

## **INTELLECTUAL PROPERTY RIGHTS AND ECONOMIC GROWTH: EVIDENCES FROM HIGH, MIDDLE AND LOW INCOME COUNTRIES**

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**Abstract.** The protection of intellectual property rights has been considered as an engine of economic growth in developed and developing economies. In this study, we analyze the impact of intellectual property rights on economic growth for a balanced panel of 38 countries (11 from high income countries; 16 from middle income countries; and 11 from low income countries) over the period of 1975-2005 by utilizing Ginarte and Park Index of Intellectual Property Rights (2005). The empirical results reveal that intellectual property rights contribute significantly to economic growth. But the impact is found to be more significant in high income countries as compared to middle and low income countries. Similarly, the effect is stronger in case of upper middle income countries as compared to lower middle income and low income countries.

### **I. INTRODUCTION**

The protection of the Intellectual Property Rights (IPR) has been an integral component of economic growth both in developed and developing countries.

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**Acknowledgements.** The authors would like to express their gratitude to Walter G. Park, Associate Professor, Department of Economics, American University, USA, for providing the Index of Intellectual Property Rights (2005). We are thankful to Ghulam Samad, Research Economist, Pakistan Institute of Development Economics, Islamabad, for his invaluable comments and technical assistance. We also thank to Dr. Shujaat Farooq, Assistant Professor, National University of Science and Technology, Islamabad, and Nasir Iqbal, Staff Economist, Pakistan Institute of Development Economics, Islamabad, who facilitated us to conclude for the policy recommendations during the entire analysis.

The technological innovations<sup>1</sup> have long been recognized as a stimulus for raising total factor productivity and living standards through the production and provision of better quality goods and services in various economies. More specifically, the technological progress causes the changes in the production and processing techniques, modification of organizational structures, which enhance the productivity and growth in various economies over a period of time. For technological innovations, the investors and innovators prefer to invest in various research and development activities in order to earn higher returns from their inventions, depending upon protection of IPR in different countries. Besides, creating new products through various research and development activities have also been considered as an integral component to enhance the stock of knowledge, which is essential for future innovations and economic growth. In this regard, appropriate policies in favour of different innovative-activities and protection of intellectual property rights are essential for long-run economic growth in developed and developing countries.

The effectiveness of IPR on economic growth in different countries depends upon their various stages of development (being measured in terms of per capita GDP growth and/or human-capital development); innovative capability and imitative activities; technological development; and factor endowments, etc. In general, due to different R&D activities, mostly the innovations are produced in high income countries and protection of intellectual property rights further encourages for innovations by allowing the innovators to earn returns from their inventions over a period of time. In all middle income countries, intellectual property rights positively affect the economic growth but this effect is less than that of high income countries, which may be due to the fact that the level of protection of intellectual property rights in these countries is very low. Moreover, among the middle income countries, each entity is different in terms of its economic structure with divergent intellectual property rights. Therefore, these middle income countries are divided into upper middle income countries and lower middle income countries. In upper middle income countries, intellectual property rights are supposed to have positive effect on economic growth. On the other hand, in lower middle income countries, due to poor protection of intellectual property rights, IPRs have only moderate effect on economic growth. In low income countries, this effect further weakens.

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<sup>1</sup>Patents are granted over innovations, possessing novelty, inventiveness and industrial applications.

As far as empirical evidence on the subject is concerned, only limited literature is available compared to that in other areas of economics. For 95 countries, Gould and Gruben (1996) utilize Rapp and Rozek index of intellectual property rights and conclude that IPR protection has positive effect on economic growth and this effectiveness is slightly stronger for more open economies. Thompson and Rushing (1996) carry out a similar exercise for 112 countries and find a positive, though statistically insignificant, relationship between the IPR protection and economic growth. Both these studies examine the impact without any distinction between high income, upper middle income, lower middle income and low income countries. Thompson and Rushing (1999) extend their previous work for 55 developed and developing countries and conclude that the 'patent protection' has a positive and significant impact on total factor productivity in more advanced countries. By employing Ginarte and Park (1997) index of IPR, Kanwar and Evenson (2003) examine for a panel of 32 countries and find out that the protection of intellectual property rights has a positive and significant impact on research and development activities in these countries. They also conclude that stronger protection of IPR promotes the innovation and technological progress that has a positive impact on productivity and economic growth. By using the threshold regression techniques of Hansen (1996; 1999; 2000), Falvey *et al.* (2004a) improve the 'single equation regression analyses' for 80 developed and developing countries and conclude that the effectiveness of IPR protection depends upon various stages of development and structure of the concerned economies. Maskus *et al.* (2005) examine and show that the effect of IPR protection on economic growth depends on the level of development in different countries. Other factors, stimulating the economic growth, include: innovations, technological development and knowledge sharing and market structure. Janjua and Samad (2007) estimate an empirical relationship between protection of IPR and economic growth for 10 middle income developing countries with balanced and unbalanced data set of 1960-2005 and 1970-74 respectively. They conclude that intellectual property system does not necessarily contribute in the economic growth in middle income countries due to lack of well prepared infrastructure development in order to accept the challenge of IPR protection.

The motivation for this study comes from the fact that the previous studies, though are quite comprehensive, but do not differentiate for high income countries, upper middle income countries, lower middle income countries and low income countries in terms of the effectiveness of intellectual property rights on economic growth. This distinction is important

as the level and structure of IPR protection is quite different in upper middle income countries compared to that in lower middle income countries.

With this literature gap, the objective of the present study is to estimate and analyze the effect of IPR on economic growth in high income countries, upper middle income countries, lower middle income countries and low income countries respectively. More specifically, we have estimated the effect of IPR protection on economic growth in the sample countries. For this purpose, we have taken a balanced panel of 38 countries among which 11 are high income countries; 8 are upper middle income countries; 8 are lower middle income countries; and 11 are low income countries. For empirical investigation, the study uses data over the period 1975-2005. Furthermore, we have utilized Ginarte and Park index of intellectual property rights (2005).

