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THE DETERMINANT OF INTELLECTUAL PROPERTY PROTECTION IN DEVELOPING COUNTRIES: DOES ABSORPTIVE CAPACITY MATTERS ?

Dr. Said Hammami
hammamisaid12@gmail.com
Faculty of Economics and Management of Tunis-Tunisia

Pr. Bouthaina Fekih-Soussi
Faculty of Economics and Management of Nabeul

Abstract

The increased importance of the knowledge economies and the Trade Related Intellectual Property Rights Agreement (TRIPs) move the IPR question to the core of nation's industrial policy. In this paper, we investigate the determinants of Intellectual property Rights policy in the developing countries. We assess whether factors as absorptive capacities, the human capital and the level of economic development matters in designing the intellectual property policy. We find that the economic development's stages as well as the absorption capacity of the economy are the main variables explaining the level of the Intellectual property protection. We stress the fact that no country would be incited to protect effectively the property rights without well-developed technological base. The policy implication of this finding is that previously to any agreement concerning property rights three main factors have to be considered: well-developed technological base, a wide absorptive capacity and strong institutions. Thus, the developing countries should operate on the factors enhancing the endogenous demand for IPR rather than to enforcing it exogenously.

Keywords: Intellectual Property Rights, Absorptive capacity, technological innovation, economic development.

1. INTRODUCTION

The growing importance of the knowledge economy placed the IPR on the core of the industrial policy. Hence, the issue of Intellectual Property Rights (IPR's) and its impact on innovation, direct foreign investment and technology diffusion is of great importance especially for developing countries. Therefore, the effect of IPR on growth and innovation received greater focus since the TRIPs agreement due to its controversial effects on developing countries (Di Vita 2013; Gould and Gurben 1996 ; Schneider 2005) , However ,little attention was devoted to studying the determinant of IPR and the related Policies (Drahos 2002 ; Ginarte and park 1997).

Historically, the IPR took a special attention since the mid-80 and was expressed in the TRIP's agreement enacted in 1995 which set up a minimum standard of protection

concerning the intellectual property rights no later than 2005. The system moved toward an harmonized level of patent protection. By participating to international patent, the member indicates his willingness to provide national non-discriminatory treatment to foreigners. Initially, the main agreements were: (i) The Paris convention of 1883; (ii) The patent cooperation treaty of 1970 and (iii) The international convention for the protection of new varieties of plants of 1961. It was supposed that weak patent protection stimulates imitation and hence the production of counterfeit goods, rises the cost of entrance in the sector and would restrain the flow of trade (Maskus 2000). When reforming intellectual property rights protection two dynamics are simultaneously at work: the market power effect and on the market expansion effect.

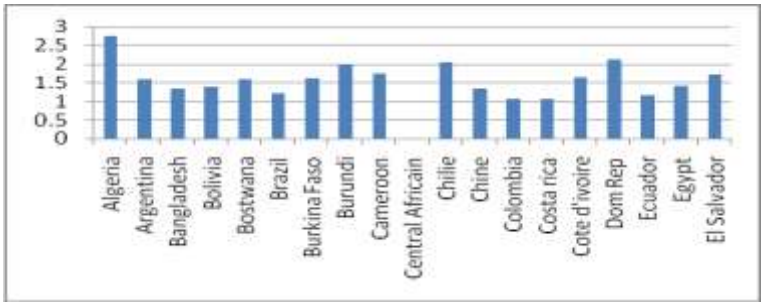

Figure 1: The IPR Index for a sample of developing countries

However, it is necessary highlight the institutional origin of IPR before exposing its economic implications. In fact, frequently was stressed the role of institution and hence the effective property rights as a central element in the process of economic development (North 1990). Besely and Ghatak (2009) examined how property rights could affect the productivity and growth. They classified the channels through which property rights affects efficiency by limiting expropriation and secondly, by facilitating transactions. The first element contains two sub-categories: rising investment by limiting expropriation and reducing the cost of enforcing property while the second element contains two sub-categories too which are trading in assets and facilitating credit transaction. A well-established property right system makes the economic assets productive by decreasing the transaction costs and allowing investment without the fear of the expropriation (International Property Right Index, 2010). Secure property has a direct influence on economic development by allowing the capital non-invested to be integrated in the economic system. In consequence, insecure property rights could affect negatively the economic development.

