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Intellectual Property Rights and Economic Growth: The Case of Middle Income Developing Countries

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1. INTRODUCTION

Intellectual property (IP) refers to the creation of mind: inventions, literary and artistic works, and symbols, name, and images used in commerce. Intellectual property rights (IPRs) have been widely recognised as a growth enhancing factor for the global economies as a whole. IPRs regime can influence the growth process through domestic and external sector of an economy. This study is primarily concerned with the effects of IPRs regime through external sector. Through different channels IPRs can promote economic growth in the recipient countries. The most important is technology transfer and its positive spillovers. Therefore, IPRs exert economic growth, which requires increase in productivity, increase in productivity requires increase in technological innovation and it requires the efficient protection of IPRs Rapp and Rozek (1990). The IPRs can influence the average growth more effectively in the open economies as compare to the close one Gould and Gruben (1996). Latter on Thompson and Rushing (1999) extended the model and included total factor productivity (TFP) in their growth model, which shows that IPRs have an insignificant impact on TFP for developed and developing countries but a positive and significant impact for the developed countries. To sustain economic growth it requires secured property rights system.

Due to lack of secured property rights system and awareness about it, assets in the developing countries cannot be turned into productive capital, traded outside, used as collateral for a loan, or share against investment. Therefore it result in lower technology growth, remains at high risk with no collateral, higher costs of borrowing, and face greater costs of financial intermediation De Soto (1999, 2000). The most important aspect of IPRs is that it brings technical know how, competitiveness to the local firms in the recipient countries, which can be used to expand their business opportunities.

World Bank (2002, 2003, 2005) as well as World Intellectual Property Organisation and UNCTD in many publications asserts that protection of IPRs can help

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in revenues generation, improve balance of payment (BOP), provide access to international markets, create confidence to investors, increase employment opportunities, and productivity as well as provide technical know how to the world developing countries. Moreover, the importance of IPRs especially Geographical Indication (GI) and Traditional Knowledge can help in poverty alleviation.

This study makes two important contributions to the empirical literature. First, it examines the relationship between IPRs and economic growth. Second, it considers the effect of IPRs on middle income developing countries by using large, time series, and both balanced as well as unbalanced data.

Section 2 of our study deals with the linkages of IPRs to economic growth. Section 3 discusses data description and econometric techniques. Section 4 covers results analysis. Section 5 concludes the study with recommendations.

2. LINKAGES OF IPRs TO ECONOMIC GROWTH

Classical economist Adam Smith and writers of neoclassical tradition like Solow and Swan (1956) recognised that productivity depend on saving rate, population growth, and technological progress. Solow added technology to the production function equation. However, in his model technology works exogenously. The major weakness of Solow's model is keeping technology outside of the growth equation [Zipfel (2004)].

The important implication of Solow's model is convergence property. Barro (2001) drives the neoclassical model from the concept of diminishing returns to the role of capital (technology). Economies that have less capital per worker relative to their long run capital per worker tend to have higher rates of return and higher growth rates. The convergence is conditional because the steady-state levels of capital and output per worker depend in the neoclassical model on the propensity to save, the growth rate of population, and the position of the production function characteristics that may vary across the countries. Further cross country factors are for example government policies with respect to levels of consumption spending, protection of property rights, and distortions of domestic and international markets.

The criticism on the neoclassical model is that it leaves technology growth as exogenous factor. It did not have adequate explanatory power to account for output and to predict growth. Therefore economists are in search of more refined ways to account for economic output and growth over time.

The development of endogenous growth models focused on improvement in the productivity that can be linked to faster pace of innovation and extra investment in human capital. Endogenous growth theorists stress the need for government and private sector institutions and markets which nurture innovation, and provide incentives for individuals to be inventive.

