



## RESEARCH ARTICLE

# A PANEL ANALYSIS OF THE INTERACTION BETWEEN THE DEVELOPMENT OF THE AGRICULTURAL INSURANCE AND THE GROWTH OF THE AGRICULTURAL PRODUCTION IN PRESENCE OF NATURAL RISK

**\*Ezdini Sihem**

Faculty of Economics and of Management of Sousse, Tunisia

### ARTICLE INFO

#### Article History:

Received 21<sup>st</sup> June 2015

Received in revised form

09<sup>th</sup> July, 2015

Accepted 19<sup>th</sup> August, 2015

Published online 30<sup>th</sup> September, 2015

#### Keywords:

Agricultural insurance,  
Agriculture growth production,  
Natural risk,  
Panel analysis.

### ABSTRACT

In this paper, we try to evaluate the impact of the systems of insurance on the growth economy and this by an empirical estimation in static panel of the interaction which exists between the degree of the development of the agricultural insurance and the development of the real growth of the agricultural production in three American, European and Asian continents during period (2000-2012) in presence of natural risk. In particular, this evaluation is explored for an economy activity strongly submitted to risks, namely the agriculture. Our study covers 24 countries selected on the basis of data availability they include : (a) the European countries, consisting of 7 countries, namely : Austria, Russia, France, Greece, Portugal, Italy and Spain ; (b) the American countries, consisting of 15 countries, namely : Brazil, Canada, Mexico, Panama, Chile, Dominic Republic, Argentina, Costa Rica, Paraguay, Australia, the USA, Colombia, Peru, Uruguay and Venezuela ; and (c) the Asian countries, consisting of 2 countries, namely : India and China. The hypothesis which is discussed stipulates that the application of the agricultural insurance and as a consequence the development of the penetration in the agricultural insurance could have a positive impact on the the growth of the agricultural production in presence of natural risk. We validate by an empirical estimation in static panel the interaction which exists between the degree of the development of the market of the agricultural insurance and the development of the real growth of the agricultural production in three American, European and Asian continents during period (2000-2012) in presence of natural risk. The results obtained from our estimation are interesting and suppose that several factors influence positively the development of the industry of agricultural insurance to insure an improvement of the agricultural growth production. These factors are: the penetration rate in the agricultural insurance, the agricultural investments, the agricultural spending and the subsidies of agricultural price production. The particularity of our estimation is the introduction of variables to evaluate the natural risk such as drought, floods, extreme temperatures in % of the population and disaster and the climatic indicators (Total Number of death).

### INTRODUCTION

Empirical research has not yielded a consensus on the interaction between the development of systems of insurance and the economic growth. More recently, the subject has garnered attention due to rising of risks which led to costs with the desire to reduce risks. Various studies have focused on different countries, time periods, modeling techniques and different proxy variables have been used for insurance activity and economic growth nexus. The evaluation of the significant impact of the systems of insurance on the economy was not enough developed. In particular, this evaluation was not explored for an economic activity strongly submitted to risks, namely the agriculture. The empirical results of these studies are mixed and have not reached a consensus. The results differ even on the effect of the insurance on economic growth. We are interested in our work on the evaluation of the implications of the development of agricultural insurance on agricultural growth production in countries confronted to agricultural risks.

*\*Corresponding author: Ezdini Sihem,  
Faculty of Economics and of Management of Sousse, Tunisia.*

The policy implications of these relationships can be significant depending upon what kind of causal links exists. In fact, it is the theories of the insurances and the risks, the information theories and knowledge, theories of the economy of transaction costs and the theory of the organization that analyze the effect of the application of the systems of insurance on the development of the economic process.

As a consequence, several factors relative to the financial and economic system determine the evolution and the rigor of the systems of insurance and contribute to the realization of the objectives fixed during the application of a system of insurance. Our work calls on to two disciplines to know the economy and the finance because we try to understand the effect of the application of a method of management of risk of knowing the insurance about the economy. More exactly, we chose to see these impacts for the agricultural activity. We suppose that the development of the agricultural growth production constitutes an essential determiner to insure the well-being of the farmers and to maintain stable their income and this could come true by having a system of insurance

which meets the expectations of insurants and which insures the regulating effect in case of risks. We support in our article the hypothesis which stipulates that the application of the agricultural insurance and as a consequence the development of the penetration in the agricultural insurance could have a positive impact on the agricultural growth production in presence of natural risk.