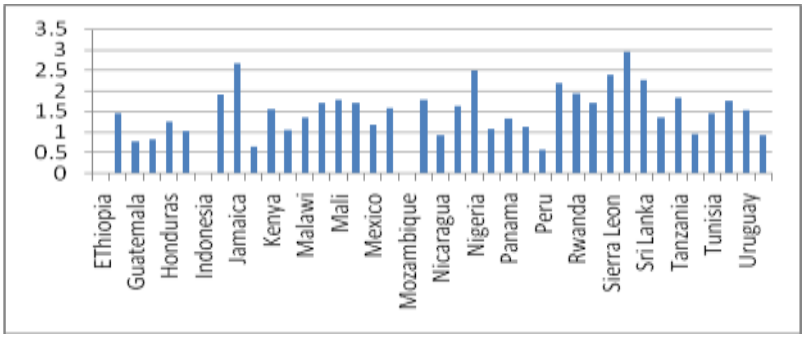

Figure 2: The IPR Index for another sample of developing countries

2. LITERATURE REVIEW

It is interesting to analyze the main factors which determine the level of IPR. Chin and Grossman (1991) modeled competition between Northern firms and Southern's firms selling one good to an economic integrated world. They find that the North and the South have opposed interest since the North is supposed benefiting of high level of patent protection while the South is benefiting from low level of patent protection.

However, Kanwar and Evenson (2003) focused on another aspect. They investigate whether technological development leads to the strengthening of intellectual property rights. They used a cross-country data of IPRs, level of technological development and control variables. In some developing countries, only the process was subject to intellectual protection while the product is not subject to such protection, to allow firms to adapt foreign technologies since innovation is essentially imitative and incremental. When these countries reach certain threshold concerning the technology base, their intellectual protection becomes more stringent since they produce innovating products.

Kanwar and Evenson (2003) showed that the protection granted by countries differs depending on many factors. Some countries allow both product and process while other some countries initially do not allow product patent in some areas. Patents laws are different with respect to the duration of protection. The purpose of TRIPs was a harmonization of laws concerning intellectual property. Nations differed with conditions of duration, coverage and enforcement procedures. It is claimed that countries with weak technology basis adopt a laxist policy of intellectual property rights while countries with strong technology basis adopt a stronger intellectual property scheme.

2.1. Determinants of IPRs

The topic of IPRs determinant across countries was an interesting topic. Ginarte and Park (1997) developed an index of patent protection incorporating five aspects of patent laws: (i) the extent of coverage, (ii) the membership to international patent agreements, (iii) the duration of protection, (iv) the provision for loss of protection and (v) finally enforcement mechanisms. They argued that patent rights' strength depends on several factors as gross domestic product (GDP per capita), the market size, investment in R&D activities as part of GDP (R&D in GDP) and market freedom. They showed also that IPR is positively related to the demands of patents protection, that is countries with continuous rising of level of human capital and innovative products would experience a demand for intellectual protection and hence the property rights increase. Ginarte and Park (1997) noted the positive effect of openness on IPR's index which was explained by the rising varieties available to consumer and the fierce competition which imply an increase of demand for patent. Lerner (2002), when analyzing the IPR enforcement between countries, examined different categories as existence and duration of patent protection, patent application's cost, restrictions imposed and administrative characteristics for 60 countries but did not elaborate a specific index.

Fundamentally, policy maker would choose the level of patent protection by comparing benefits and costs. On one hand, the innovator benefiting from patent protection would innovate but less frequently. An increase in patent strength increases monopoly power, so that the prices increase. In fact, he has incentive to innovate but since the follower could not

imitate it rapidly, he would introduce less frequently new innovations. As a consequence of increased innovations, productivity is enhanced as well as quality and variety of goods. In the other hand, a nation would develop a better trade relation with other nations as IPR are granted. However, IPR generates also costs steaming from higher costs of intermediate goods which influence the final selling price in market. Moreover, setting up an IPR system needs an infrastructure like courts, administrative offices and police to enforce law.

