



## Intellectual Property Rights and Innovation: Implications for Added Value Creation in Africa

Laurent Oloukoi<sup>1,2\*</sup> and Modeste Senou<sup>3</sup>

<sup>1</sup>Faculty of Economics and Management Sciences of Savè, University of Parakou, Bénin.

<sup>2</sup>WTO Chair-International Trade and Inclusive Development (WTO-CHAIR-ITID),  
University of Abomey-Calavi, Bénin.

<sup>3</sup>Faculty of Economics and Management Sciences, University of Abomey-Calavi, Bénin.

### Authors' contributions

*This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.*

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### ABSTRACT

This paper analyses mainly the type of relation existing between intellectual property rights (IPR), innovation and added value in six (06) countries of Africa namely Benin, Côte d'Ivoire, Senegal, Kenya, South Africa and Tunisia. The Auto Regressive Distributed Lag (ARDL) approach is used. The main results stemming from analyses reveal, among others, that is the effect of IPR on added value and growth remainder ambiguous ; ii) The IPR encourage investment and innovation which causes added value creation ; iv) The use of innovation and the possibility to imitate the innovation constitute the source of added value creation, economic growth and development. The paper recommends at last that it is very important to direct economic policies toward IPR promotion, the development of innovations, the use and imitation of innovations.

*Keywords: Intellectual property rights; innovation; added value; economic growth; development.*

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\*Corresponding author: E-mail: [loloukoi@chaire-omc-cidi.org](mailto:loloukoi@chaire-omc-cidi.org);

## 1. INTRODUCTION

The technological change is a key lever of the economic growth [1]. From this point of view, in the developed countries, as [2] assert, the innovation and the intellectual property rights (IPR) are going to occupy a special place in the diary of the economic policies during 1980s. Supervised by the World Trade Organization (WTO) with the doctrine of the trade liberalization, the promotion of the innovation and the IPR will be, more and more, an objective assigned to developing countries [3]. Indeed, as asserts it Joly Pierre-Benoît (1992), a low level of appropriation is not compatible with strong private investments in the R&D. For [4], the implementation of a system of intellectual property rights pursues two objectives in the theoretical plan: Encourage firms to produce new knowledge and to make so that the information relative to these discoveries is made public. However, controversies exist on the contribution of the innovation and the IPR to the economic growth of countries today. Diverse questions arise namely: In what does the development of the IPR lead the economic growth in the world? Can the increase of the number of patent or the other forms of IPR be on the basis of the creation of the added value and the development of countries today? These justifiable questions find their essence in the contradictory objectives among which it is necessary to arbitrate as regards the protection of the intellectual property: create a suitable environment to the innovation; spread the innovation once this one is realized.

The literature states that the effect of intellectual property rights (IPR) on the innovation depends on the initial level of the IPR and on the level of economic development [5]. Seen under this angle, the economic development is perceived as being a canal which the IPR favors the innovation. The consequence of this thesis is that the impact of the IPR will not be the same as the country is developed either not or as the stage of development is different [6-11]. For [2], the researchers find generally that the developed countries benefit more from the institution of the IPR than the developing countries. After all, the report is that this form of analysis contradicts the initial proposal of Schumpeter according to which the innovation produces the development and the profit. If the IPR has the advantage to protect the inventor and the pioneer their allocation and their management can contribute effectively to the economic and social development by the distribution of new technologies and new

products or the creation of new value chains? Such is the question this paper tries to answer. For that, the paper analyses mainly the type of relation existing between intellectual property rights (IPR), innovation and added value. In both theoretical and empirical plan, several works, among which those of [10] and [12], show that the IPR, by stimulating the technological innovation and by inciting positively the inventor, is a real source of economic growth. For [13], the patents which are a form of IPR play a central role at the same time as a signal with the investors and as tool of coordination of the actors. However, other works support the negative impact of the IPR [14-17 and 18]. For these works indeed, the IPR by granting a power of excessive monopoly to the inventors, does not always allow a good transfer of the technologies and their distribution is not always easy: Anything which plays against the economic growth and some development.