### **Our objective is to answer the following question**

The development of the penetration to the market of agricultural insurance of a country could - it improves the growth rate of the agricultural production in presence of natural risk?

Our article will be organised as follows, after the introduction which is presented in section 1, in section 2, we move forward the importance and the objectives of our analysis, we give a review of the literature onto the foundations of the insurance in an economy to know the concepts of uncertainty and risk and we present the functions of the insurance in the economy. Then in section 3, we present a theoretical review which consists in presenting the models which put in relation the development of the systems of insurance and the economic activity and we identify the main canals of transmission between insurance and economic activity by making a reference to the agricultural activity. We distinguish the various empirical works which analyzed the relation enter agricultural growth production in presence of natural risk and insurance to make the main empirical profits on this matter in section 4. The concluding remarks are given in the fifth section.

### **The interaction between the insurance and the economic activity: Literature Review**

Historically, the importance of the activity of insurance is not new because some references to the activity of insurance were mentioned in the works of Adam Smith, Marshall and in that of Knight. However, these works did not specify its contribution to the economic activity and did not really study its role and its modalities of management of risk. A review of the empirical literature on the relation between insurance and economic growth led to explain the interaction between the activity of the market of the insurance and the economic growth were diverse. Simply, the explanation of this relation enters an exceptional sectorial activity of point of view that it is submitted to diverse risks and which demands an effective management of these risks by the appeal to the market of the agricultural insurance and to the activity so vital as is in developed countries or in development regarding its contribution to the agricultural growth production was not enough developed.

The evaluation of the link between the activity of the market of the agricultural insurance and the growth of the agricultural production was not widely studied. Probably it is of for the not availability of the data which explain this relation. From this limit, we direct our research work to explain the interaction between the development of the activity of insurance and the real growth of the agricultural production. In what follows we shall present a review on the empirical literature of the main works which handled this relation. It was during 1960s when the economy of insurance knew its peak with the works of Borsh (1962) and Arrow K (1970) which showed that it is the

theory of insurance that allows the economic analysis of the risk and the uncertainty. The idea developed by the economists is that the insurance contract allows a monetary exchange in case of unforeseen specific events what allows insuring an additional debt which allocates the economic activity. In the modern financial theory and in the model Arrow Debreu, the insurance contract is a financial asset in an economy of uncertainty. It is a question according to this analysis a form of conditional debt.

In the process of the trade and the development, the insurance knew its development. In fact, since 1964, and during the United Nations Conference on Trade and Development (UNCTAD), the market of the insurance and the reinsurance were considered as an essential component of the economic growth. And the insurance as a financial service took its quantitative importance while trying to follow the evolution of the financial situation of institutions. According to Grace (Favor) and Rebello, (1993), the activity of the insurance can contribute on the activity of the banking sector. The development of the activity of insurance could encourage the bank loan by increasing the demand of financial services. The evaluation of the relation between the potential activity of the market of the insurance and the economic growth was presented by Ward and Zurbruegg (2000), Webb and al. (2002) Kugler and Ofoghi (2006), and Adams, Andersson, Andersson, and Lindmark (2006) for the countries of the OECD, it was Ward and Zurbruegg (2000) which tried to explain the potential relation between the growth of the insurance sector and the economic growth.

These authors used the tests of cointegration of Johansen to explain the models of test and correction of errors to explain the relation of causality between the economic growth and the insurance. They examined the relation of potential causality between the economic growth and the activity of the market of the insurance for the countries of the Organization of the Trade and the Economic Development for period 1961-1996 and this by using the annual Real Gross Domestic Product as measure of the economic growth and the annual premiums as the measure of the insurance. Adam and al. (2005) examined empirically the relation between the banking activity, the insurance and the economic growth in Sweden for period 1830-1998 by using the tests of causality of Granger. The results showed that the banking development and not of the insurance (by the total insurance premiums) led to the economic growth in Sweden in XIX Th of Century and that the insurance seems to be motivated by the rhythm of the growth of the economy. Chun-Ping (2005) explained the relation between the development of the market of the insurance (via the penetration and the density) and the economic growth.