Next, Maskus (2000) extended the work of Ginarte and Park (1997) by studying a sample of 72 countries for the period starting from1985 to 1990. Firstly, she found that the market size has no significant impact on the IPR index while the income per capita is significantly related with this index. Secondly, she identifies the existence of nonlinear relation between patent strength and income per capita, consequently, the IPR falls as income per capita rise above its initial value.

Similarly, Kanwar and Evenson (2003) use the index of intellectual property developed by Ginarte and Park (1997) as the dependent variable. It is based on five components: index of coverage indicating what kind of invention could be protected; index of duration which concerns the number of years of protection; index related to the membership to the international convention; index linked to the conditions of patent withdrawal and finally the mechanisms available for law enforcement. Each sub-index is assigned a value between 0 and 1 and the total index is given by the total sum of the five components.

The explanatory variables used by Kanwar and Evenson (2003) are the research and development as percentage of GDP: financial resources of government measured by government revenue; human capital proxied by the number of years of secondary education, the GDP per capita. The economic freedom index used is constructed from five factors, access to finance, freedom of trade, regulation of credit, security of property rights and government size. The value of this index is between 0 and 10. Kanwar and Evenson (2003) did not find evidence of relation between intellectual property protection and the level of technological development which casts a serious doubt on the large shared conjecture of relation between IPR and the level of the technological progress. They underlined the importance of financial and human capital as factors explaining the level of IPR. They noted that more open economies seem to have stronger property rights in their effort to promote innovation.

2.2 Absorptive capacities and innovation

Zahra and George (2002) defined the absorptive capacity as "*A dynamic capability pertaining to knowledge creation and utilization that enhances a firm's ability to gain and sustain a competitive advantage*" while Cohen and Levinthal (1990) defined it as the process allowing identification of the value of external informations. Narula and Criscuolo (2002) considered the fact that the national absorptive capacity is the function of three essential components: the country R&D expenditure, the innovation system that defines the knowledge spillover within country and between countries and the distance to technological frontier. Cohen and Levinthal (1990) argued that the main determinant of national absorptive capacity is R&D investment. However, this variable is much larger to include technological and learning activities. They noted that in the early stage of development, little or no effort is dedicated to the development of new products or processes, while it is essentially concentrated on

building technological capacities by learning by doing and learning to learn, reverse engineering and development of human capital. Narula and Criscuolo (2002) indicated that the local R&D effort must be supported by assimilation of foreign knowledge.

Rogers (2004) explained that absorptive capabilities depend on three major factors: accessibility to new technologies developed abroad, learning abilities and incentives for implementation of new technologies. He highlighted the possibility of using telecommunication infrastructure and publications data as proxy for technology capacity. The students studying abroad are considered as measure for technology flows from abroad to domestic economy. Rogers (2004) considers the number of publication articles as an indicator of the level of scientific specialist and the degree of demand for such specialist knowledge. The greater the demand for specialist scientific and engineers is, the greater the number of publications is. Rogers (2004) uses the number of telephones per 100 populations as indicator of absorptive capacity.

The incentive to implement new technologies depends on the catching up countries of a set of economic, social and political causes. Rogers (2004) reported that the main factors related to political factors are the existence of intellectual protection, the enforcement of rule of Law and low corruption.

3. METHODOLOGY AND DATA

The empirical analysis was conducted on a panel data set of developing countries composed of four periods of five years from 1985 to 2004. We regress the dependent variable which is the level of IPR protection, retrieved from the study realized by Park (2008), on a set of independent variables averaged on the correspondent period when fully available. We employed this averaging method used previously by Schneider (2005) to mitigate the effect of business cycle fluctuations. However, when some data are missing, we used the lagging variable of the starting period (t-5) as a proxy. The objective is assessing the middle term effect of the explicative variable on IPR variation since it does not adjust immediately to these variations. In other side, the use of lagging variable is suitable to deal with reverse causality and endogeneity biais related to IPR and explicative variables. The estimated equation is as follows:

$$IPR_{it} = \beta_0 + \beta_1 \text{lngdp} + \beta_2 \text{gcf} + \beta_3 \text{lnedu} + \beta_4 \text{lnpatnum} + \beta_5 \text{lnabs} + \beta_6 \ln efi + \beta_7 tripsbreak + \beta_8 gdpgrowth + \beta_9 \ln fdi + \mu_i + \varepsilon_{it} \quad (1)$$