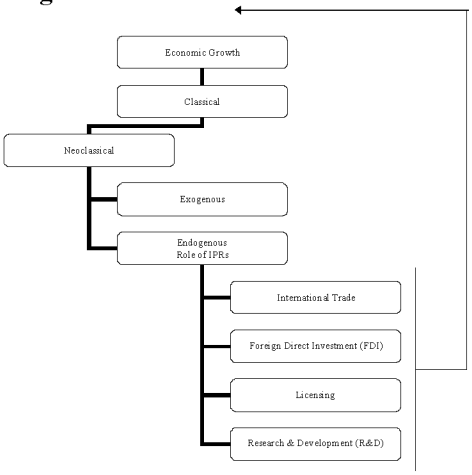
According to the concept of Romer (1986) positive, long run growth rates can be achieved without assuming exogenous technical change through technology growth as the outcome of competitive firms that invests in knowledge generation. Many authors have tested Romer's findings. Important modifications and re-interpretations have included the role of human capital and imperfect competition and misuse of intellectual property. Imperfect competition implies that welfare may be suboptimal. Would a social planner prefer more or less resources devoted to innovation? In general, the social benefit of an innovation cannot be fully captured by a monopolist implying too little private investment in innovation.

Lucas (1988), Rebelo (1991), and Barro (1995) were of the views that neoclassical model can be broadened from physical capital to include human capital in the forms of education, experience, and health. Gary Becker (1990) defines human capital as, "embodied knowledge and skills…" According to him "economic development depends on advances in technological and scientific knowledge, therefore development presumably depends on the accumulation of human capital". Human capital affects economic growth in two ways. Rogers (2003) First, if human capital (H) is a factor of production, e.g. Y=f (A, K, H, L); changes in H will be correlated with changes in Y (growth). Workers with higher levels of education or skills are more productive than simple labourers. Second, the level of human capital may affect the rate of accumulation of other factors. Human capital measurement is a difficult task. A number of studies used average years of schooling to measure human capital [Barro and Lee (1996, 2000). Benhabib and Spiegel (1994) find that changes in schooling capital are uncorrelated to growth. However, they find that changes in schooling capital are related to technological growth.

Falvey, *et al.* (2006) discussed varieties of channels through which technology can be acquired. The effect of IPR protection on growth depends upon the level of development. Other factors, which stimulate economic growth, are stimulation of invention and innovation, market deepening, quality assurance, domestic and international diffusion of knowledge, composition of global research and development Maskus, *et al.* (2005). To what extent the host country's policy environment matter for stronger effective IPRs protections? According to Nair-Reichert and Duncan (2003) it is important to know the welfare implications. The welfare impact of stronger protection depends on the structure of the economies. In a small country with limited production and innovation capabilities higher protection may improve welfare as long as it permits access to products that would otherwise not be available. In a country with a greater production capabilities along with the possibilities for imitation, but with limited innovative capacity measured by its R&D, higher standards of protection will likely displace local producers, raise prices as well as transfer rent from local consumers and producers to foreign titleholders resulting in a negative welfare impact Braga and Fink (2005).

The linkage between IPRs and economic growth is illustrated in the following figure.

Linkages between IPRs and Economic Growth



The proposed model defines the process of economic growth. It emphasises the role of IPRs in endogenous growth theory. It highlights the growth process based on IPRs through the channels of international trade, foreign direct investment (FDI), licensing, R&D (innovation). The combined effects of IPRs through these channels will stimulate economic growth.

Intellectual Property Rights (IPRs) affect international trade flows when knowledge intensive goods move across national boundaries.[1] Patent system promotes technological and business competition, because patent holders and their competitors compete each others to improve inventions and to create new ideas.[2] According to Raffiquzzaman (2002) the effect of stronger patent rights on trade is indeterminate, because the trade volumes simultaneously rise and fall through the market expansion and market power effect. The net trade result depends on which effect dominates; if the market power effect is more substantial than the market expansion effect, trade flows may decrease. If the opposite occurs, strengthened IPR protection will lead to trade expansion.

Soete (1981) argued that R&D expenditure undertaken by countries is used to explain foreign patenting activity in the country. A large literature finds that social rates of return to R&D be substantially higher than private rates of return. These rates of return both inform us that how important R&D is for growth and provide us one of the main justification for government subsidies to R&D Rachel Griffith (2000). Economic theory emphasises that increased level of R&D has very strong positive effects on total factor productivity growth Coe and Helpman (1993). Output through R&D is equal to the rate of return to R&D multiplied by the share of the R&D stock in output.[3] R&D subsidy rate depends on the elasticity of demand for innovative products. If the demand is more elastic, a tightening of Southern IPRs protection is found to induce the North to increase the optimal subsidy rate. Conversely, if the demand is less elastic, a tightening of Southern IPRs is found to invite the North to decrease the optimal subsidy rate Lin (2002).