The empirical results reveal that the IPRs contribute significantly to economic growth. But the impact is found to be more significant in high income countries compared to that in middle income and low income countries. Similarly, the effect is stronger in case of upper middle income countries as compared to lower middle income countries.

This paper is organized as follows: after brief introduction in section I, methodological framework and data description are discussed in section II. The empirical results regarding the effect of intellectual property rights on economic growth for different countries are explained and discussed in section III. Summary of findings and concluding remarks are presented in Section IV.

## **II. METHODOLOGICAL FRAMEWORK**

The IPRs and economic growth are positively and significantly linked with each other (Gould and Gruben, 1996) and this relationship is more in open and developed economies as compared to closed and developing economies. The effectiveness of IPR also depends upon the physical infrastructure of concerned economies; and this impact becomes prominent when countries reach a particular level of development that can be measured in terms of their initial level of per capita GDP and factor endowments (Thompson and Rushing, 1996).

In general, various research and development activities and innovations add to the stock of knowledge and help to earn profits either through the introduction of new products or via the upgrading of currently available products. Moreover, every new product, which is produced either through product patenting and/or process patenting, increases the stock of knowledge

thereby reducing the cost of innovations in future through knowledge accumulation. The accumulation of knowledge and IPR protection cause to enhance the innovation and economic growth in the short-run as well as in the long-run in high income developed and low income developing countries. A limited literature is available in relation with intellectual property rights, innovation and economic growth for developing countries.<sup>2</sup>

The concept of convergence implies that poor economies grow faster than richer ones in terms of their initial level of per capita GDP, examined by Barro (1991) and we obtain the negative coefficient for this level of GDP, which conforms that the convergence has been achieved in the system. Trade openness and human capital stock also contribute to the economic growth (Romer, 1990b; Grossman and Helpman, 1991). In many countries, a fundamental objective of different economic policies is to obtain high economic growth rate by lowering the inflation rate (Gokal and Hanif, 2004). High inflation is associated with increased price variability, which leads to uncertainty for the future profitability and investment in various projects and hence low level of productivity and economic growth. Inflation may also lessen the international competitiveness of domestic products by increasing their prices and affects the balance of payments.

The protection of IPRs provides protective measures to their trading partners over a period of time, which encourages the potential innovators by granting temporary monopoly powers over their innovations. Therefore, the choice of IPR policy reflects a balancing of both stronger and weaker considerations in terms of protecting of IPR, intending to restore incentives for future innovations, which may encourage long-run economic growth and improves the quality of products. Population growth may also affect the productivity and growth differently in high income developed countries and low income developing countries. In developed countries the impact of population growth appears to be positive, as determined by their absorption capacity. But in developing countries, population growth leads to less capital per worker, decreasing the per capita output and consumption. When businesses are investing to raise their production level in physical capital and the government invests in construction of roads, railways, schools, and hospitals, reflecting the optimism for productivity and economic growth.

The previous brief review of literature suggests that per capita GDP growth depends on initial level of per capita GDP, inflation, intellectual

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<sup>2</sup>For references on the subject, see for instance Kormendi and Meguire, 1985; Barro, 1991; Romer, 1990a; Mankiw *et al.*, 1992; and Levine and Renelt, 1992, among others.

property rights, population growth rate, trade openness and rate of investment. Among these variables, initial level of per capita GDP predicts the level of development; investment rate shows production of new goods and services; population growth determines that how per capita growth rate of GDP is affected over a period of time; inflation determines the stability of the country; and trade openness elaborates sum of the exports plus imports to GDP ratio – open economy. Based on the literature, our analysis uses an estimated growth equation to empirically investigate the relationship between intellectual property rights and economic growth through fixed effects method:

$$y_{it} = \beta_{it} + \beta_1 \bar{y}_{it} + \beta_2 \pi_{it} + \beta_3 ipr_{it} + \beta_4 gn_{it} + \beta_5 to_{it} + \beta_6 inv_{it} + \varepsilon_{it}$$

In this relationship, for  $i^{\text{th}}$  country in  $t^{\text{th}}$  time period, here  $y$  indicates per capita GDP;  $\bar{y}$  shows initial level of per capita GDP at the beginning of the sample period;  $\pi$  is the inflation rate;  $ipr$  is intellectual property rights index;  $gn$  indicates population growth rate;  $to$  is trade openness;  $inv$  exhibits investment to GDP ratio; and  $\varepsilon_{it}$  is the error term.

In empirical analysis, both the fixed and random effect models conclude their outcome differently. Generally, for a balanced panel, one might expect that the fixed effects method works better. On the other hand, when sample contains limited number of observations then random effects method would be more appropriate. During the empirical analysis, in order to determine the validity of fixed and random effects methods we use Hausman test. The test assumes that under null hypothesis both OLS and GLS are consistent but OLS is inefficient under alternative hypothesis, OLS is more reliable than GLS methods. If the value of Hausman statistic is large, we reject the null hypothesis and use the fixed effects methods. On the other hand, a small value of the statistic suggests that the random effects estimator is more appropriate.

## DATA DESCRIPTION

In this study, the data covers 38 countries<sup>3</sup> with 11 high income countries; 16 middle income countries including 8 upper middle income and 8 lower

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<sup>3</sup>**High Income Countries:** Australia, Austria, Canada, Finland, France, Italy, Japan, Singapore, Switzerland, United Kingdom, and United States.