In their works on the effect of the IPR and patents on the added value in 12 countries and in 3 branches of industry, [2], conclude that the IPR improves the added value of the industries in a general way. However, this effect remains mitigated when we intensify the implementation of the IPR. Besides, these authors show that when we grant patents on knowledge or innovations, it do not favorite always the research and development. In this line, [19] wrote: "the very fast growth of the number of patents causes problems of management and control. The failure of the patents services, which recently patented questionable "inventions" from the point of view of the "non-obvious fact" or from the point of view of the novelty (trivial technology, algorithms sometimes limited to little original mathematical operations, etc.), are aggravated by the difficult problems which put the new technologies, in particular in the biological domain and the information, as well as by the extension of the space of the patentable. The international aspects, in particular the politics of "stow away" of certain countries, the asymmetries in the capacities of research, became more important. They also ask the question of the role of the intellectual property in the redistribution of the wealth on the planet and its links with the development aid".

Hudson and Minea [5] will show from their part that the effect of the IPR on the innovation is complex; they will find a non-linear relation between the IPR and their initial level and the GDP per head. With the appearance of new

challenges: Border between basic research and applied research become more vague, fast growth of the number of patents, failure of the services of patent, problems posed by the new technologies, the extension of the space of the patentable, the international aspects and the development aid, it urge to wonder about the type of link which exists among IPR, creation of the added value and the development.

After the introduction and the conclusion, the paper presents successively the literature review presenting the theoretical and empirical frame of analysis of the link existing between the IPR, the innovation, and the added value (section 2), the model (section 3), and the results and discussions (section 4).

## 2. LITERATURE REVIEW

The policy of the intellectual property plays an important role in a strategy of differentiation: the control of the economic and technological decision centers; the creation and the industrial multiplication; the control of the production assured by the control upstream to the process (R&D), the intellectual property (patents, licenses) and the distribution of certain productive standard. This section presents respectively the links existing between Intellectual property rights and innovation, intellectual property rights and creation of the added value; and intellectual property rights and economic growth and development.

### 2.1 IPR and Innovation

The main question we are entitled to arise is to know if the area of the institution and the protection of the IPR allows to stimulate the innovation and thus the scientific progress. If for the partisans of a vast protection, the IPR allows to insure a better coordination of the research, the others, in this particular case those who advocate a limited protection, consider that it is good to let play the competition not to attend monopoly positions. [4] made observe that between these two points of view, exists certain analytical space which remains because of insufficient one taken into account of the uncertainty inherent to the protection by the right. For this author, the motivations of the patent registration by firms depend on a crucial hypothesis according to which the detention of a patent constitutes an actual defense. By applying his analysis to the cases of the medicine and the software, [4] concludes that the innovation's

behavior of firms depends not only on the way their products are protected, but also from compensations to pay to their rivals holders of a patent and legal costs in case of trial. Several theoretical and empirical contributions showed the type of link which exists between IPR and innovation. Most of them dealt with the specific effect of patents on the technological innovation. These forms of contribution are known under the name of «theory of optimal patent". This theory, defended by authors as [20-23], supports the existence of a relation in the form of U curve spilled between the IPR and the innovation. Other more recent theoretical works confirmed this relation [24-27]. From this point of view, we conclude that the effect of the IPR on the innovation is positive at first then negative secondly. If the positive effect comes, among others, from the incentive to be innovated conferred on the inventors by the IPR, the negative effect, as for him, results partially from the increase of transaction costs supported by the inventors to acquire licenses [5]. For [28], this effect is positive because of profits bound to the protection of the intellectual property. [12] is afterward going to make a higher bid by showing not only that the IPR has a positive effect on the innovation but also that this effect is amplified as the IPR becomes intensified. Authors such as [15,5] are going to deduce that this relation is very complex and is of non-linear type.

