le, Q., "The effects of intellectual property rights violations on economic growth", *Modern Economy*, 2011, Vol. 2, 107-113.
[47] Andres, R. and Goel, K., "Corruption and Software Piracy: A Comparative Perspective", *Policy & Internet*, 2011, Vol. 3, pp. 1-22.
[48] Sattar, A. and Mahmood, T., "Intellectual property rights and Economic growth: Evidences from high, middle- and low-income countries", *Pakistan Economic and Social Review*, 2011, Vol. 49, pp. 163-186.
[49] Hudson, J. and Minea, A., "Innovation, Intellectual Property Rights, and Economic Development: A Unified Empirical Investigation", *World Development*, 2013, Vol. 46, pp.66-78.
[50] Lerner, J., "The Empirical Impact of Intellectual Property Rights on Innovation: Puzzles and Clues", *American Economic Review*, 2009, Vol. 99, pp.343-348.
[51] Boldrin, M. and Levine, D., "Against Intellectual Monopoly", *Cambridge University Press*, Cambridge, 2009, UK.
[52] Samuel, A., "Intellectual property rights, innovations, and economic growth in Sub-Saharan Africa", *Journal of Third World Studies*, 2011, Vol. 28, pp. 231-236.

However, the previous studies on IPRs and economic growth, although quite comprehensive, have overlooked the resource-based economies. The role of IPRs in technological innovation and economic growth in resource-based economies such as the Gulf Co-operation Council (GCC) petro-states is expected to be different from that in non-resource-based economies, since the resource-based economies of GCC countries exhibit the characteristics of 'rentier states'.[53]

This study estimates and analyses the effects of IPRs on the economic growth of the GCC petro-states, namely Saudi Arabia, Oman, Bahrain, United Arab Emirates (UAE), Kuwait and Qatar. It provides empirical evidence on the effect of the level of IPRs on the economic growth

of the GCC petro-states; in particular, it looks at the role of level GCC countries' IPRs in stimulating innovation and economic growth.

The analyses in this study utilizes panel data from cross-sectional data on all GCC countries over a span of six years (2008 to 2013). The IPRs index used in this study was developed in 2007 by Property Rights Alliance (USA). All other explanatory variables (initial GDP per capita, inflation, human capital, population, openness, and investment) are from the World Bank's World Development Indicators (2012). The empirical findings confirm the expectations relating to 'traditional' sources of economic growth.

[53] Springborg, O., "GCC Countries as 'Rentier States' Revisited", *The Middle East Journal*, 2013, Vol. 67, 301-309.

CASE STUDY

METHODOLOGICAL FRAMEWORK AND DATA

Empirical Modelling

This section identifies the basic determinants of growth augmented with measurement of IPRs by regressing per capita growth on a set of relevant variables in the sample of GCC countries. Although this approach is silent with respect to the underlying helpful in highlighting the main factors affecting the economic growth of GCC countries. This approach is standard in the empirical literature on economic growth (e.g. Park and Ginarte[54]; Falvey et al[55]; Sattar and Mahmood[56]; McLennan and Le[57]). The strategy followed here is to have at least one proxy for each of the basic determinants of growth variables augmented with one IPRs variable. Therefore, the econometric technique employed in this study is as follows:

$$Y_{it} = \alpha_{it} + \beta x_{it} + U_{it} \quad (1)$$

where 'i' denotes a country and 't' a time period; 'α' is a country-specific parameter; Y represents the rate of growth of per capita GDP, while 'x' is a matrix of the explanatory variables. Considering the standard growth decompositions of equation (1), then equation (1) can be estimated in regression form as follows:

$$Y_{it} = \beta_{it} + \beta 1 \bar{Y}_{it} + \beta 2 INF_{it} + \beta 3 IPRs_{it} + \beta 4\ POP_{it} + \beta 5\ HUM_{it} + \beta 6 OPEN_{it} + \beta 7 INV_{it} + \mu_{it} + \upsilon_{it} + \varepsilon_{it} \quad (2)$$

In this relationship, for i^{th} country in t^{th} time period, Y indicates per capita GDP; $\bar{Y}$ shows the initial level of per capita GDP at the beginning of the sample period; INF is the inflation rate;

IPRs is intellectual property rights index; POP indicates population growth rate; HUM is a measure of human capital; OPEN is trade openness; INV exhibits investment to GDP ratio; ε_{it}, is the error term; and ų and υ are country- and time-specific effects, respectively.