Where (IPR_{it}) is the Intellectual Property Protection measure of the country i at time t; (lngdp) is the gross domestic product that allows controlling the level of economic development; (gcf) is the gross capital formation, an indicator of investment of the economy; (lnedu) is a measure for human capital; we consider the number of secondary education for people over 25 years old; (lnpatnum) corresponds to the average number of patents filed by the country during the period; (lnabs) is a proxy for absorptive capacity the measure used is the average number of scientific articles published during the 5 years period; (lnefi) represents the economic freedom index; (tripsbreak) is a dummy variable taking the 0 value for the years before 1995 (trips agreement) and 1 for later years; (gdpgrowth) controls for the

economic performance; (lnfdi) corresponds to the foreign direct investment measure; μ_i is the country specific effect while ε_{it} is the disturbance error term.

We estimate the model using the fixed effect regression. IPR data is obtained from Park (2008). The measure of EFI is from Economic Freedom of The World data base (2012) while the variable (edu) is from Barro and Lee (2010) data base. Intellectual property is expected to rise with the level of economic development and the rise of economic freedom. The relation between innovation and IPR is ambiguous since more domestic innovation requires more ipr protection but also more stringent protection may hinder seriously the learning process and form a real obstacle to technology transfer.

The results of the regression are reported in Table (1) and (2). In Column 1, we have noted the OLS regression results while in the other columns we reported the results of Fixed Effect panel estimation. The first Column shows that while the coefficients related to gross domestic product per capita (lngdp), Gross Capital formation (GCF) and education (lnedu) are positive, only three variables have positively and statistically significant coefficients: absorptive capacities (lnabs), economic freedom index and trips break. This first result demonstrates the importance of absorptive capacity as a determinant of Intellectual Property Protection (IPR).

Table1: Results of regression using intellectual property rights as dependent variable (low income countries)

Covariates	(1) OLS	(2) FE	(3) FE	(4) FE	(5) FE	(6) FE	(7) FE
Constant	-0.96	-5.55	-5.22	-6.84	-4.91	-5.06	-4.91
	(-2.44)**	(-3.44)***	(-3,46)***	(-4.25)***	(-3,14)***	(-3.25)***	(-3.09)***
lngdp	0.06	0.90	0.68	0.73	0.55	0.54	0.54
	(1.54)	(3.72)***	(2.91)***	(3.10)***	(2.74)**	(2.42)**	(2.38)**
gcf	0.69	0.80	0.40	0.44	0,58	0.73	0.55
	(1.53)	1.33	(0.71)	0,77	1.06	1.33	(0.94)
lnedu	0.09	0.86	0.59	0.25			
	(1.26)	(4.87)***	(3,25)***	(1.14)			
lnpatnum	-0.09	-0.12	-0,14	-0.17	-0.13	-0.16	-0.18
	(-3.20)***	(-1.97)*	(-2,43)**	(-3.05)***	(-2,63)***	(-2.98)***	(-3.04)***
lnabs	0.10		0.28	0,24	0.17	0.18	0.16
	(3.61)***		(3.62)***	(3.15)***	(2.27)**	(2.45)**	(2.10)**
lnefi	0.37			0.95	0.67	0,77	0.72
	(2.52)**			(4.31)***	(3.18)***	(3.52)***	(3.15)***
Dummy for	0.42				0.27	0.25	0.25
agreement date	(6.43)***				(3.33)***	(3,1)***	(3.00)***
gdpgrowth						2.97	2.76
						(1.55)	(1.36)***
lnfdi	0.01						0.02
	(0.98)						(0.85)
R-squared:	0.60	0.12	0.18	0.24	0.32	0.33	0.32

overall							
within		0.45	0.52	0,62	0.66	0.67	0.68
between		0.18	0.22	0.19	0.22	0.22	0.21
Observations		131	131	117	119	119	116
F test that all ui=0	F(42,84)=2.69	F(42,83)= 3	F(37,73)=2,89	F(38,74)=1.82	F(38,73)=1.91	F(38,69)=1.76	