### 2.2 IPR, Economic Growth (Creation of the Added Value), and Development

The economic theory reveals the link between IPR, economic growth and development is the object of several controversies. According to [28] the IPR can have positive or negative effect on the economic growth and the development. [29] revealed that the problem is very complex. For him, the impact of the IPR on the development and the growth depends on certain characteristics appropriate to every country. This point of view aligns itself with the results of [30] which showed that at the same moment when industrialized countries benefited positive effects of the IPR, developing countries as for them, saw each other penalized because of the emergence of the practice of the monopoly prices and the weakness of the level of the wealth. So seen, a rigorous system of protection of the intellectual property can either stimulate the growth, or restrict it. The effects of the IPR on the growth and the technological progress are positive if and only if they are implemented in the direction of the promotion of the competition [28].

In an empirical way, more recent works were interested in the effect that can have the IPR on the economic growth. For example, for [31], the IPR, combined with other tools of marketing (such as advertisements and other forms of promotion of the activities) are very important in the differentiation of products and services of SMES<sup>1</sup>; what allows them to be easily recognized by the target clientele or by the foreign countries. [2] estimated empirically the effect of the IPR on the innovation and the economic growth (added value). They estimated simultaneously an equation of innovation and a production function. Their conclusion is that the IPR has two types of effects: a direct effect on the added value by the marketing of the finalized technologies and an indirect effect via the innovation (research and development). They eventually convince themselves that the IPR improves the added value. Besides, [28] brings that the IPR, when they are well supervised, can constitute barriers and means to restrict the competition and to favor then the monopoly; anything which does not guarantee the growth and the development. [32], by endogenizing the IPR, show how the incentives to protect the IPR affect positively the economic development and the growth.

### 3. MODEL AND DATA

The model used in this paper is inspired from that implemented by [2]. In this model, two types of equations are considered: An equation of innovation as one of [33] and an equation of added value as defended by [34]. Both equations are estimated at the same time in a single equation to identify the direct and indirect effects of the IPR on the added values. We so consider two canals by which the IPR acts on the added value as at Park and [35] a direct canal by means of the marketing of the technology and an indirect canal which influences the innovation. The Fig. 1 presents the general framework of this model.

The equation of the added value is a Cobb-Douglas production function which is specify as:

$$\ln Y_t = \alpha_0 + \alpha_1 \ln L_t + \alpha_2 \ln K_t + \alpha_3 \ln INOV_t + \alpha_4 DPI_t + \varepsilon_t$$

Where  $Y_t$  represents the total added value (sum of the agricultural, industrial added values and the services);  $L_t$  the labor;  $K_t$  the stock of physical

capital;  $INOV_t$  represent the innovation with the high-technology exports as proxy;  $DPI_t$  is the intellectual property right and has as proxy the expenses received for the use of patents. The indirect effects of the IPR via the innovation are got by the coefficient  $\alpha_3$ . The coefficient  $\alpha_4$  allows to measure the direct effects. The description of variables and the sources of the data are presented in the Table 1.

To estimate the equation (1), the paper favors the ARDL approach of [36]. Indeed this approach is generally used for two fundamental reasons [37,38,39]. In the first place, while the other tests require that variables are quite integrated into the same order before testing the hypothesis of co-integration, the approach of the test in the borders of [36] can be applied independently of the fact that variables are I (1) and I (0) or all I (1). Secondly, approaches in the borders of [36] can detect adequately the relation of co-integration in the presence of small samples [40] whereas the other tests are valid only when the sample is enough big.