[54] Park, G. and Ginarte, J., "Intellectual property rights and economic growth", *Contemporary Economic Policy*, 1997, Vol. 15, pp.51-61.
[55] Falvey, R., Foster, N. and Greenaway, D., "Intellectual Property Rights and Economic Growth", *Review of Development Economics*, 2006, Vol. 10, pp.700-719.
[56] Sattar, A. and Mahmood, T., "Intellectual property rights and Economic growth: Evidences from high, middle- and low-income countries", *Pakistan Economic and Social Review*, 2011, Vol. 49, pp. 163-186.
[57] McLennan, P. and Le, Q., "The effects of intellectual property rights violations on economic growth", *Modern Economy*, 2011, Vol. 2, 107-113.

Data Description

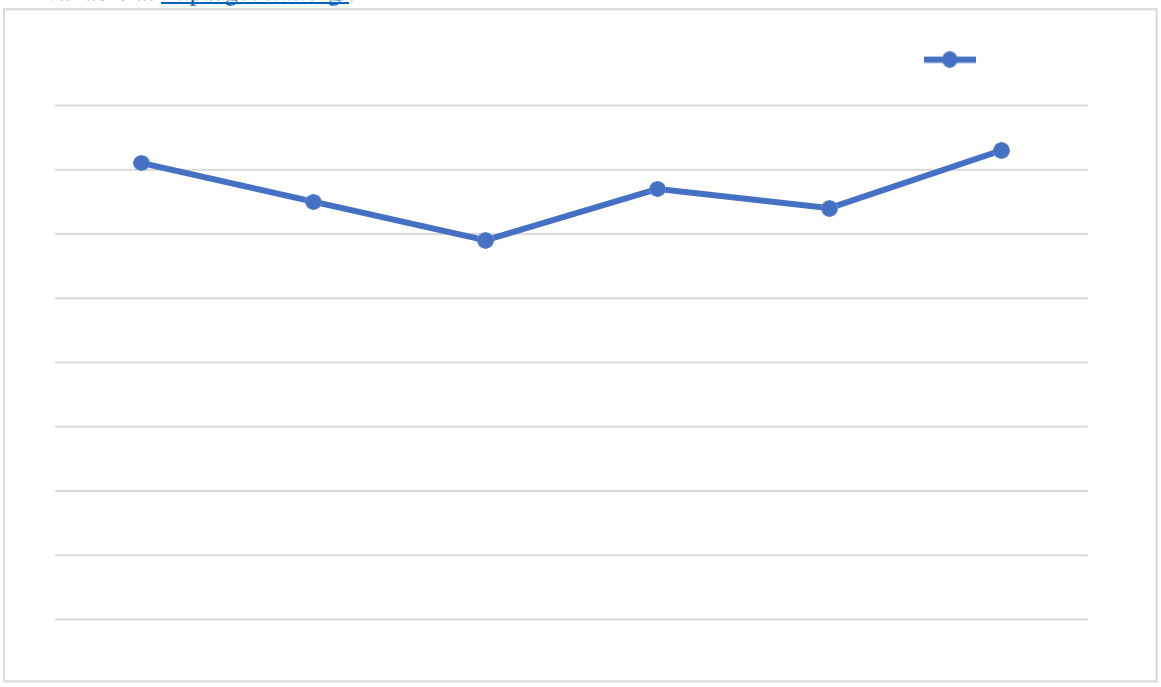
The analyses in this study utilize panel data from cross-sectional data on all GCC countries, namely Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the UAE, over a span of six years (2008 to 2013). The time span is limited by the availability of the IPRs index used in this study; the index was developed in 2007 by Property Rights Alliance (USA). The IPRs index employed in this study has advantages over other IPRs indexes such as Ginarte and Park[58] and the Software Piracy rate developed by Business Software Alliance (BSA). The index used in the current study is the only one that measures the significance of both physical and intellectual rights and their protection for economic well-being. Further, the index employed focuses on three intertwined areas: Legal and Political Environment (LP), Physical Property Rights (PPR), and Intellectual Property Rights (IPRs).