The variables which are used are relative to the demography, to the financial level in the economic profit and in the regional conditions. Kugler and Ofoghi (2006) showed proofs of long-term causality of the insurance in the growth of the Gross Domestic Product for eight categories of insurance in the United Kingdom. Marco. In (2006) showed that in the developed countries or in the developing countries, the activity of insurance is considered as a financial intermediary and a supplier of transfer of risk. Such activity allows insuring the compensation of the insurants what could contribute to the economic growth by allowing to manage the risks in a effective

way. Arena (2008) found proofs of a link of causality enter the development of the insurance on the economic growth a wide panel of 56 countries and of 28 years (1976-2004). Curak, Loncar and Poposki (2009) examined the relation between the development of the agricultural insurance sector and the economic growth in 10 countries member states of the EU between the period 1992-2007. Olubiyo and Ajfand (2009) tried to make a comparison between the practices of production between the insured and uninsured farmers by using an econometric analysis and this by referring to functions of which integrate the option agricultural insurance. The results showed that the insured farmers are directed to the choice of the combination of the factors of production such as inputs what led to an increase of the production.

One of the underlying hypotheses of the agricultural insurance, it is because its introduction allows to encourage the farmers to change positively the agricultural practices what allows to increase the production further to an effective use of the agricultural inputs. The analysis suggests that the insured farmer would generate a net profit by reducing their current level of the use of the resources compared with the uninsured farmers. According to the World Bank via Erik's empirical works and Rodney (2011), it was shown that there is a link of causality between the development of the insurance sector and the economic growth, although the results turn out sometimes ambiguous. Piece (2012) showed that the development of the industry of the insurance assurance can contribute to the economic growth as a financial intermediary and a supplier of transfer of risks and compensation to manage the risks in a effective way. The insurance allows insuring the risk management to reduce or master the losses.

Craig. M and Fotis (2013) were able to estimate the impact of the use of the insurance on the economic performance of farms by making an analysis of the determiners of the demand of the agricultural insurance, saw that the demand of the agricultural insurance could affect the agricultural performance and this by using a model in two simultaneous equations. The first equation describes the impact of the explanatory variables, including the use of the insurance, on the performance of the agricultural activity. And the second equation describes the impact of the explanatory variables, including the agricultural performance at request of the insurance. Yesuf (2014) identified the insurance collect as an effective institutional mechanism to face the risks of production. It is estimated the impact of the insurance collects on the risks of production. Once used the insurance collects, it will affect the yields on the farmers. Mirela and Silviu (2014) tried to analyze the correlation between the insuranc and the economic growth by showing the existence of a direct link of causality between both, such as the level of development of the insurance sector depends on the degree of economic development of the country.

**Natural risk and effect of the development of the penetration to the agricultural insurance on the real growth of the agricultural production**

By the estimation, we introduce variables which measure the natural sudden risk by the farmers in the form of climatic hazards (drought, temperatures extremes and floods) and which measure the disasters and the climatic indicators.

**We use both following indicators**

Drought, floods, extreme temperatures in % of the population (the average of 1990), noted Ic1. Disaster and the climatic indicators (Total Number of death), noted Ic2.

**Model specification**

The equation of panel is defined as follows:

$$Y_{it} = \alpha X_{it} + \beta Z_{it} + v_{it} \tag{1}$$

With  $Y_{it}$  : the real growth of the annual agricultural production

And X: the penetration rate to the agricultural insurance of a country

And Z is all the variables of control in the model which reflect the economic and financial conditions which could impact at the same time on the activity of agricultural insurance and the agricultural production. For the estimation, the variables of control are the agricultural spending in percentage of the Agricultural Gross Domestic Product, the subsidies of the prices the agricultural production, the agricultural investments, the farmlands and two variables wich measure the disasters and the climatic indicators such us Drought, floods, extreme temperatures disaster and climatic indicators.

The term of error is  $v_{it}$  .