Notes: t-Statistics in brackets. * Significance at the 10% level. ** Significance at the 5% level. *** Significance at the 1% level

When estimating the model with a fixed effect the results of the column 3 show that the level of development proxied by the gross domestic product per capita has a positive and significant coefficient as well as the education level, investment and absorptive capacities. Thus, an increase of 1% of respectively the gross domestic product per capita, the gross capital formation and human capital (lnedu) would increase the level of IPR protection by respectively 0.68%, 0.40 % and 0.59%. When analyzing the effect of innovation on the level of intellectual property protection we find that more innovative developing countries are likely to have lower level of IPR protection, i.e. an increase of 1% of innovation in these countries will reduce the level of protection of 0.14%.

Table2: Results of regression using intellectual property rights as dependent variable (middle income countries)

Covariates	**(8) OLS**	**(9) FE**	**(10) FE**	**(11) FE**	**(12) FE**	**(13) FE**	**(14) FE**
Constant term	-0.99	-6.37	-5.92	-8.47	-7.93	-5.82	-5.59
	(-2.01)*	(-4.18) ***	(-3.63)***	(-4.49)***	(-4.11)***	(-4.83)***	(-4.30)***
lngdp	0.08	0.99	0.75	1.05	0.86	0.68	0.67
	(2.05)**	(4.42)***	(3.05)***	(3.95)***	(2.82)***	(2.96)***	(2.97)***
gcf	0.62	0.98	0.46	1.13	0.69	0.84	0.71
	(1.41)	(1.68)*	(0.75)	(1.72)*	(1.02)	(1.53)	(1.30)
lnedu	0.17	0.81	0.53	0.43	0.16		
	(1.44)	(3.01)***	(2.71)***	(1.65)*	(0.77)		
lnpatnum	-0.07	-0.14	-0.16	-0.18	-0.19	-0.17	-0.21
	(-2.00)**	(-1.84)*	(-2.56)**	(-2.33)**	(-2.79)***	(-3.02)***	(-3,45)***
lnabs	0.07		0.29		0.23	0.15	0.12
	(2.17)**		(3.49)***		(2.19)**	(1.58)	(1.41)
lnefi	0.25			1.06	1.02	0.72	0,66
	(1.05)			(4.70)***	(4.70)***	(2.49)**	(2.6)**
Dummy for TRIPS (tripsbreak)	0.44					0.27	0.27
	(6.41)***					(2.99)***	(3.16)***
gdpgrowth	0.03						0.04
	(1.37)						(0.87)
R-squared:							
overall	0.62	0.09	0.16	0.14	0.24	0.30	0.29

within		0.45	0.53	0.60	0.64	0,68	0.70
between		0.08	0.12	0.10	0.16	0.17	0.17
Observations	101	116	116	103	103	103	101

Notes: t-Statistics in brackets. * Significance at the 10% level. ** Significance at the 5% level. *** Significance at the 1% level

When adding other explanatory variables to the model, we remark in column 7 that the coefficients of gdp growth, economic freedom index and trips break are positive and statistically significant at 1% level. While the coefficient of the level of development is equal to 0.54 and that of absorptive capacities equal to 0.16 and significant at 5%. This result indicates that the intellectual property rights are related to the level of development of the economy, level of human capital, available infrastructures, the absorptive capacities of its units of productions and thus the economy as a whole, the level of growth rate realized and the economy freedom prevailing. In consequence, establishing a minimum standard for intellectual property protection for all countries as set up by TRIPs during the Urugay Round without taking into account the level of development seems to be inconvenient.

In fact, three interesting results could be pointed out from Table (1). Firstly, the effectively choice of intellectual property protection in low income countries is made in close relation with their level of economic development. Secondly, more efficient policy of intellectual protection could not be established without enhancing the level of human capital, investing in infrastructure and granting economic freedom. Thirdly, the result concerning the negative effect of innovation on intellectual protection indicates that the more innovative economies in developing countries are, the lower the level of IPR protection they adopt is.