**Upper Middle Income Countries:** Argentina, Brazil, Columbia, Mexico, Peru, South Africa, Uruguay, and Venezuela.

**Lower Middle Income Countries:** Guatemala, Sri Lanka, Philippines, Ecuador, Morocco, Nigeria, Paraguay, and Swaziland.

middle income countries; and 11 low income countries. The sample countries have been classified into various income groups as per the World Bank's Atlas Method (2010) and level of IPR protection in these countries. The time period covered is 1975-2005. Instead of using data for each year, we have taken averages of all variables over a period of five years. Data on per capita GDP, initial level of per capita GDP, population growth, investment (as a percentage of GDP), trade openness and inflation have been taken from the World Development Indicators (2008) and Penn World Table (PWT 6.1). The study employs Ginarte and Park index of intellectual property rights<sup>4</sup> (2005), constructed for each of the country, *quinquennially* from 1975-2005 through the use of coding scheme as per their national patent laws. To cover all aspects of intellectual property rights, Ginarte and Park index adopts five major categories, namely:

- (i) extent of coverage;
- (ii) membership in international patent agreements;
- (iii) provisions for loss of protection;
- (iv) enforcement mechanisms; and
- (v) duration of protection.

Each sub-category of the index is scored a value between 0 and 1 and sum of all these categories provides an overall value of IP index for each country.

Table 1 describes the index values of patent rights for sample countries for required time period.

Now we determine the values for each category through coding scheme for which each condition possesses binary characters: YES, *if satisfied* and NO, *if not satisfied*. A country satisfying all three conditions, necessary for the loss of protection, scores 3 out of 3 and earns a value of 1 regarding the provision for loss of protection and if it satisfies only 1 condition, it will obtain a score of 1/3 against this provision, and so on. Table 2 describes all the categories, sub-categories with their scoring values for the construction of Ginarte and Park index of intellectual property rights.

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**Low Income Countries:** India, Cameroon, Bangladesh, Pakistan, Kenya, Malawi, Nepal, Haiti, Senegal, Zambia, and Zimbabwe.

<sup>4</sup>Since Rapp and Rozek index of intellectual property rights (1990) does not fully cover all the aspect of intellectual property rights, therefore, in 1997 another index of IPR was developed by Ginarte and Park, which covers more aspect of IPR.

TABLE 1  
Ginarte and Park Index of IPR

S. No.	Country	1975	1980	1985	1990	1995	2000	2005
1.	Argentina	1.71	1.71	1.71	1.71	2.73	3.98	3.98
2.	Australia	2.04	2.49	2.49	3.28	4.17	4.17	4.17
3.	Austria	2.64	3.01	3.43	3.68	4.21	4.33	4.33
4.	Bangladesh	1.47	1.47	1.47	1.47	1.87	1.87	1.87
5.	Brazil	1.08	1.28	1.28	1.28	1.48	3.59	3.59
6.	Cameroon	1.58	1.90	1.90	1.90	2.10	2.23	3.06
7.	Canada	2.91	2.91	3.16	3.28	4.34	4.67	4.67
8.	Colombia	1.13	1.13	1.13	1.13	2.74	3.59	3.72
9.	Ecuador	1.16	1.16	1.16	1.16	2.04	3.73	3.73
10.	Finland	2.30	2.98	3.31	3.31	4.42	4.54	4.67
11.	France	3.23	3.63	3.76	3.88	4.54	4.67	4.67
12.	Guatemala	0.75	0.75	0.75	0.88	1.08	1.28	3.15
13.	Haiti	2.58	2.58	2.58	2.58	2.58	2.90	2.90
14.	India	1.03	1.03	1.03	1.03	1.23	2.27	3.76
15.	Italy	2.82	3.36	3.68	4.01	4.33	4.67	4.67
16.	Japan	2.78	3.43	3.43	3.88	4.42	4.67	4.67
17.	Kenya	1.38	1.58	1.58	2.03	2.43	2.88	3.22
18.	Malawi	1.29	1.49	1.49	1.49	2.03	2.15	2.15
19.	Mexico	1.12	1.12	1.35	1.36	3.14	3.68	3.88
20.	Morocco	1.58	1.58	1.58	1.58	1.78	3.06	3.52
21.	Nigeria	2.53	2.53	2.53	2.53	2.86	2.86	3.18
22.	Nepal	1.79	1.79	1.79	1.79	1.79	1.79	2.19
23.	Pakistan	1.05	1.05	1.18	1.18	1.38	2.20	2.40
24.	Paraguay	1.13	1.13	1.13	1.13	1.53	2.39	2.89
25.	Peru	0.59	0.59	0.59	0.59	2.73	3.32	3.32
26.	Philippines	2.16	2.16	2.36	2.36	2.56	3.98	4.18



S. No.	Country	1975	1980	1985	1990	1995	2000	2005
27.	Senegal	1.58	1.70	1.90	1.90	1.98	2.10	2.93
28.	Singapore	1.51	1.71	1.71	2.04	3.88	4.01	4.21
29.	South Africa	2.87	3.07	3.07	3.19	3.39	4.25	4.25
30.	Sri Lanka	1.94	2.58	2.78	2.78	2.98	3.11	3.11
31.	Swaziland	1.38	1.38	1.38	1.38	1.98	2.43	2.43
32.	Switzerland	2.80	3.46	3.66	3.91	4.21	4.33	4.33
33.	United Kingdom	2.66	3.76	3.88	4.34	4.54	4.54	4.54
34.	United States	3.83	4.35	4.68	4.68	4.88	4.88	4.88
35.	Uruguay	1.54	1.67	1.67	1.67	2.07	3.27	3.39
36.	Venezuela	0.92	0.92	0.92	0.92	2.82	3.32	3.32
37.	Zambia	1.54	1.54	1.54	1.54	1.62	1.74	1.94
38.	Zimbabwe	1.34	1.74	2.08	2.08	2.28	2.60	2.60

Source: Ginarte and Park (2005)

### Extent of Coverage

This category also includes various sub-categories such as: chemicals and pharmaceuticals; textiles; paper and metallurgy; physics and electricity; mechanical engineering; lighting and heating; weapons; fixed constructions; food items; surgical products; microorganism; and utility models.

Similarly, based on the coverage, each country receives its own index value of patent rights. The countries which provide coverage to all sub-categories receive a value of 1, if 3 then  $1/3$  and if 5 then  $1/5$  and so on. But the developed countries generally provide coverage to all these sub-categories and, therefore, receive maximum value of the index under this category.