### 4. RESULTS AND DISCUSSION

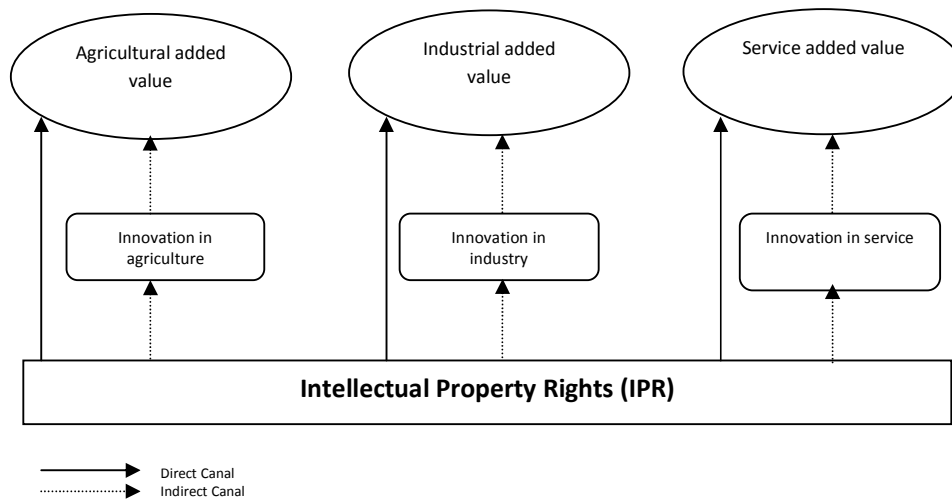
The Table 2 presents results of the estimation of the added value's equation for the studied countries of Africa. Both canals by which the IPR acts on the added value are taken into account in these results. The direct canal is got by the impact of the IPR on the added value and the indirect canal is measured by the impact of the innovation on the added value. The non-linearity relation which could exist between the added value and the IPR is not any more observed in the reality contrary to the results of [5] and [41]; this justifies the non-presence of the result connected to this hypothesis in the Table 2 of the estimations.

The Table 2 reveals that, for all the countries, with the exception of the Ivory Coast and Senegal, the IPR has a positive direct effect on the added value. This effect is significant for South Africa and Tunisia while it is not the case for two other countries such as Benin and Kenya. This result suggests that in South Africa and Tunisia, the IPR, by allowing companies holders to control the distribution and the marketing of the information and the new ideas which they created, allows them to gather in income; anything inciting to the investment and to the innovation pledge some creation of the added value. The incentive in the creation being the spearhead of the process of innovation. From

<sup>1</sup>Small and Medium-Sized Enterprises.

this point of view, the paper supports with [42] that the extension and the continuation of the IPR, allowing the firms to weaken their costs of R&D, would be then the essential condition of the innovation. In Benin and Kenya, even if the impact of the IPR and the added value is low, it remains nevertheless positive. This expects from a medium and long-term important role of the IPR on the added value in these two countries. In the medium term, if the economic policies in these countries are directed to the protection of the inventors through the granting of patents, this would constitute a source of incentive in the investment on behalf of companies. This positive impact of the IPR on the added value confirms the results of several previous works. These works indeed show, the importance of the IPR in the vitality of the markets of the technologies in the supply of property rights and cost cutting of transaction [10,43,44,45]. This result confirms

the recent works of [2] who showed a positive relation between the IPR and the added value in the sectors of the machinery and the electronics. By considering the Table 2, the positive role and meaning of the IPR on the added value in Tunisia and South Africa reveals that the value of the technological transactions would be higher in these countries than in the other considered countries. This pulls a positive effect on the expansion of the market in these countries. The protection of the IPR increases the productivity of the work as suggested [32]. On the other hand, the results for Ivory Coast and Senegal are surprising. The IPR, indeed in these countries has a low but not significant negative impact on the added value (Table 2) while the works generally state a positive relation. In view of this result, we can conclude that the effect of the IPR on the added value is ambiguous.