This relation is partly explained by the character of innovations in these countries which is adaptive concerned with minor modifications rather than radical innovation. In this case, they prefer lower property protection to prefer from technology developed abroad with limited cost. We have reestimated the model using middle income countries. Our objective was to investigate the determinant of IPR protection in countries with middle income countries and compare them to those of low income.

In table (2) we have reported the results concerning the determinant of Intellectual Property Protection for middle income countries. We found that the level of economic development is an important determinant of IPR protection as well as absorptive capacities at 1% level of confidence. These two variables have a positive impact on the IPR protection confirming the fact that IPR is related to the stage of economic development confirming the result of Maskus (1998) and Ginarte and Park (1997). In fact, it resorts from the result that the absorptive capacities of the countries raise their need to higher property protection. It is possible to interpret that by the fact that higher learning capacities increase the capacity of generating new technology and hence the demand for intellectual protection. On other side, the TRIPs agreement has exerted a positive impact on the intellectual property protection.
Thus, we find a positive correlation between the Tripsbreak variable and IPR protection. Another important result concerns the fact that innovation proxied by the number of patents filed by residents is negatively related to IPR protection. In consequence, more innovation in the middle income countries has a negative impact on IPR, i.e. more innovative countries (low and middle income) are less likely to protect innovations. This result could be explained by the fact that these countries are dependent of foreign technologies and performing

adaptive and incremental innovation requiring reverse engineering and around innovation which needs important spillover, lower input costs and high technology diffusion. Finally, we can observe that the economic freedom index has a positive impact on intellectual protection. Thus, more convenient economic and social environment with suitable liberties is more likely to affect positively the private property and specifically the intellectual property protection.

4. CONCLUSION AND POLICY IMPLICATIONS

In this paper, we have investigated the determinant of the intellectual property protection for developing countries. This concern rose from the fact that the TRIPs agreement called for the harmonization of the minimum standard of intellectual property protection between North and South while some driving forces determine this level of protection for all countries. We find empirically that the intellectual property protection is depending positively on the level of economic development, the level of economic freedom and economic absorption. While it depends negatively on technological innovation in countries engaged in catching up process. Thus, the closer is the country from the technology frontier, the lower the level of intellectual protection required. This fact was remarked historically when developed countries started their process of industrialization, they frequently used a low level of intellectual protection (Japan, United States). The most important contribution of our paper concerns the fact that an efficient policy of intellectual property protection should be preceded by enhancing the scientific and technological capabilities of the concerned countries in the objective of developing a demand for intellectual protection and hence the standard will naturally be set. However, when countries are lagging behind in term of technological innovation, they are little incited to protect intellectual property and the gain from meeting this standard is low. In fact, when the costs of enforceability are high as well as the cost of administration and the benefits of IP protection generated by innovation are low, the country would not protect efficiently the property rights even if it was compelled by international agreement. The main solution is then to develop a suitable incitation for developing countries through technology transfer of technical assistance allowing them to reach some level of technological development.

Annex 1 List of the middle income countries

Algeria; Argentina; Bangladesh; Bolivia; Bostwana; Brazil; Cameroon Chilie Colombia Costa rica Cote d'ivoire Dom Rep Ecuador Egypt El Salvador Ghana Guatemala Guyana Honduras India Indonesia Iran Jamaica Jordan Kenya Malaysia Mauritania Mexico Morocco Nicaragua Nigeria Pakistan Panama Paraguay Peru Philipines South Africa Sri Lanka; Thailand Tunisia Uruguay Venezuela Vietnam Zambia

Annex 2 List of low income Countries

Benin, Burkinafaso, Burundi; Central African Rep; Chad; Congo Dem Rep; Eriteria; Ethiopia; Gambia; Guinea; Liberia; Madagascar; Malawi; Mali; Mozambique; Nepal; Niger; Senegal; Sierra Leone; Somalia; Tanzania; Togo; Uganda ; Zimbabwe.

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