The indications  $i = 1...N$  and  $t = 1...T$  represent respectively the individuals and the time. In the model predefined the terms of interaction are used to know the effect of the development of the agricultural insurance on the growth of the agricultural production. That is if the development of the market of the agricultural insurance could exercise a positive impact on the growth of the agricultural production. In the model, we integrate variables which can explained the economic and financial conditions and which are defined in the vector according to whom group  $F = (\text{Economy, finance})$  (2)

These variables are tested to see if they will have an impact on the relation between the development of the penetration to the market of the agricultural insurance and the growth of the agricultural production.

**The economic consequences can be spread as follows**

If  $\alpha > 0$  et  $\beta > 0$ , it confirms the hypothesis which the development of the penetration to the market of the agricultural insurance has a positive impact on the growth of the agricultural production and in this case the variables of control which are introduced into the model affect positively the relation. All the used variables and which reflect the economic and financial conditions has a positive impact on the growth of the agricultural production.

If  $\alpha > 0$  et  $\beta < 0$ , it supposes the hypothesis which the development of the penetration to the market of the agricultural insurance has a positive impact on the growth of the agricultural production through the conditional variables which have negative impact on the estimated relation. These hypotheses will be clearly explored to estimate how the development of the penetration to the market of the insurance

affects the growth of the agricultural production by using conditional variables which express the economic and financial conditions.

$$\frac{\partial (VPAB)_{i,t}}{\partial X_{i,t}} = \Gamma \dots\dots\dots(3)$$

$$\frac{\partial (VPAB)_{i,t}}{\partial X_{i,t}} = \Gamma + S.M_{i,t} \dots\dots\dots(4)$$

The equations (3 and 4) express the marginal effects of the model. In the model, the sign of  $\Gamma$  is positive or negative and  $\Gamma$  indicates the direct effect, while  $\Gamma + S.M_{i,t}$  indicates the indirect effect and represent the total effect. In fact, the total effect of the agricultural insurance on the growth of the agricultural production affected by the conditional variables is measured by the total effect  $\Gamma + S.M_{i,t}$ .

In the model, the marginal effect of the insurance on the growth of the agricultural production depends on coefficients  $\Gamma, S$  and  $M$  (one of the conditional variables). En consequence; the marginal effects of the model can be ambiguous. Through this estimation, we target to show if the development of the penetration in the agricultural insurance contributes to the growth of the agricultural production. We examine if the relation between the development of the penetration to the market of the agricultural insurance and the growth of the agricultural production could be affected by different conditions. The model aims at adding conditions and terms of interaction between the variables of agricultural insurance and the conditional variables.

**Hypothesis of the work**

The hypothesis which we test is the following one: in the presence of the natural risk, the relation between the development of the industry of agricultural insurance and the growth of of the agricultural production would be probably maintained. The estimated model takes into account the countries of the sample during period 2000-2012. The dependent variable is the growth of the global agricultural production (VPA)

**The explanatory variables are the following ones**

- The penetration rate to the market of the agricultural insurance (penetration)
- The agricultural investments (idea)
- The subsidies of production prices agricultural (esp)
- The agricultural spending in percentage of the PIBA (depa)
- Drought, floods, extreme temperatures in % of the population (ic1)
- Disaster and the climatic indicators (Total Number of death of has disasters) (ic2)

**Tests**

The tests of specification of the estimated model are presented in what follows to be able to define the estimated model.

**Test of Fisher**

The relation between the growth of the agricultural production in the presence of the economic and financial variables and by retaining variables relative to the natural risk is justified by the test of Fisher. In the presence of the natural risk, the model is judged as globally significant as far as the probability of calculated Fisher is lower than 5 % the associated probability is lower than 5 %  $0.0000 < 0.05$  and  $R^2 = 86.70 \%$ .