In general the patents are granted over different innovations, which possess the characteristics of novelty, inventiveness and industrial applications. Accordingly, various patent laws have been designed to protect the inventions for a certain time period. The utility models develop various measures being applied to different objects as a tool, which result in the improved utilization of the objects.

TABLE 2  
Construction of Ginarte and Park Index of IPR

1.	<b>Extent of Coverage</b>	<b>Yes</b>	<b>No</b>
	Patentability of Chemicals and Pharmaceuticals	1	0
	Patentability of Textiles, Paper and Metallurgy	1	0
	Physics and Electricity	1	0
	Mechanical Engineering, Lighting, Heating, Weapons, Fixed Constructions	1	0
	Patentability of Food	1	0
	Patentability of Surgical products	1	0
	Patentability of Microorganism	1	0
2.	<b>Membership in International Patents Agreements</b>	<b>Yes</b>	<b>No</b>
	TRIPS Agreement	1	0
	Paris Convention	1	0
	Patent Cooperation Treaty (PCT)	1	0
3.	<b>Provisions for the Loss of Protection</b>	<b>Yes</b>	<b>No</b>
	Working Requirements	1	0
	Compulsory Licensing	1	0
	Revocation of Patents	1	0
4.	<b>Enforcement Mechanisms</b>	<b>Yes</b>	<b>No</b>
	Preliminary Injunction	1	0
	Contributory Infringement	1	0
	Burden-of-Proof Reversal	1	0
5.	<b>Duration of Protection</b>	<b>Value</b>	
	<i>Application-based Standard</i>		
	$x \geq 20$ years	1	
	$0 \geq x < 20$	$x / 20$	
	<i>Grant-based Standard</i>		
	$x' \geq 17$ years	1	
	$0 \geq x' < 17$	$x' / 17$	

### **Membership in International Patent Agreements**

Member states protect their inventions at national and international level through patent laws such as: Paris Convention (1883); Patent Cooperation Treaty (1970); and International Convention for the Protection of New Varieties of Plants, 1961 (UPOV). Paris Convention protects industrial property like patents, trademarks and industrial designs; Patent Cooperation Treaty (PCT) is an “International Patent Law Treaty”, providing a uniform procedure for international patenting; and UPOV develops procedures to protect New Varieties of Plants in different countries.

The member states, which satisfy all these three treaties, receive a value of 1 and obtain a value of 1/3 and so on. Since developed (high income) countries are generally the signatory to all the relevant agreements or treaties and receive maximum value of the index as compared to developing (middle and low income) countries, receiving a fraction of the values and hence receive a low value of intellectual property rights index.

### **Provisions for Loss of Protection**

Sometimes the patent holders may face risk of imitation over their inventions and this provision provides protection against the losses which may arise due to working requirements, compulsory licensing and revocation of patents. During working requirements some inventions are exploited and misused for industrial purposes. Under compulsory licensing the patentee share the exploitation of his/her invention with some other parties that has reduced the profit level. Under this measuring category, the countries, which stratify all three conditions, receive a value of 1 and if someone is satisfying 2 of these, then they will get a value of 2/3 and so on.

### **Enforcement Mechanism**

For the adequate enforcement mechanism this category requires the following pertinent conditions, namely: “preliminary injunctions; contributory infringement pleadings; and burden-of- proof reversals”. During *preliminary injunctions* the patentee is provided protection and an alleged infringement has been ceased. On the other hand, *contributory infringement* means to provide protection to those inputs, which are used in the preparation of a patented product. Finally *burden-of-proof reversal* reveals that a product has been produced through a patented process.

If a country is satisfying all these conditions, it will receive a value of 1 and if 2 receives 2/3 under this category and so on.

### **Duration of Protection**

The TRIPS agreement states that each IP product must be protected to earn the returns for a certain time period in the Member States. Due to differences in their patent laws across countries, two scales have been used to measure the strength of patent.

These scales of measurement are different in each country in the sense either the patent must be applications based (date of filing) or grant based (date of granting). Across countries, generally the processing period for granting a patent is 3 or 4 years. The countries in which if inventions are protected for 20 years or more, obtain a value of 1. But those who provide short term protection on their inventions may get a fractional value of 20 years. For example, if a country is providing 15 years of protection, it receives a value of 0.75. If a patent is granted on “grant based” terms, then the duration of protection becomes 17 years.

### **III. RESULTS AND DISCUSSION**

In the entire analysis, dependent variable is average growth rate of GDP per capita, denoted as  $y$  and the explanatory variables are: log of initial level of per capita GDP at the beginning of sample period, denoted as  $\log(\text{INIGDPPC})$ ; inflation rate, denoted as (INF); index of intellectual property rights, denoted as (IPR); population growth rate, denoted as (GPOP); trade openness, denoted as (TRADEOPEN); and investment to GDP ratio, denoted as INV.

Table 3 reports the results regarding the impact of intellectual property rights on economic growth in such a way that column 1 defines explanatory variables and columns 2, 3, 4, 5, 6 and 7 show the empirical results for full sample of countries, high income countries, all middle income group, upper middle income countries, lower middle income countries and low income countries respectively.

The effectiveness of intellectual property rights on economic growth is based on the characteristics of concerned economies, whether they are innovative and/or imitative. Generally, various R&D and innovative activities take place in high income developed countries and the protection of intellectual property rights facilitates in economic growth and development in these countries. On the other hand, very few inventions are produced in low income developing countries and due to weaker protection of intellectual property rights, most of industries rely on pirated and imitated technologies in these countries. Similarly, among high and middle income countries, it is observed that the former are more innovative than latter and accordingly

have different rates of economic growth over a period of time. It has also been observed that in upper middle income countries the impact of IPR on economic growth is significantly greater than that of lower middle income countries, suggesting that in upper middle income countries the IP rights are well protected than in lower middle income countries.