Regarding the welfare implications, the Southern welfare declines but Northern welfare rises at the steady state, as long as the Southern IP protection is strengthened. The overall picture shows, the welfare maximisation requires a regime of Southern IP protection that is neither as stringent as the North favours, nor as lax as the South prefers.

Foreign direct investment (FDI) and licensing have been given importance in economic growth process by economists. These FDI and licensing flows provide access to the technological and managerial assets of foreign multinational enterprises. Empirical findings of the relationship between IPRs and FDI are of diverse nature in developing countries. Mansfield and Lee (1996) and Seyoum (1996) conclude that country system of IPR protection and development level influences the volume and composition of investment. According to Yang and Maskus (1998) FDI and licensing are important forms of technological transfer. Helpman (1993), Kondo (1995), as well as You and Katayama (2005) found that there is no clear link between stronger patent rights and FDI. However, Javorcik (2005) in his empirical evidence indicated that the extent of IPR

[1]See, Intellectual Property and Development, World Bank (2005), page 19.

[2]To ascertain the role of patent system in international trade Schiffel and Kitti (1978) and Bosworth (1980) considered US as recipient6 and host country respectively. Whereas, Maskus and Penubarti (1995) and Rafiquzzaman (2002) considered manufacturing industry in developed countries.

[3]For detail see, Rachel Griffith, The Institute for Fiscal Studies, Briefing Note No. 12.

protection in a host country affects the composition of FDI, e.g. weak IPR regime divert FDI projects from manufacturing to distribution, because setting up a production plant is more costly that setting up distribution chain.

Maskus (2005) found that FDI depends on the level of technology (lower, medium and high level technology) based in the recipient countries. Investment in lower technology goods and services, such as textiles and apparel, electronic assembly, distribution and hotels depends relatively little on the strength of IPRs and relatively much on input costs and market opportunities. The study concludes that IPRs can be an effective tool for inward FDI, but other factors like market liberalisation and deregulation, technology development policies, and competition regimes are also important.

3. DATA DESCRIPTION AND METHODOLOGY

3.1. Data Description

This study includes 10 middle income developing countries and nine sub-periods: i.e. 1960-64, 1965-69, 1970-74, 1975-79, 1980-1984, 1985-89, 1990-1994, 1995-1999, and 2000-2005 for unbalanced data and seven sub periods: i.e. 1970-74, 1975-79, 1980-1984, 1985-89, 1990-1994, 1995-1999 and 2000-2005 for balanced data. The data on growth rates, population growth, investment, trade, and inflation was taken from World Bank's *World Development Indicators* (2006), for secondary school education from Barro and Lee (2000), for IPR index from Ginarte and Park (1997), for Economic Freedom of the World (EFW) from Gwartney and Lawson's and for Political and Civil Liberty Rights index from Freedom House, a non-profit NGO.

3.2. Methodology

To examine the long-run relationship between growth rate of real GDP and explanatory variables mentioned below, this study apply Pooled Least Square estimation technique (fixed and random) using a cross sectional unbalanced design for the period 1960 to 2005 and balanced design for 1970-2005. The reason for this time period is that it contains a sizeable amount of data available for a large cross section of countries. A reasonably long time period reduces the effects of business cycles and the effects they would play on the applicability of our analyses.

For the sample, we selected Asian ten middle income developing countries[4] including Pakistan, Bangladesh, India, China, Turkey, Malaysia, Indonesia, Sri Lanka, Iran, and Nepal. This particular sample of countries was chosen due to the availability of data for each of the variables used in our study and looking in view the importance of these countries for this study.

The general equation for our study is

$$GROW_{it} = ß_1 + ß_2 INITGDP_{it} + ß_3 GDI_{it} + ß_4 POPGROW_{it} + ß_5 SYR15_{it} + ß_6 TRADEGDP_{it} + ß_7 INFLATION_{it} + ß_8 IPR_{it} + ß_9 EFW_{it} + ß_{10} WF_{it} + U_i + \ldots \quad (A)$$

[4]According to World Bank (2006) classification countries having US$ $ 906-$11,115 as GNI per capita are included in the middle income developing countries.