**We can find an explanation in the relations between**

- The relation between the development of the penetration to the market of the agricultural insurance and the real growth of the agricultural production.
  - The relation between variables relative to the climatic risk and the agricultural production.
  - The links between the variables which reflect the conditions economic as the agricultural investments, the agricultural spending in percentage of the agricultural PIB and the subsidies of production prices and growth of the agricultural production
- by the recourse in t of student, we analyze the significativity of the individual variables.
- The penetration rate in the agricultural insurance is a significant variable in 1 %.
  - The variable drought, floods, extreme temperatures in % of the population are a significant variable in 1 %.
  - The variable devastates and the climatic indicator is a significant variable in 1 %.
  - The agricultural investments is a significant variable in 1 %.
  - The agricultural spending in percentage of the PIBA is a significant variable in 1 %.

**Test of normality of residues**

The test of normality of residues confirms that the data follow a normal law because the probability of the test is  $Pr = 0.3262$ . The used hypotheses are the following ones:

- H0: residues follow a normal law.
- H1: residues do not follow a normal law.

With the probability of the test  $Pr = 0.3262 > 0.05$ , we accept the hypotese H0 according to which residues follow a normal law.

**Test of multicollinearity**

We calculate the VIF to see if there is a problem of multicollinearity between variables.

A problem of multicollinearity is detected if the value of a VIF is superior or equal to 10 and / or the average of VIF is superior or equal to 2 (Chatterjee, Hadi and Price, on 2000)

In our case, we can keep all the explanatory variables in the estimation. As a matter of fact, the predefined model can be estimated by the data of panel. It is enough to distinguish if the specific effects are fixed effects or random effects. We use to make this distinction the test of Hausman.

**Test of Hausman**

To arbitrate between the model with fixed effects and the model with variable effects is made by the test of Hausman. The general hypotheses which define this test are the following ones:

H0: there is no systematic difference between the coefficients

H1: there is a systematic difference between the coefficients

In our estimation, it is the model with random effects that will be the model the most appropriate and which will answer the hypotheses inverted by the test following to know for our model:

H0: there is a systematic difference between the coefficients

H1: there is no systematic difference between the coefficients  
Thus, the predefined model is a model with random effects with  $\chi^2(6) = 83.26 > 0$  and  $\text{Prob} > \chi^2 = 0.0000$ . We pass in the check if there are problems of heteroscedasticity and autocorrelation of the errors.

### Test of heteroscedasticity of the residues

In the estimation, there is a problem of heteroscedasticity of the errors which we corrected. The probability associated with the test is lower than 5 % according to the following hypotheses of the test:

### The contemporary correlation between individuals (Breush-Pegan)

The test of Breush Pagan allows estimating the significativity of the model at random effect.

The test bases itself on the following hypotheses

H0: absence of fixed effects (independence of residues between the individuals)

H1: presence of fixed effects (dependence of residues between the individuals)

From the results of the test the probability of the test of which is lower than 5 %, we can say that the random effects are globally significant and the errors are not correlated in a contemporary way.

### The test of autocorrelation of the errors (Breush-Godfrey)

The hypotheses of the test are described as follows:

H0: absence of autocorrelation of the errors

H1: presence of autocorrelation of the errors

There is a problem of autocorrelation of the errors which we correct as far as the probability associated with this test is lower than 5 % ( $\text{Pr} = 0.0379$ )

As a matter of fact, it is well about a model with random effects corrected by the problem of heteroscedasticity and by the problem of autocorrelation. After correction of the problem of heteroscedasticity and of autocorrelation, the explanatory variables are the following ones:

- The penetration rate to the market of the agricultural insurance is a significant variable in 1 %.

- The variable drought, floods, extreme temperatures in % of the population is a significant variable in 1 %.
- Disaster and the climatic indicators (T. Number of death) is a significant variable 1 %.
- The agricultural investments is a significant variable 1 %.
- The agricultural spending in percentage of the PIBA is a significant variable 1 %.