All other explanatory variables (initial GDP per capita, inflation, human capital, population, openness, and investment) are from the World Bank's World Development Indicators (2012), except for the 2013 data, which are extracted from various publications of 'The Statistical Centre for the Cooperation Council for the Arab Countries of the Gulf (GCC Stat)'[59]. The initial level of per capita GDP ($\bar{Y}$) is used to predict the level of development and level of convergence, and it is expected to have a negative sign. Inflation rate (INF) is included to measure economic stability and is expected to have negative effects on economic growth. Trade openness (OPEN) is a proxy for economic openness and is measured by the sum of the exports plus imports to GDP; it is expected to be positively related to economic growth. Population (POP) is expected to be inversely related to economic growth. Investment (INV) shows the production of new goods and services, and is expected to positively affect economic growth. Human capital (HUM) as measure by secondary-school enrolment is expected to be positively

related to economic growth.

Figure 1 shows a comparison of IPRs across GCC countries in 2013, and reveals that UAE and Qatar scored the highest IPRs index.

[58] Park, G. and Ginarte, J., "Intellectual property rights and economic growth", *Contemporary Economic Policy*, 1997, Vol. 15, pp.51-61.
[59] Available at http://gccstat.org/.



Source: Date from the report of Property Right Alliance (2013).

The next section will explain how the country-specific effect of the panel data in this study is treated, and hence, how the parameters are estimated.

MODEL ESTIMATION AND EMPIRICAL RESULTS

To ensure the robustness of the empirical results, the study employs three different approaches to estimations: constant coefficient approach (ordinary least squares (OLS)), the fixed effects approach, and the between effects approach.

Constant Coefficient Approach

The econometric analysis in this study starts by estimating the constant coefficient approach, by the pooled OLS. This approach assumes that there are neither significant country (individual) effects nor significant temporal effects. In the context of this study, this means that

all GCC countries in the sample react in the same way to changes in all explanatory variables. The results of the constant coefficient approach will then be compared with the results of the other two approaches in this study.

The overall results of OLS estimation as shown in Table (1) conform to prior expectations and can be interpreted as offering empirical validation for the theoretical explanatory variables that have been suggested in the economic growth literature.

Table 1. Estimation Results

	Dependent Variable: Growth Rate of GDP Per Capita		
	Specification (1)	**Specification (2)**	**Specification (3)**
Explanatory Variables	**Constant Coefficient Approach (OLS)**	**Fixed Effects (within) Estimation**	**GLS Random Effects Estimation**
Constant	31.56*** (6.12)	29.76** (4.32)	33.34** (5.87)
$\bar{Y}_{it}$	-0.726 (-6.81)	-1.635** (-3.12)	-0.76* (-4.71)
INF_{it}	0.08 (0.7)	0.019 (0.12)	0.01 (0.76)
POP_{it}	-(0.18)** (-2.13)	-0.07* (-2.86)	-0.06 (-3.98)
HUM_{it}	0.06* (2.29)	0.06* (3.87)	0.14* (2.76)
$OPEN_{it}$	4.95*** (3.14)	6.97** (4.87)	5.24* (4.14)
INV_{it}	0.02 (0.19)	0.76* (2.25)	0.31* (2.59)
$IPRs_{it}$	0.06 (0.26)	0.47 (0.97)	0.39 (0.34)
R-square	0.69	0.63	0.71
F-statistics	18.1**	15.8*	15.15*