Where *GROW* is the average growth rate of GDP per capita for country *i* in period *t*, INITGDP is the (logged) level of per capita GDP at the beginning of each five year period, GDI is the average (logged) level of gross domestic investment, POPGROW Is the average growth rate of population, SYR15 is the average years of secondary education for people over 15 years of age, TRADEGDP is the average ratio of imports plus exports to GDP[5], INFLATION is the average rate of inflation[6], IPR index is our measure of IPR protection. To measure the institutional effects, Economic Freedom of the World (EFW), World Freedom (Political Rights and Civil Liberty Rights) are included. U_i and V_t are the country- and time-specific fixed effects.

4. EMPIRICAL ESTIMATION AND RESULTS

The Pooled Least Square (Unbalanced and Balanced), Fixed Effect and Random Effect Models are used to estimate Equation (A) and the results are presented in Tables 1, 2, 3 and 4, respectively. The results of balanced data by using the above mentioned models are primarily considered, because they are more significant than the results of unbalanced data. The results show that coefficients of most of the standard explanatory variables caries the expected sign and are statistically significant.

This study finds that for the middle income developing countries with the strengthening of IPR regime, the real GDP per capita growth declines. The coefficient associated with IPR with balanced data indicates that with a one unit increase (more strengthening) in the IPR index, the real GDP per capita growth declines by 0.73 percent (Random Effect Model, Table 4) and 0.76 percent (Fixed Effect Model, Table 3).

It means that the empirical results do not support theoretical positive relationship between IPR and economic development for middle income developing countries. One reason may be that these developing countries are at the transitional stage of their economic development and the cost of innovation is higher than the cost of imitation. Thus, the result of study supports the findings of Falvey, *et al.* (2005).

Human capital which is defined as average years of education carries the expected sign and it is significant. The findings show that with one unit increase in the average years of education index, the real GDP per capita growth will increase by 0.52 percent (Random Effect Model, Table 4) and 0.62 percent (Fixed Effect Model, Table 3). Educational attainment indicates more skilled and more productive workers.

Economic Freedom of the World (EFW) which covers security of private property rights, rule of law, legal structure, monetary policy, and fiscal policy has a significant impact on the economic growth of the developing countries. The results are highly significant. If there is one unit increase in the EFW index the real GDP per capita growth rate will increase by 0.87 percent (Random Effect Model, Table 4). The empirical analysis favours the positive role of institutions in the economic growth process by judicial efficiency, low level of corruption, effective bureaucracy and protected property rights.

World freedom that includes political and civil liberty rights affects significantly and positively the process of economic growth in these developing economies. The coefficient of the world freedom indicates that as a result of 1 unit increase in the world freedom index, the real GDP per capita growth increase by 0.28 percent (Table 4).

[5]Included to capture the potential benefits of trade openness.

[6]Typically included to measure the economic instability.

Population growth affects economic development in a complex way. In case of developed economies its impact appears to be positive as determined by their absorption capacity. However, in developing countries, population growth leads to less capital per worker decreasing per worker output and consumption. This study has also found that increase in the population growth lower the economic growth of the developing countries. The coefficient of the population indicates that as a result of 1 percent increase in the population growth, the real GDP per capita growth decrease by 0.31 percent (Table 4).

Inflation rate is also included in the model to measure the economic instability. The result indicates that it carries the expected negative sign. If the inflation increases by one percentage point, it will decrease real GDP per capita by 0.001 percent, which is insignificant.

Gross capital formation or formerly gross domestic investment (GDI) typically increases productivity and GDP growth. When businesses are investing in land improvements (fences, ditches, drains, and so on); plant, machinery, and equipment purchases; and the construction of roads, railways, and the like, including schools, offices, hospitals, private residential dwellings, and commercial and industrial buildings, it typically reflects optimism for future growth. The empirical results show that when there is one percentage point increase in the GDI, the real GDP per capita growth rate would increase by 0.13 percent (Table 4).