TABLE 3  
Intellectual Property Rights and Economic Growth  
(Balanced Panel and Fixed Effects)

Dependent Variable: Growth Rate of GDP Per Capita						
1	2	3	4	5	6	7
C	31.74 (7.34)**	20.94 (2.40)**	73.18 (13.66)**	105.50 (12.94)**	33.45 (2.68)*	14.26 (3.12)**
Log (INIGDPPC)	-4.56 (-7.38)**	-2.65 (-3.73)**	-9.86 (-10.25)**	-13.32 (-10.89)**	-4.47 (-2.50)*	-2.57 (-2.22)**
INF	-0.0005 (-1.57)*	-0.11 (-1.68)***	-0.001 (-5.07)**	-0.001 (-3.48)**	-0.05 (-0.97)	-0.03 (-5.37)**
IPR	0.79 (3.56)**	1.30 (3.10)**	0.80 (3.29)**	0.48 (1.51)*	0.54 (1.05)	0.47 (0.97)
GPOP	-0.45 (-2.78)**	0.67 (4.48)**	-0.28 (-0.43)	-0.34 (-0.50)	0.18 (0.39)	-0.84 (-1.08)
TRADEOPEN	-0.003 (-0.42)	0.0008 (0.35)	-0.012 (-1.60*)	0.04 (2.56)**	-0.02 (-1.95)**	0.006 (0.26)
INV	0.19 (8.65)**	20.94 (1.86)***	0.10 (1.96)**	0.18 (2.81)**	-0.02 (-0.47)	(0.26) 4.34**
R-squared	0.59	0.62	0.62	0.73	0.40	0.58
F-statistic	6.17**	7.97**	5.65**	6.87**	1.75**	4.20**
Hausman statistic	32.92	7.70	34.86	39.81	17.50	12.30

\*, \*\*, \*\*\* indicate significance at 10, 5, and 1 percent level respectively, t-statistics are reported in parenthesis.

Column 2 reveals the empirical results for full sample of countries, stating that most of the variables have their expected signs and are significant at conventional level, except for the trade openness, which insignificantly affects the growth rate of per capita GDP. Further, it has also been observed that the intellectual property rights and rate of investment both have positive and significant impact on per capita growth of GDP. In addition, initial level of per capita GDP; inflation; and population growth all are negatively and

significantly affecting the economic growth in these countries. The effect of initial level of per capita GDP on per capita growth is negative, confirms the convergence hypothesis. Similar results are found in *Falvey et al.* (2006); Janjua and Samad (2007).

Generally, most countries sustain and maintain their economic growth by reducing the inflation rate because it creates uncertainty about future profitability and investment opportunities. High inflation also affects the trade balances by increasing the prices of domestically produced products in the international markets. Borrowing and lending capacities are also affected by high inflation rates (Gokal and Hanif, 2004). Depending upon the structure of economies, inflation and growth may be linearly or non-linearly linked with each other (Barro, 1995; Fischer, 1993; Bruno and Easterly, 1998; Khan and Senhajdi, 2001). In order to examine the effect of inflation on growth, inflation rate is included in the model. The result indicates that it carries the expected negative sign like in other studies (see for instance *Falvey et al.*, 2006). If the inflation increases by one percentage point, it will marginally decrease the growth by 0.0005 percent, which, though statistically significant at 10 percent level but is economically insignificant.

The intellectual property rights are positively and significantly affecting the economic growth for full sample of countries. The coefficient associated with IPR for balanced data set shows that due to one unit increase (more strengthening of IPR), the per capita growth rate increases by 0.79 percent and is significant at 5 percent level of significance, (similar results are found in other studies like Gould and Gruben 1996; Thompson and Rushing 1996; Kanwar and Evenson 2003; and *Falvey et al.*, 2006, among others). Therefore, in general, the strengthening and protection of IPR help to increase economic growth in all types of countries. Population growth may affect the economic growth differently in different countries. In many developed countries, this impact is found to be positive in the sense that these countries have more absorption capacity as compared to developing countries. But in developing countries, population growth leads to less capital per worker and it decreases the per capita output and consumption. The coefficient of the population, in full sample of countries, indicates that as a result of 1 percent increase in the population growth, the per capita growth decrease by 0.45 percent.

Trade openness augments the economic prosperity and development of the trading partners (Romer, 1990b) and (Grossman and Helpman, 1991). Globally, the protection of IPR and human capital development would be important sources for economic growth processes. While analyzing this

effectiveness, we include trade openness indicator, which is insignificantly impacting the growth rate for full sample of countries. So, once we include IPR protection as one of the independent variable, trade openness no more remains significant in a model of economic growth. This may be due to collinearity between IPR protection and trade openness, as most of the developed countries have effective IPR protection mechanism and at the same time they are more open. The IPRs affect the economic growth in more open economies as compared to closed economies (Gould and Gruben, 1996). Investment to GDP ratio also promotes economic growth. In our analysis, the empirical results reveal that if investment increases by one percent, then per capita growth will rise by 0.19 percent (as found in Falvey *et al.*, 2006; and Janjua and Samad, 2007).

An important point is noteworthy. In the previous studies, in all middle income countries, the intellectual property rights and economic growth negatively linked with each other or *at least* results are ambiguous (See for instance, Falvey *et al.*, 2006; Janjua and Samad, 2007). In these countries, due to poor research and development activities with fewer inventions and weak protection of the intellectual property rights, many industries rely on pirated and imitated technologies and hence have low level of productivity and economic growth. Among middle income countries, however, each entity is different in terms of its economic structure with divergent protection of the intellectual property rights.

Therefore, we have classified middle income countries into upper middle income countries and lower middle income countries for empirical examination of the relative effectiveness of IPR on economic growth. In our study, different results have been found for upper middle income countries and lower middle income countries. Overall we have classified the sample countries into four major groups, namely:

- (i) high income countries;
- (ii) upper middle income countries;
- (iii) lower middle income countries; and
- (iv) low income countries.