*Notes: t-statistics for the OLS and fixed effect models and the corresponding z-statistics for the random effects model are given in parentheses. *, **, *** indicate that the given variable is statistically significant up to the 10%, 5% and 1% level of significance, respectively; otherwise the variable is statistically insignificant. The reported R-square is overall R-square. + + indicates the time-invariant variable (i.e. $\bar{Y}$) that was initially dropped from the estimation because the fixed effects estimation cannot estimate variables that do not change over time; however, it was recovered after being regressed on the residual of the main regression, as shown in equation (3).*

The signs and significance of explanatory variables are generally as expected, except for the

inflation, IPRs and physical investment, which are positive but not significant; the statistical insignificance of these variables might be due to their collinearity with other explanatory variables in the model, or with other 'omitted' country-specific characteristics that are not part of the explanatory variables. Otherwise, the initial GDP per capita is negative and significant, confirming the convergence hypothesis; population has a negative sign, as expected, and is significant; trade openness prompts economic growth with the expected positive sign; secondary-school enrolment, which is used as a proxy for investment in human capital, is also significant and has the expected positive sign. To ensure the robustness of the estimates, several diagnostic tests on the chosen model in this study are performed. These included testing for heteroskedasticity using the Breusch Pagan and Cook-Weisberg tests; multicollinearity test using correlation matrix and variance inflation factor (VIF); normality test using skewness/kurtosis test and normality graphs; model specification test using link specification test; and omitted variables test using Ramsey RESET test. All results show that the chosen models of economic growth are well specified, except where heteroskedasticity is exhibited, and this problem has been corrected by using robust standard errors.

Fixed Effects Approach

As explained previously, the constant coefficient approach disregards the space and time dimensions of the pooled data. Although the constant coefficient approach is simple, the pooled regression might distort the true picture of the relationship between the dependent variable and independent variables. This study is able to explicitly control for some factors that might affect the economic growth of GCC countries, such as GDP, GDP per capita, population, trade openness, and inflation. However, there are some additional, unobservable factors that might affect the determinants of GCC countries' economic growth. Such factors might include the extent of globalization, changes in government regulations, the national industrial structure, industrial policy in each country, and the cultural and historical aspects of each country. It is difficult to determine adequately or measure quantitatively the extent and the direction of such factors. Therefore, it is important in this study to take into account the possibility of some heterogeneity between GCC countries. What is needed here, therefore, is to find a way to take into account the specific nature of the different countries and possibilities of time dimension effects during the period studied.

The heterogeneity between countries in any study might appear in the regression coefficients and might vary across countries and time. Unfortunately, no single, valid specification exists.

Rather, the choice of the appropriate specification depends on the type of problem and on the nature of the data. The two specifications that are most popular in taking into account the heterogeneity of the cross-sectional units (i.e. countries) are the fixed and random effects models. The question of whether a fixed or a random model should be chosen for this study is an important and challenging one, as the two models lead to two different conclusions about the data. The question of which model to use basically hinges upon the assumption one makes about the likely correlation between the unobserved individual-specific effects (εi) and the regressors.[60] If the εi is seen to be correlated with regressors then the fixed effects model probably outperforms the random effects model. However, if εi is viewed as uncorrected with regressors, the random effects model might outperform the fixed effects model. Furthermore, if the individual countries appearing in the sample are randomly chosen from the whole population, then the random effects model is more appropriate; otherwise the fixed effects model is more useful.[61]

As far as this study is concerned, the sample is not randomly chosen, as the countries in the sample are selected based on the availability of IPRs data. Also, the individual-specific effects (εi) are very likely to be correlated with one or more of the explanatory variables. For instance, cultural aspects of a country (unobservable variable) are likely to correlate with an explanatory variable of trade openness in that country. Therefore, intuition leads one to think that the fixed effects estimation should be used in this study. However, before finalizing the decision about which model (fixed vs. random) to select, it is important to consider two formal statistical tests: the Breusch-Pagan Lagrange Multiplier test[62] (1980) and the Hausman test[63] (1978). The results of the Breusch Pagan test suggest that cohort effects are not zero, indicating heterogeneity between the countries in the sample. Therefore, the pooling regression is not suitable in this case. The results of the Hausman test show that unobserved individual-specific effects and the explanatory variables are correlated; therefore, the fixed effects estimators are consistent, whereas the random effects estimators are inconsistent. So, the overall results favour the fixed effects model for this study. The result of choosing fixed effects rather than random effects confirms the prior expectation, as explained previously. Therefore, we focus on the fixed effects model.