**Fig. 1. General framework of the model showing the link (direct and indirect) among IPR, innovation and added value**

**Table 1. Description of variables for the equation of the added value**

Variables	Description	Source of data
DPI	It is the natural logarithm of the received amounts for the use of Intellectual property rights and innovation (BoP, current US dollar)	World Development Indicators
INOV	It is the natural logarithm of the high technologies export(current US dollar)	World Development Indicators
Y	It is the natural logarithm of the sum of agriculture, industry services value at constant price 2005 in US dollar	World Development Indicators
L	It is the natural logarithm of the labor	World Development Indicators
K	It is the natural logarithm of the capital (constant US dollar 2005)	World Development Indicators

**Table 2. Estimation of the equation of the added value Y for Benin, Ivory Coast, Kenya, Senegal, South Africa and Tunisia**

Variables	Auto regressive distributed lag estimates					
	ARDL(1) selected based on schwarz bayesian criterion					
	Bénin	Côte-d'Ivoire	Kenya	Sénégal	Afrique du Sud	Tunisie
Y (-1)	0,60225	0,64920***	0,45850***	0,59238**	-	-0,32011
DPI	3,82E-04	-0,026636	2,47E-04	-0,013741	0,32572*	4,6339*
INOV	-0,018412	-0,011846	0,063484	0,005013	-0,087909**	-2,7749*
L	-0,08455	0,044066	0,83075	0,64393***	1,5820*	-3,3348
K	0,50055	0,37923***	-0,090952	-0,024467	-0,17003	2,5642
R square	0,86307	0,39774	0,97186	0,98244	0,98656	0,98585
Adjusted R square	0,58922	-0,80677	0,91559	0,94732	0,97313	0,95756

As far as the effect of the innovation is concerned, it is negative for countries such as Benin, Ivory Coast, South Africa and Tunisia. This effect is significant for South Africa and Tunisia. This result could give some explanation by the fact that the export does not favor the large-scale use and the possibility of imitation of the innovation in these countries. Yet, as demonstrates by [32], the possibility of imitation, being the source of growth, has important implications for the protection of the IPR. Already, [46] deduced that in the countries which imitate products invented abroad, an over liberal protection of the IPR can induce a fast growth. All this reveals the essential role of the imitation.

**5. CONCLUSION**

This paper aims to analyze the type of relation between right intellectual property, and added value in six (6) countries of Africa such as Benin, Ivory Coast, Senegal, Kenya, South Africa and Tunisia. For that purpose, an Auto-Regressive Distributed Lag approach (ARDL) is used. According to [47], the IPR is rules providing the right to make revenues of an innovative and creative activity, and protect them. As such, they confer to their holder two types of possible actions: i) the control of the distribution and the marketing of the information and the new ideas which it created; ii) the implementation of penalties on meeting of their fraudulent use (imitation). In the theoretical plan, the implementation of a system of intellectual property rights allows to encourage firms to produce new knowledge and to make so that the information relative to these discoveries is made public. The protection of the inventors through the granting of the IPR, by establishing a source of incentive in the investment on behalf of companies, favor the viability of the markets of technologies in the supply of property rights and

cost cutting of transaction. After the investigations, the following teachings are pulled:

- The IPR has an ambiguous effect on the added value and the economic growth in the six (6) studied countries of Africa. If in Benin, Kenya South Africa and Tunisia, this effect is positive, the IPR, has on the other hand a negative but not significant effect on the added value in Ivory Coast and in Senegal.
- The IPR constitutes a source of incentive in the investment and in the innovation pledge some creation of the added value. The incentive in the creation being the spearhead of the process of innovation. From this point of view, the paper supports that the extension and the continuation of the IPR, allowing the firms to weaken their costs of R&D, would be then the essential condition of the innovation.
- The IPR plays a very important role in the creation of the added value through the vitality of the markets of the technologies and the cost cutting of transaction.
- The IPR favor the expansion of the market and increases the productivity of the work.
- The innovation, its use and the possibility of its imitation is a source of added value creation, economic growth and development.

**COMPETING INTERESTS**

Authors have declared that no competing interests exist.

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