### The test of endogeneity

There is no endogeneity between the explanatory variables and the dependent variable. The model with random effect corrected by the problem of heteroscedasticity and by the problem of autocorrelation of the errors is the most appropriate seen that  $\text{Prob} > \chi^2 = 0.7688$ . The model which we estimated is a model with random effects corrected by the problem of heteroscedasticity and by the problem of autocorrelation of the errors, (5):

$$VPA = 11.165 + 0.198 \text{ penetration} + 0.205 \text{ idea}0 + 0.468 \text{ depa}0 - 0.809 \text{ ic}20 + 0.677 \text{ ic}10 - 0.024 \text{ esp}0$$

$$(39.85)^{***} \quad (6.84)^{***} \quad (5.39)^{***} \quad (7.79)^{***} \quad (-15.29)^{***} \quad (18.11)^{***} \quad (-0.48)$$

$$R^2 = 83.14\%$$

$$\text{Wald}\chi^2(6) = (1889.52)^{***}$$

From our estimation, our purpose was to show that in the presence of natural risk of in the climatic hazards the relation of which the floods, the drought and the extreme temperatures in the countries of the sample, between the development of the penetration to the market of the agricultural insurance and the growth of the agricultural production always remains justified.

### The statistical results of our estimation show that

- The hypothesis which stipulates that the development of the penetration to the market of agricultural insurance could have an effect on the agricultural production is based as far as the model is globally significant for the various countries of the sample during period 2000-2012.
- There is more than an explanatory variable which is significant according to the value of the test of Student.
- Residues follow a normal law.
- Absence of the problem of multicollinearity between the variables which can be kept in the estimation.
- It is the model with random effects corrected by the problem of heteroscedasticity and by the problem of autocorrelation of the errors that is the model the most suited for our estimation.
- The tests of Breush-Pagan and Breush-Godfrey show respectively that the random effects are globally significant and the presence of the problem of autocorrelation of the errors.
- And the test of endogeneity confirms the absence of the problem of endogeneity between variables.
- The results of the empirical model always showed the positive and significant correlation between the penetration rate to the market of the agricultural insurance and the real growth of the agricultural production in the presence of the natural risk which affects the production of the farmers between 2000-2012.
- In our estimation, the variable which measures the natural risk relative to the Disasters and the climatic indicators (Total Number of death) (ic2) is significant and correlated

negatively in the agricultural production, a sign which is expected.

- So, the variable of control which measures the natural risk for these countries justifies once again that in these countries it is the development of the industry of agricultural insurance and especially the agricultural insurance product indexed that contributes positively to the potential improvement of the agricultural performance.
- The agricultural foreign direct investments are correlated positively and significantly in the growth of the agricultural production.
- And a positive and significant correlation between the agricultural spending and the agricultural production.

**Table 1. Natural Risk and effect of the development of the penetration to the market of agricultural insurance on the real growth of the agricultural production (includes penetration, esp, idea, Ta, depa, ic1, ic2)**

Variables	MEF	MEA	MEAC
Penetration	0.073	0.206	0.198
esp0	(1.03)	(2.52)*	(6.84)***
Idea0	0.026	-0.034	-0.024
Ta0	(0.44)	(-0.45)	(-0.48)
depa0	0.145	0.217	0.205
ic20	(3.72)***	(4.45)***	(5.39)***
ic10	-0.222		
Constante	(-0.67)		
R <sup>2</sup>	0.086	0.3	0.468
N/Nbre d'obs	(0.94)	(2.7)***	(7.79)***
F Statistique	0.027	-0.176	-0.809
Wald Chi 2	(0.47)	(-2.43)*	(15.29)***
Test de Hausman	0.007	0.133	0.677
Test de Breush-Pegan	(0.23)	(3.29)**	(18.11)***
Test de Breush-Godf	16.70	14.98	11.16
	(43.85)***	(31.65)***	(39.85)***
	17.69%	83.14%	83.14%
	9/107	9/107	9/107
	(3.30)***		
		(43.71)***	(1889.52)***
		(83.26)***	
	(14.91)***	(26.38)***	
	(6.014)	(6.172)	

Source: Compilations of the author from the estimation

### Economic analysis of the results of the estimation

In what follows, we are going to verify if the used explanatory variables present well the expected signs and answer well the hypothesis of our estimation. As a consequence, through our estimation the signs of the explanatory variables are the following ones:

The variable penetration to the market of agricultural insurance which expresses the degree of penetration of these countries to the market of the present agricultural insurance the corresponding and expected sign as far as the countries of the sample use the agricultural insurance as one management tool of natural risk what has impacts on the agricultural production.