Unfortunately, the fixed effects model suffers from two important defects. Firstly, all time-invariant variables are excluded from the model. In this study, the initial GDP per capita is dropped. The fixed effects model cannot directly estimate variables that do not change over

time because the inherent transformation wipes out such variables. Secondly, the fixed effects approach utilizes only the variations within countries, ignoring the variation between countries in the sample (the differences in the levels of variables across countries). This is useful when

[60] Verbeek, M., A GUIDE TO MODERN ECONOMETRICS, John Wiley & Sons, England, 2001.
[61] Egger, P., "A note on the proper econometric specification of the gravity equation", *Economic Letters*, 2000, Vol.66, pp.25-31.
[62] Breusch, T. and Pagan, A., "The Lagrange multiplier test and its application to model specification in econometrics", *Review of Economic Studies*, 1980 Vol. 47, pp.239-254.
[63] Hausman, J., "Specification tests in econometrics", *Econometrica*, 1978, Vol. 46, pp.1252-1271.

the unobservable individual-specific effects (εi) are fixed but not common across countries. This is the reason why the fixed effects model is also called the within effects model. This is a cost of eliminating the inconsistency issue caused by unobserved individual effects[64]. The first problem can be easily solved. The time-invariant variables can be retrieved by estimating them in a second step by running another regression with the individual effects as the dependent variable (IE_{ij}) and all the time-invariant variables as independent variables; this has been done in many studies (Filippini and Molini[65]; Zarzoso and Lehmann[66]; Cheng and Wall[67]). The proposed estimation of the time-invariant variables is as follows:

$$IE_{ij} = \beta_0 + \beta 1 \bar{Y}_{ij} + V_{ij} \qquad (3)$$

where IE_{ij} is the individual effect, and V_{ij} the error term.

The results of the fixed effects model show that ln ($\bar{Y}_{ij}$) is statistically significant, consistent with theoretical prediction. Comparing the results of the fixed effects model approach with the consistent coefficient model approach shows that all the explanatory variables are as expected, except, again, for inflation, which is still not statistical significant; this can be explained by the fact that inflation is quite low in GCC countries, so it is not a factor in promoting GCC countries' economic growth, or by the existence of a nonlinear relationship between inflation and economic growth. The main interest in this study is the IPRs variable, which again is positive but not statistically significant, confirming that IPRs protection is not an important factor in promoting economic growth in GCC countries.

Random Effects Model Approach

Although our intuition, together with the formal results of the Breusch-Pagan and Hausman tests, indicates that we should use the fixed effects model rather than the random effects model

for the pre-specified model of this study, it is decided to apply the random model here simply in order to make a comparison between the random effects and fixed effects models. The random effects model allows us to utilize the generalized least squares estimator (GLS). The GLS estimator is a BLUE (best linear unbiased estimator) under the random effects

[64] Tolman, R. and Wang, H., "Domestic violence and employment: Fixed effects models of three waves of women's employment study data", Paper presented to Annual Conference of the Association for Public Policy Analysis and Management (APPAM), Dallas, 7-9th November, 2002.
[65] Filippini, C. and Molini, V., "The determinants of East Asian trade flow: A gravity equation approach", *Journal of Asian Economics*, 2003, Vol. 14, pp. 695-711.
[66] Zarzoso, M. and Lehmann, N., "Augmented gravity model: an empirical application to Mercosur-European Union trade flow," *Journal of Applied Economics*, 2003, Vol. 6, pp., 45-63.
[67] Cheng, I. and Wall, W., "Controlling for heterogeneity in gravity models of trade and integration", 2004, *Working Papers, No. 99-010*, Federal Reserve Bank of St. Louis.