Column 3 shows the empirical results for the relationship between intellectual property rights and economic growth of high income countries<sup>5</sup>

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<sup>5</sup>Countries with per capita income \$ 11,906 or more are considered as high income countries (World Bank Atlas Method, 2010).

in such a way that all variables appear with expected signs and are significant at conventional level, except for trade openness, which has insignificant effect on growth in these countries. The results are in conformity with those found in full sample of countries. The effect of initial level of per capita GDP and inflation on growth is found to be negative and statistically significant. The effect of IPR protection, population growth and investment to GDP ratio on economic growth is significantly positive. Again trade openness is found to have insignificant impact on economic growth. The positive effect of population growth on economic growth, for developed countries is consistent with the empirical findings of various other studies. A few models have examined the dynamic effects of the intellectual property rights on economic growth and development.

Generally, high income developed countries remain engage in different innovative activities and stronger IPR protection causes to increase the economic growth in these countries in the short run (Grossman and Helpman, 1991; Helpman, 1993). In the long run, rate of innovations fall in developed countries due to scarcity of available resources. For high income countries, our study finds that intellectual property rights are positively and significantly affecting the economic growth. The empirical result show that if IPR increased by one unit (more strengthening), the growth rate increases by 1.30 percent, which is significant at 5 percent level of significance. This result is similar to Gould and Gruben (1996); Thompson and Rushing (1996); Kanwar and Evenson (2003); and Falvey *et al.* (2006), suggesting that protection of IPR may help to increase economic growth in high income countries.

In middle income countries, due to lack of secured property rights, most of available assets cannot be turned into productive capital and tradable items, which result into less technological growth with high borrowing costs (De Soto, 1999; 2000). In these countries, intellectual property rights do not clearly affect economic growth and most of the industries rely on pirated and imitated technologies (Falvey *et al.*, 2006) and sometime its impact on economic growth is negative (Janjua and Samad, 2007).

For all middle income countries, column 4 shows that some of the results are contrary to what we have found for our previous analysis. Only IPR and investment to GDP ratio have been found to have positive and significant effect on economic growth. The effect of inflation rate and initial level of per capita GDP is negative. Interestingly the coefficient of trade openness is now marginally significant and is negative but population growth has no effect on economic growth. Effect of population growth is positive in



developed countries as they have high stock of capital and technology. If population grows at positive rate, in these countries, then there are more people to use that capital stock, which increases the marginal product of capital. The inverse effect is expected in developing countries where capital stock is already low. So any increase in population results in decreasing per capita capital stock thereby decreasing productivity of workers. In middle income countries per worker capital lies in between the two extremes. So population growth does not affect much on the labour productivity. That is why; we have found insignificant effect of population on economic growth.

The study concludes that in middle income countries, intellectual property rights is positively and significantly affecting the growth rate of per capita GDP in the sense, if IPR increase by one unit (more strengthening) then the growth increases by 0.80 percent, which is significant at 5 percent level of significance. This result is contrary to Favey *et al.* (2006) where they conclude that the intellectual property rights are not significantly affecting the economic growth in middle income countries. However, the magnitude of the coefficient of IPR is much lower than what we have found in case of developed countries.

In order to distinguish the relative effectiveness of the intellectual property rights on economic growth within middle income countries, we further classify these countries into upper middle income countries and lower middle income countries. Both types of countries are different in their economic structure and availability of resources, therefore, the impact of intellectual property rights on economic growth may vary accordingly in these countries.

The empirical results for the relationship between IPR and economic growth for upper middle income countries<sup>6</sup> are shown in column 5. These results show that the effect of initial level of per capita GDP and inflation rate is again found to be negative. The effect of IPR protection, trade openness and investment is positive.<sup>7</sup> Finally the effect of population growth on economic growth is insignificant.

In upper middle income countries due to fewer research and development activities some inventions are produced and these economies generally import the technologies or hire some potential experts to meet their industrial demands due to having linkages with high income countries and

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<sup>6</sup>Countries with income level of \$ 3856–\$ 11905 are considered as upper middle income countries (World Bank, Atlas Method 2010).

<sup>7</sup>The effect of IPR protection is only marginally significant.

acquire their resources to benefit their economies. These countries rarely adopt and hire pirated and imitated technologies for their production purposes and provide protection to their innovators to earn the returns over their inventions. Results state that the coefficient associated with IPR indicates that increase (more strengthening) of IPR by 1 leads to increase of growth by 0.48 percent, which is significant at 10 percent level of significance. It is, therefore, argued that being the signatory of the WTO's TRIPS agreement, the concerned upper middle income countries are trying to enhance and enforce the protection of IPR to meet the minimum standards of the agreement and hence its impact on economic growth is increasing gradually and progressively.

The World Bank (2010) defines that the countries with income level in the range of \$ 976–\$ 3856 are classified as lower middle income countries and empirical results in relationship with IPR and economic growth for these countries are shown in column 6, indicating that most of the variables have expected sign and are insignificant at conventional level. In these countries, due to scarcity of research and development activities very few inventions are invented and import the foreign technologies and mostly adopt pirated and imitated technologies for their production purposes. The empirical results for lower middle income countries show that only initial level of per capita GDP and trade openness has significant effect on economic growth. The reason of negative effect of trade openness on economic growth may be the fact that increased openness renders the domestic industry to open competition. Domestic industry may not compete in the world market, so the growth of domestic industry is hurt. That is why trade openness has negative effect on economic growth in these countries. The innovations may have long run impact on growth if there is the protection of innovator's rights. The result indicates that the impact of intellectual property rights on growth is positive but insignificant, which means that if such countries are encouraged to protect the property rights in the short run then its impact on growth can be achieved in the long run.

The countries with an income level of \$ 975 or less are considered as low income countries (World Bank, 2010) and the empirical results regarding IPR and economic growth relationship for these countries are shown in column 7, which indicate that the initial level of per capita GDP and inflation rate negatively affect economic growth. Investment to GDP ratio positively affects economic growth. Trade openness, population growth and IPR protection have insignificant effect on economic growth. Population growth, as expected, negatively affects economic growth in low income countries. These countries are thickly populated but have low capital stock.