- The positive sign between the penetration rate to the market of agricultural insurance and the growth of the agricultural production supposes that in the American, European and Asian countries there is a strong trend to the development

of the industry of agricultural insurance what contributes to the improvement of the agricultural production.

- The variable devastates and the climatic indicators (Total Number of death) (ic2) present the expected sign as far as it is negatively correlated in the agricultural production. . The agricultural investments always present a positive sign waited because the agricultural investments tending to increase the production capacity in the agriculture. Investments help the insurant to face the climatic risks.
- The public spending are used as aids to the farmers present a sign positive and waited in correlation in the growth of the agricultural production.
- The natural risk that undergoes the American, European and Asian insured farmers made incite to the development of the agricultural insurance as management tool of this genre of risk which affects besides the production, the income of the farmers and their well-being.

Thus, the development of the agricultural insurance will be a solution to promote the agricultural production and this once to manage the risk due to natural disasters and unpredictable climatic hazards.

We confirm via this estimation the existence of a positive relation between the development of the insurance in case of natural risk and the agricultural production. A production which will be maintained and supported by the agricultural investments and by the spending intended for the agriculture. The aids or the subsidies insured in this case are not inevitably subsidies of agricultural production prices, a variable which is tested and which is not significant and negative in case of introduction of the variable risks climatic. It supposes that the direct subsidies are not inevitably direct aids on the prices but can be aids for the improvement of the quality of farmlands, to support the agricultural investors for example. As a matter of fact, what we were able to confirm it is that the development of the penetration to the market of agricultural insurance in the presence of the natural risk affects positively the growth of the agricultural production in the countries of the sample chosen during the period of study.

To insure the viability of the industry of agricultural insurance, economic and financial factors have to evolve in the sense of the promotion of the industry of agricultural insurance and the growth of the agricultural production. Among these factors are the agricultural investments, a penetration rate to the market of agricultural insurance raised (in other words a volume of the premiums of importing agricultural insurance) and agricultural subsidies supplied to help States to support the farmers in case of natural risk.

### Conclusion

The agricultural insurance is the activity of financing which demands the solidarity for the property to be insured individuals. In fact; it is the solidarity of the individuals that makes reduce the risks until their control. More the number of individuals to manage the risks are important, more the risks are mastered. So, the insurance is once applied will be verified the law of large numbers. We examined on the empirical relation between the development of the market of the agricultural insurance and the real growth of the agricultural production of other one by holding the economic and financial

conditions and this for a panel of 25 countries for the period 2000-2012. In the model, the relation between the positive impact of the development of the market of the agricultural insurance and the real growth of the agricultural production is demonstrated in three successive estimations by specifying the agricultural risk that is natural.

In fact, the relation between the development of the agricultural insurance and the growth of the agricultural production and between the penetration to the market of agricultural insurance can become ambiguous seen the specificities of the agricultural activity in every country and because the behavior of farms distinguishes itself from a country in another one. As a matter of fact, one of the political recommendations which we can pulled it is that States owe insurants a successful financial system which contributes to maintain the positive effects of the development of the market of the agricultural insurance on the growth of the agricultural production. In defect and if the decision-makers do not take into account the conditions which affect the relation, the growth of the agricultural production can be maintained without the industry of agricultural insurance develops. From their part, the insurers have to hold in consideration the conditions relative to the development of the agricultural production.

Among the financial factors which were used as potential factors which contribute to the development of the agricultural insurance, a penetration rate in the importing agricultural insurance. Concerning the economic factors which act positively at the same time on the growth we showed that it is the agricultural investments, the agricultural spending in the form of the aids other than subsidies on the prices and the quality of the farmlands which are the potential economic factors. In conclusion, to allow the promotion of the industry of agricultural insurance in presence of natural risk, it is enough to develop data which have a direct or indirect impact on the agricultural insurance and which allow to analyze the relation agricultural insurance versus the agricultural performance. In particular, the structure of the market, the culture of the country as well as the institutional, environmental, statutory and legal frame of the country. The impact of the insurance on the economic activity can not be only explained by these elements, there are other factors who can explained such an effect and even to spread it to the social side.