assumption, whereas it is the OLS estimator that is a BLUE estimator under the fixed effects assumption. Furthermore, the fixed effects model is costly in terms of the degree of freedom forgone. For these reasons, it is appropriate here to compare the performance of the two models in the present context. The overall results (Table 1) show that there is not much discrepancy in the statistical significance and the sign for most of the explanatory variables. Indeed, the random effects model also confirms the previous finding of the limited role of IPRs in promoting the economic growth of GCC countries. This result is sensible, as the sources of economic growth of the GCC petro-states are oil and gas: these countries account for 52.1% of the total OPEC oil reserves and 49.5% of the total OPEC crude oil production.

Furthermore, the results of random effects estimation show that the R-squared value is higher for the random effects than for the fixed effects model. This implies that the random effects model has the greater explanatory power with respect to the dependent variable in this context. However, this outcome is not sufficient evidence for us to conclude that the random effects model is a better model than the fixed effects model. A possible interpretation of the differences between the fixed and random effects models is that the absence of cross-sectional data variations (the second problem of fixed effects to which we referred above) and the reduction in the degrees of freedom in the fixed effects model have the potential to make the estimations of this model somewhat fragile. Caution should therefore be used when making a direct comparison of the two models, as each model has its own underlying assumptions and implication

CONCLUSION

In this paper, we have seen that innovation is a key of a countries' economic growth and IPRs are one of the essential elements required to promote innovation and growth. We have also dealt with a study on the relationship between IPRs protection and economic growth of the resource-based countries, which have been overlooked in the previous studies.

The main objective of this study was to empirically explore the relationship between IPRs protection and the economic growth of the GCC petro-states. The findings largely confirm the prior expectations relating to 'traditional' sources of economic growth as postulated in the economic growth theories, in terms of convergence hypothesis, population growth, trade openness, and others; these are in line with the findings of many studies, including Barro and Saia-i-Martin[68], Sinha and Sinha[69], and others.

However, what is important is that the present study does not find any empirical validations with respect to the role of IPRs in promoting economic growth in the GCC petro-states. At the same time, the study does not find that stronger IPRs protection in GCC countries reduces economic growth, as the variable of IPRs has a positive sign but is not statistically significant in the three specified models. This result is similar to the findings of many studies, including Janjua and Samad[70], Boldrin and Levine[71], Samuel[72], and others.

The insignificant relationship between IPRs and economic growth in the case of GCC countries might be related to the fact that GCC countries are 'rentier states'[73] in which IPRs per se are not sufficient to ensure technological progress and innovations. In order for IPRs to promote innovations and economic growth, a coherent set of complementary policies are required, and the governments of the GCC countries need to play a positive role in inducing technology acquisition and creation.

[68] Barro, R. and Sala-i-Martin, X., *Economic Growth*, 1995 McGraw Hill, New York.
[69] Sinha, D. and Sinha, T., "Toda and Yamamoto causality tests between per capita saving and per capita GDP for India", 2007, *MRP A Paper No. 2564*, 04 January.
[70] Janjua, Z. and Samad, G., "Intellectual property rights and economic growth: The case of middle-income developing countries", *The Pakistan Development Review*, 2007, Volume 46, pp.711-722.
[71] Boldrin, M. and Levine, D., "Against Intellectual Monopoly", *Cambridge University Press*, 2009, Cambridge, UK.
[72] Samuel, A., "Intellectual property rights, innovations, and economic growth in Sub-Saharan Africa", *Journal of Third World Studies*, 2011, Vol. 28, pp. 231-236.
[73] Springborg, O., "GCC Countries as 'Rentier States' Revisited", *The Middle East Journal*, 2013, Vol. 67, 301-309

International Journal for Innovative Engineering and Management Research
PEER REVIEWED OPEN ACCESS INTERNATIONAL JOURNAL
www.ijiemr.org