So the per capita capital stock is quite low in these countries. Increase in population, therefore, reduces per worker capital stock, which in turn negatively affects labour productivity. Its effect is statistically insignificant, which may be due to fact that we have included only 11 countries. This problem may not occur if sample of countries is increased to include more countries. Trade openness has insignificant effect on economic growth. Developing countries rely more on agriculture and less on industry. So if these countries become more open, their agriculture sector gets advantage of that but their industrial sector loses. So the cost and benefits of openness compensate each other and the net effect of openness on economic growth is negligible. The study also finds positive but insignificant effects of IPR protection on economic growth; which is consistent with Falvey *et al.* (2006). The reason for insignificant effect is that, in our sample, the developing countries are at their different levels of growth and development. That is, there is significant variation among the per capita GDP in these countries. However, the IP index shows no variation for these countries, so that different growth rates, in these countries, in the sample cannot be explained by the intellectual property rights.

#### **IV. SUMMARY OF FINDINGS AND CONCLUDING REMARKS**

In this study, we empirically investigate the impact of the intellectual property rights on the economic growth for a panel of 38 countries from which 11 are high income countries; 8 are upper middle income countries; 8 are lower middle income countries; and 11 are low income countries. The sample period spans over 1975–2005. The empirical results provide the evidence that the intellectual property rights contribute to economic growth positively and significantly in case of full sample of countries. Further, on classifying the entire sample of countries into high income countries, upper middle income countries, lower middle income countries and low income countries, we have found that the impact is more in high income countries compared to that in middle and low income countries. Moreover, it also concludes that the impact of intellectual property rights on economic growth is more effective in upper middle countries compared to that in lower middle income countries, which in turn is stronger when compared with low income countries.

In order to get benefits for the productivity and economic growth, the agreement on Trade Related aspects of Intellectual Property Rights (TRIPS) may encourage for the innovations in developed and developing countries through setting some standards for the protection and enforcement of

intellectual property rights. It should also leave some room for discretion in order to achieve different goals and targets regarding protection of intellectual property rights for developing countries. Regular publications in relation with patents must be encouraged in developing countries, which will help in knowledge accumulation and innovations over a period of time. In this way, in future, the TRIPS standards will expand among the trading partners for their technological development and economic prosperity. Moreover, the national intellectual property legislation should be updated for international competitiveness. In order to enforce the privileges of the intellectual property, the role of police, custom, Federal Investigation Agency (FIA) and specialized judiciary should be re-evaluated in the developing countries.

## REFERENCES

- Aghion, P. and P. Howitt (1992), A model of growth through creative destruction. *Econometrica*, Volume 60(2), pp. 323-351.  
<http://www.jstor.org/stable/2951599>
- Backus, David K., Patrick J. Kehoe and Timothy J. Kehoe (1992), In search of scale effects in trade and growth. *Journal of Economic Theory*, Volume 58(2), pp. 377-409. [http://dx.doi.org/10.1016/0022-0531\(92\)90060-U](http://dx.doi.org/10.1016/0022-0531(92)90060-U)
- Barro, Robert J. (1991), Economic growth in a cross section of countries. *The Quarterly Journal of Economics*, Volume 106(2), pp. 407-443.  
<http://dx.doi.org/10.2307/2937943>
- Barro, Robert J. and Xavier Sala i Martin (1990), Economic growth and convergence across the United States. National Bureau of Economic Research Working Paper # 3419.
- Benhabib, J. and M. M. Spiegel (1994), The role of human capital in economic development: Evidence from aggregate cross-country data. *Journal of Monetary Economics*, Volume 34(2), pp. 143-173.  
[http://dx.doi.org/10.1016/0304-3932\(94\)90047-7](http://dx.doi.org/10.1016/0304-3932(94)90047-7)
- Branstetter, L. G., R. Fisman and C. F. Foley (2004), Do stronger intellectual property rights increase international technology transfer? Empirical evidence from U.S. firm-level panel data. *World Bank Policy Research Working Paper No. 3305*. Washington, DC: The World Bank.
- Chen, Y. and T. Puttitanun (2005), Intellectual property rights and innovation in developing countries. *Journal of Development Economics*, Volume 78(2), pp. 474-493. <http://dx.doi.org/10.1016/j.jdeveco.2004.11.005>
- Chin, J. C. and G. M. Grossman (1990), Intellectual property rights and north-south trade. In R. W. Jones and A. O. Krueger (eds.), *The Political Economy of International Trade*, pp. 90-107. Cambridge, MA: Basil Blackwell.
- Cohen, W. M. and D. A. Levinthal (1989), Innovation and learning: The two faces of R&D. *The Economic Journal*, Volume 99(397), pp. 569-596.  
<http://www.jstor.org/stable/2233763>
- De Long, J. Bradford (1988), Productivity growth, convergence and welfare: Comment. *The American Economic Review*, Volume 78(5), pp. 1138-1154.
- Deardorff, A. V. (1992), Welfare effects of global patent protection. *Economica*, Volume 59(233), pp. 35-51. <http://www.jstor.org/stable/2555064>
- Diwan, I. and D. Rodrik (1991), Patents, appropriate technology, and North-South trade. *Journal of International Economics*, Volume 30, pp. 27-47.  
[http://dx.doi.org/10.1016/0022-1996\(91\)90003-O](http://dx.doi.org/10.1016/0022-1996(91)90003-O)