## REFERENCES

- Alberto, G. and David, Z. 2005. Income Risk Management in Agriculture, OCDE.
- Alexander, E. 2004. On the Premium for Revenue Insurance under Joint Price and Yield Risk, Working Paper, 4, 368, Center for Agricultural and Rural Development.
- American Agricultural Economics Association Annual Meeting, Orlando, FL,
- Anne, G. 2012. Risk Management Instruments for Food Price Volatility and weather Risk in Latin America and the Caribbean, The Use of Risk management instruments, Inter-American Development Bank, Institutions for Development (IFD), Discussion paper, 220.
- Antonia, A. and Jussi, L. 2013. Agricultural risk management policies under climate uncertainty, *Jesu's Global Environmental Change*, 23, 1726–1736.
- Architesh, P., Upasna, S. and Anthony, P. 2013. Adaptive capacity contributing to improved agricultural productivity at the household level: Empirical findings highlighting the importance of crop insurance, *Global Environmental Change*, 23, 782–790.
- Arthur, H. 2006. Production under uncertainty with insurance or hedging Insurance, *Mathematics and Economics*, 38, 347–359.
- Boussard, J. M. 1999. Economic aspects of risk in agriculture, FAO, document technique.
- Bruce, A. and Chad, E. 2005. Influence of the Premium Subsidy on Farmers'Crop Insurance Coverage Decisions, Working Paper, 5, 39, Center for Agricultural and Rural Development. Central Research Institute for Dryland Agriculture.
- Chen, Y, 2013. Agricultural Policy, Climate Factors and Grain Output: Evidence From Household Survey Data in Rural China, *Journal of Integrative Agriculture*, 12, 169-183.
- Craig, M. and Fotis, P. 2013. Productivity, credit, risk, and the demand for weather index insurance in smallholder agriculture in Ethiopia, *Agricultural Economics*, 44, 399–417.
- Daniel, A. 2012. Economic and Environmental Effects of Agricultural Insurance Programs, FARE.
- David, C. and Fernando, V. 2012. Agricultural Insurance in the Americas: A Risk Management Tool, Inter-American Institute for Cooperation on Agriculture, Inter-American Institute for Cooperation on Agriculture (IICA).
- Erik, F. and Rodney, L. 2011. What Drives the Development of the Insurance Sector? An Empirical Analysis Based on a Panel of Developed and Developing Countries, The World Bank.
- Fabian, C. and Carlo, C. 2012. Public Intervention in the Management of Agricultural Risk: Who Benefits from Insurance Subsidies? Department of Agricultural Economics and Policy, University of Naples Federico II, Portici, Italy.
- Georges, D. 2013. Agricultural risk management through weather based insurance ,
- Giancarlo, M. 2001. Uncertainty, Risk aversion and risk management for agricultural producers, *Handbook of Agricultural Economics*.
- Guochen, P. 2012. The Relationship between Insurance Development and Economic Growth: A Cross-Region Study for China, China International Conference on Insurance and Risk.
- Harun, B. and Keith, J 2013. Political Economy of Crop Insurance Risk Subsidies under Imperfect Information, Selected Paper prepared for presentation at the Agricultural & Applied Economics Association's. July 27-29,
- Katie, F. and Anthony, G. 2014. The Effect of Index Insurance on Returns to Farm Inputs: Exploring Alternatives to Zambia's Fertilizer Subsidy, Selected Presentation prepared for presentation at the Agricultural and Applied Economics Association's 2014, AAEA Annual Meeting, Minneapolis, July 27-29.
- Manitra, A. 2008. The impact of agricultural policy distortions on the productivity gap: evidence from rice production, Selected Paper prepared for presentation at the

Marco, A. 2006. Does Insurance Market Activity Promote Economic Growth? A Cross-Country Study for Industrialized and Developing Countries, the World Bank Policy Research Working Paper, 4098.

Michel, E. 1989. Le risque en agriculture, Edition de l'ORSTOM

Pan, G. 2012. The Relationship between Insurance Development and Economic Growth: A Cross-Region Study for China, China International Conference on Insurance and Risk Management.

\*\*\*\*\*