Earlier studies have suggested that countries that are more open to the rest of the world are better positioned to absorb the rapid technological advances of leading nations. If the costs of technological imitation are lower than the costs of internally developed innovations, then a poorer country will grow faster than a more developed one. This faster rate of growth will continue so long as that country remains open for capturing new ideas until, at some point, equilibrium is reached and the rate of growth slows. Various theoretical models predict that openness to international trade accelerates productivity and promotes economic growth. However, the empirical results of this study do not support this positive relationship. Increasing trade (exports plus imports) as a fraction of GDP by 1 percentage points will decrease the real growth rate of GDP per capita by 0.002 percent (Table 4).

Finally, the values of initial GDP at the beginning of each five years were taken to measure the convergence factor. The economic theory says, if the value of initial GDP coefficient is negative, developing countries are converging towards the developed countries. The convergence is supported in this study.

4.1. Econometric Tests

Durbin-Watson d test has been used to check for autocorrelation in time series and cross sectional data. Two out of six important assumptions e.g. First, there are no missing observations and second the regression model includes the intercept term. Due to the presence of missing values in unbalanced panel from 1960-2005, the D.W d statistic value is not efficient. Similarly, the second assumption violates the applicability of Constant Coefficient Method. However, D.W d statistic value is interpretable for balanced panel (Fixed and Random effects) data. The value of D.W for unbalanced data (1960-2005) and balanced data (1970-2005) are 1.87 and 2.11 respectively. The

acceptable (balanced data) value is 2.11, so it is near to standard value of 2, which means no positive and negative autocorrelation.

To check and correct for Heteroscedasticity, White General Hetroscedasticity and White Heteroscedasticity Variances and Standard Error methods are used respectively. The significance of the White Heteroscedasticity Variances and Standard Error on Weighted Least Square (WLS) is that it cannot assume variance ($б_i^2$) is known. This problem is more common in cross sectional than in time series data, because it deals with members of population or geographical subdivisions at a give point of time. On the other hand time series data can be collected for the same variable over a period of time.

Now if we look at the results obtained after correction for Hetroscedasticity, differences are viable. One of the important variables of the study e.g. average years of education becomes significant and in accordance to the hypothesis, average years of education positively affect the real GDP per capita. If average years of education index increases by one percentage point, the real GDP per capita will increase by 0.11 percent.

The results of empirical estimation are given in the following tables:

Table 1

Pooled Least Square Regression Analysis (1960–2005): Annual Data
Unbalanced Panel Data (Corrected for Hetroscedasticity)
Fixed Effect Model

(Dependent Variable: Real GDP per Capita)

Variable	Coefficient	Std. Error	*t*-statistic	Prob.
C	0.002221	0.017839	–0.124484	0.9010
IPR_?	–0.483843	0.141438	–3.420877	0.0007
SYR15_?	0.110662	0.107564	1.028797	0.3042
EFW_?	0.864858	0.171459	5.044109	0.0000
WF_?	0.117094	0.075099	1.559195	0.1198
POP_?	–0.701890	0.186444	–3.764624	0.0002
INFLATION_?	–0.017523	0.005052	–3.468746	0.0006
GDI_?	0.111662	0.030308	3.684228	0.0003
TRADEGDP_?	0.000394	0.003586	0.109764	0.9127
INITGDP_?	–0.159878	0.186054	–0.859308	0.3907
R-squared	0.80			
D.W. Stat.	1.85			
F-statistic	90.75			
Prob. (*F*-statistic)	0.000			

Table 2

Pooled Least Square Regression Analysis (1960–2005): Annual Data
Unbalanced Panel Data (Corrected for Hetroscedasticity)
Random Effect Model

Variable	Coefficient	Std. Error	t-statistic	Prob.
C	–0.001240	0.016433	–0.075457	0.9399
IPR_?	–0.486592	0.136709	–3.559319	0.0004
SYR15_?	0.109707	0.102047	1.075063	0.2830
EFW_?	0.840482	0.162655	5.167257	0.0000
WF_?	0.125136	0.070647	1.771287	0.0773
POP_?	–0.747010	0.178720	– 4.179777	0.0000
INFLATION_?	– 0.017751	0.004994	– 3.554086	0.0004
GDI_?	0.104112	0.028217	3.689731	0.0003
TRADEGDP_?	0.000570	0.003374	0.168906	0.8660
INITGDP_?	–0.119756	0.180988	–0.661681	0.5086
R-squared	0.80			
D.W Stat.	1.83			
F-statistic	183.77			
Prob. (F-Statistic)	0.0000			