- Eaton, J. and S. Kortum (1996), Trade in ideas: Patenting and productivity in the OECD. *Journal of International Economics*, Volume 40, pp. 251-278.  
[http://dx.doi.org/10.1016/0022-1996\(95\)01407-1](http://dx.doi.org/10.1016/0022-1996(95)01407-1)
- Falvey, R., N. Foster and D. Greenaway (2006), Intellectual property rights and economic growth. *Review of Development Economics*, Volume 10(4), pp. 700-719. <http://dx.doi.org/10.1111/j.1467-9361.2006.00343.x>
- Feldstein, Martin and Charles Horioka (1980), Domestic saving and international capital flows. *The Economic Journal*, Volume 90(358), pp. 314-329.  
<http://www.stor.org/stable/2231790>
- Ferrantino, M. J. (1993), The effect of intellectual property rights on international trade and investment. *Weltwirtschaftliches Archiv*, Volume 129(2), pp. 300-331.
- Gilbert, R. J. and D. Newey (1982), Preemptive patenting and the persistence of monopoly. *The American Economic Review*, Volume 72, pp. 514-526.
- Ginarte, J. C. and W. G. Park (1997), Determinants of patent rights: A cross-national study. *Research Policy*, Volume 26(3), pp. 283-301.  
[http://dx.doi.org/10.1016/S0048-7333\(97\)00022-X](http://dx.doi.org/10.1016/S0048-7333(97)00022-X)
- Glass, A. J. and K. Sagi (2002), Intellectual property rights and foreign direct investment. *Journal of International Economics*, Volume 56(2), pp. 387-410.  
[http://dx.doi.org/10.1016/S0022-1996\(01\)00117-9](http://dx.doi.org/10.1016/S0022-1996(01)00117-9)
- Gould, D. M. and W. C. Gruben (1996), The role of intellectual property rights in economic growth. *Journal of Development Economics*, Volume 48(2), pp. 323-350. [http://dx.doi.org/10.1016/0304-3878\(95\)00039-9](http://dx.doi.org/10.1016/0304-3878(95)00039-9)
- Grossman, Gene M. and Elhanan Helpman (1991), *Innovation and Growth in the Global Economy*. Cambridge, MA: MIT Press.
- Helpman, E. (1993), Innovation, imitation, and intellectual property rights. *Econometrica*, Volume 61(6), pp. 1247-1280.  
<http://www.jstor.org/stable/2951642>
- Janjua, Pervez Z. and Ghulam Samad (2007), Intellectual property rights and economic growth: The case of middle income developing countries. *The Pakistan Development Review*, Volume 46(4), Part II (Winter), pp. 711-722.
- Kanwar, S. and R. Evenson (2003), Does intellectual property protection spur technological change? *Oxford Economic Papers*, Volume 55(2), pp. 235-264.  
<http://dx.doi.org/10.1093/oep/55.2.235>
- Mansfield, E. (1986), Patents and innovation: An empirical study. *Management Science*, Volume 32(2), pp. 173-181. <http://www.jstor.org/stable/2631551>
- Mansfield, E. (1995), Intellectual property protection, direct investment and technology transfer: Germany, Japan and the United States. *IFC Discussion*

*Paper No. 27.* Washington, DC: The World Bank and International Finance Corporation.

- Mansfield, E., J. Rapoport, A. Romeo, S. Wagner and G. Beardsley (1977), Social and private rates of return from industrial innovations. *The Quarterly Journal of Economics*, Volume 91(2), pp. 221-240. <http://dx.doi.org/10.2307/1885415>
- Maskus, K. E. (2000a), *Intellectual Property Rights in the Global Economy*. Washington, DC: Institute for International Economics.
- Maskus, K. E. and M. Penubarti (1995), How trade-related are intellectual property rights? *Journal of International Economics*, Volume 39, pp. 227-248. [http://dx.doi.org/10.1016/0022-1996\(95\)01377-8](http://dx.doi.org/10.1016/0022-1996(95)01377-8)
- McCalman, P. (2002), National patents, innovation and international agreements. *Journal of International Trade and Economic Development*, Volume 11(1), pp. 1-14. <http://dx.doi.org/10.1080/09638190110093136>
- Park, W. G. and J. C. Ginarte (1997), Intellectual property rights and economic growth. *Contemporary Economic Policy*, Volume 15(3), pp. 51-61. <http://dx.doi.org/10.1111/j.1465-7287.1997.tb00477.x>
- Rafiquzzaman, M. (2002), The impact of patent rights on international trade: Evidence from Canada. *Canadian Journal of Economics*, Volume 35(2), pp. 307-330. <http://dx.doi.org/10.1111/1540-5982.00132>
- Rapp, R. T. and R. P. Rozek (1990), Benefits and costs of intellectual property protection in developing countries. *Journal of World Trade*, Volume 24(5), pp. 75-102.
- Schneider, P. H. (2005), International trade, economic growth and intellectual property rights: A panel data study of developed and developing countries. *Journal of Development Economics*, Volume 78(2), pp. 529-547. <http://dx.doi.org/10.1016/j.jdeveco.2004.09.001>
- Segerstrom, Paul S. (1991), Innovation, imitation, and economic growth. *Journal of Political Economy*, Volume 99(4), pp. 807-827. <http://www.jstor.org/stable/2937781>
- Smith, P. J. (1999), Are weak patent rights a barrier to U.S. exports? *Journal of International Economics*, Volume 48(1), pp. 151-177. [http://dx.doi.org/10.1016/S0022-1996\(98\)00013-0](http://dx.doi.org/10.1016/S0022-1996(98)00013-0)
- Smith, P. J. (2001), How do foreign patent rights affect U.S. exports, affiliate sales, and licenses? *Journal of International Economics*, Volume 55(2), pp. 411-439. [http://dx.doi.org/10.1016/S0022-1996\(01\)00086-1](http://dx.doi.org/10.1016/S0022-1996(01)00086-1)
- Taylor, M. S. (1993), TRIPS, trade, and technology transfer. *Canadian Journal of Economics*, Volume 26(3), pp. 625-637. <http://www.jstor.org/stable/135891>

- Thompson, M. A. and F. W. Rushing (1996), An empirical analysis of the impact of patent protection on economic growth. *Journal of Economic Development*, Volume 21(2), pp. 61-79.
- Xu, B. and E. P. Chiang (2005), Trade, patents and international technology diffusion. *Journal of International Trade and Economic Development*, Volume 14(1), pp. 115-135. <http://dx.doi.org/10.1080/0963819042000333270>