Table 3

Pooled Least Square Regression Analysis (1970-2005): Annual Data
Balanced Panel Data (Corrected for Hetroscedasticity)
Fixed Effect Model

Variable	Coefficient	Std. Error	*t*-statistic	Prob.
C	0.001838	0.003457	0.531748	0.5949
IPR_?	–0.758796	0.041031	–18.49336	0.0000
SYR15_?	0.620434	0.031393	19.76329	0.0000
EFW_?	0.695334	0.029450	23.61044	0.0000
WF_?	0.163286	0.017763	9.192325	0.0000
POP_?	0.067184	0.059426	1.130545	0.2583
INFLATION_?	–0.001242	0.000863	–1.439474	0.1501
GDI_?	0.057960	0.009850	5.884082	0.0000
TRADEGDP_?	–0.001418	0.000699	–2.029513	0.0425
INITGDP_?	–0.487639	0.035160	–13.86915	0.0000
R-squared	0.81			
D.W Stat.	2.11			
F-statistic	856.93			
Prob. (F-statistic)	0.000			

Table 4

Pooled Least Square Regression Analysis (1970–2005): Annual Data
Balanced Panel Data (Corrected for Hetroscedasticity)
Random Effect Model

Variable	Coefficient	Std. Error	t. Statistic	Prob.
C	0.000086	0.004321	0.019965	0.9841
IPR_?	–0.728613	0.049414	–14.74495	0.0000
SYR15_?	0.522224	0.035898	14.54723	0.0000
EFW_?	0.873635	0.032772	26.65779	0.0000
WF_?	0.283482	0.016220	17.47769	0.0000
POP_?	–0.318773	0.066949	–4.761436	0.0000
INFLATION_?	–0.001722	0.000090	–1.90577	0.0568
GDI_?	0.128304	0.012750	10.06272	0.0000
TRADEGDP_?	–0.002027	0.000808	–2.508464	0.0122
INITGDP_?	–0.600617	0.045568	–13.18082	0.0000
R-squared	0.77			
D.W Stat.	2.20			
F-statistic	1372.402			
Prob. (F-Statistic)	0.0000			

5. CONCLUSION AND POLICY IMPLICATIONS

Intellectual Property Rights (IPRs) is now perceived as an important source of economic growth process in developing countries. The developing countries are signatories of WTO, which means that these countries are committed to comply with the Trade Related Intellectual Property Rights (TRIPs) agreement. Therefore they cannot ignore this agreement or otherwise they would be isolated from the world. But the pace of implementation is now important that one should make necessary arrangements to that end, otherwise the developing countries may face repercussions in term of access to the international markets, withdrawal of Generalize System of Preferences (GSP) and foreign investor confidence. Similarly, the problem of counterfeit products, which cause huge annual losses to industries and reduced tax to GDP ratio due to lack of documentation, can be addressed through adequate IPR protection measures.

The empirical result of this study provides that intellectual property system does not necessarily contribute to economic growth process in middle income developing countries including Pakistan. These developing economies are not well prepared to accept this challenge at present stage of economic and infrastructural development. Strong IPR protection measure at this stage may cause inflationary pressure, unemployment and balance of payment (BOP) problem.

Furthermore, the results indicate that other explanatory variables like economic freedom of the world, world freedom (which includes political and civil liberty rights), trade openness and average years of education affect significantly and positively the process of economic growth in these developing economies.

Policy Implications

A modern, effectively managed, intellectual property system is required for the technology based economic development. National intellectual property legislation should be updated and refined to keep pace with international developments. Similarly,

institutions should be developed to strengthen intellectual property rights. These institutions and their infrastructure should be proactively modernised and computerised. Targeted awareness building campaign is necessary to emphasise the role of intellectual property rights and economic development in the developing countries.

Moreover, intellectual property rights should be included in the syllabus of universities and institutions of higher learning. Interactive links between university and industry can be established. Research and development base should be strengthened, which will encourage innovative efforts and international competitiveness.

Incentives may be given to encourage inventiveness amongst the national youth. Like other associations, a national inventor's association should be set up, which can help inventors in getting their inventions registered, and in commercialising such inventions.

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