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Ashu Tiwari, Archana Patro, and Imlak Shaikh

Information Communication Technology-Enabled Platforms and P&C Insurance Consumption: Evidence from Emerging & Developing Economies

Ashu Tiwari (Correspondence author)
Indian Institute of Management, Rohtak
Management City, Southern Bypass, NH 10, Sunaria, Rohtak, Haryana 124001, INDIA
Cell: 8571877711, Fax: +91-1262-274051, E-mail: ashu.tewari25@gmail.com

Dr. ***Archana Patro***
Indian Institute of Management, Rohtak
Management City, Southern Bypass, NH 10, Sunaria, Rohtak, Haryana 124001, INDIA
Tel: 01262-228547, Fax: +91-1262-274051, E-mail: archana.patro@iimrohtak.ac.in

Dr. ***Imlak Shaikh***
Management Development Institute, Gurgaon
Block C, Sukhrali, Sector 17, Gurugram, Haryana 122007, INDIA
Tel: +91-124-4560297, E-mail: imlak.shaikh@mdi.ac.in

Abstract: Many business domains are benefitted with the fast diffusion of Information Communication Technology (ICT) -enabled platforms in society. But, ICT-enabled services have not received similar popularity across all domains despite rapid growth in ICT-based services. In the area of property and casualty insurance, the ICT adoption rate has been slow compared to other domains. The earlier literature in the domain attributed it to the product complexity. This paper argues that the impact of ICT-enabled platforms may have different outcomes on property and casualty insurance consumption due to risk aversion. In insurance literature, risk aversion has been proxied by many factors. As per the literature, secondary education has a positive impact on PCI (Property & Casualty Insurance) consumption while tertiary education has a negative impact on PCI consumption. In the context, this current study has empirically tested the impact of ICT-enabled platforms on PCI consumption in emerging markets and developing countries. The study found that secondary education has no significant impact on adoption of ICT platforms. However, tertiary education reduces the negative impact of ICT-enabled platform whereas Uncertainty Avoidance Index (UAI) increases the magnitude of negative impact of ICT adoption on PCI consumption.

Keywords: Information Communication Technology (ICT); ICT-Adoption; Risk factor; Property & Casualty Insurance (PCI) domain; Emerging markets and developing countries

JEL Classifications: B52, C23, O33

1. Introduction

Due to the exponential growth, fast diffusion, and network effect on business and society, Information Communication Technology (ICT)[1] has provided better economic opportunities to many business domains. But, the Property & Casualty Insurance (PCI) domain has not had significant ICT presence in the past thirty years (Swiss Re, 2000; Swiss Re, 2014; Swiss Re, 2017; Baur, Birkmaier, & Rüstmann, 2001).

However, not all the PCI markets have the same pace and the same adjustment path in terms of ICT adoption. For instance, most of the developed countries, PCI markets are well developed, and they have been significantly using online distribution channels in ICT domain for more than one decade[2]. Thus, the issue of ICT adoption is important especially in emerging and developing countries in which, though the growth rate of PCI consumption is high (Enz, 2000) yet, the markets are underdeveloped due to poor reach, high-risk premiums, lower financial awareness, and high-income elasticity (Swiss Re, 2014; Swiss Re, 2017). Therefore, realizing the potential benefits of capabilities of ICT, recently there has been increasing interest among PCI markets of these countries for ICT adoption (Catlin, Paliath, & Segey, 2014; Swiss Re, 2017).

But, PCI markets are still slow and lagging far behind from other markets in terms adoption of ICT platforms (Swiss Re, 2017). However, contrary to the current states of these markets, theoretical arguments given by Schumpeter (1934), and Davis (1979) support tremendous scope of ICT insurgence in PCI domain of emerging and developing countries (Hussels, Ward, & Zurbruegg, 2005). Therefore, there is a need to understand the reason for such a contradiction in states of PCI markets in these countries.

Despite the growing awareness of the suitability of ICT in the insurance sector, there is little information in extant literature on this topic. The few studies that have addressed the role of ICT in the domain of insurance are limited to the study of the productivity and efficiency of firms as an outcome of computing capabilities (Harris and Katz,1991; Francalanci and Galal,1998; Fukuyama and Weber, 2001). It is interesting to note that despite the scant attention paid to the use of ICT in insurance, there is sizeable literature on the role of ICT in the banking domain (Joseph, McClure, & Joseph, 1999; Mocetti, Pagnini, & Sette, 2017; Gupta and Yadav, 2017). The one study which has focused on aspect of slow ICT- adoption in PCI has attributed it to the product complexity.

Therefore, the purpose of current study is to understand the role of risk aversion behavior on adoption of online channels in PCI domain. This study is valuable in several key aspects. First, this study describes the causes for slow ICT adoption in the PCI domain. Therefore, this study will be helpful for PCI firms in designing channel adoption strategies based on local demographic characteristics related to risk aversion. Second, this study is also valuable for policymakers who are consistently trying to develop their PCI markets. The third contribution of the current study is a theoretical extension. This study demonstrates the impact of risk aversion as an important determinant of the technology-driven growth in some sectors.

[1] The study has used the term “ICT adoption” for referring the usage of online distribution channels for buying PCI products.

[2] In US, 53% of the total of IT services are consumed in insurance domain only (Groves, 2003). In UK, motor insurance is largely sold via online platforms (Swiss Re, 2014). In Italy, under Kaplan and Haenlein framework 77% of Italian insurers are using Facebook platforms for various insurance linked activities.

The remainder of the article is structured as follows: the following section provides a detailed survey of literature on factors influencing consumption of PCI insurance with a detailed focus on the role of ICT. The third section introduces the theoretical framework for hypothesis development. The fourth section describes the data, methodology, model, and estimation methods. The fifth section presents the results of estimation, and the sixth section discusses the results. Finally, the last section concludes the paper with pointers for future research in this area and discussion on the limitations of this work.

2. Literature Review

The literature on the role of ICT in insurance has been comparatively limited and covered only few aspects (Harris and Katz,1991; Francalanci and Galal,1998; Fukuyama and Weber, 2001; Donaldson, Lufkin & Jenrette, 2000; Chou, Liu, and Hammitt, 2004). Derikx, de Reuver, and Kroesen (2016) show that the use of the IT-enabled products in the insurance domain has a direct and adverse consequence of consumers' privacy concerns. However, monetary compensation can overcome this effect and positively influence the consumers' willingness to give up their privacy. Tak, and Rajawat (2016) study fraud detection capabilities with IT-enabled techniques. There have been studies on other aspects of IT-enabled insurance as well. Gandomi and Haider (2015) study the role of ICT in data predictive analysis and devise new statistical methods to remove pitfalls from big data predictive analysis. Crosby, Pattanayak, Verma, & Kalyanaraman, (2016) show the role of IT in verification of certain types of assets such as laptop, house, automobiles, etc. Puelz (2010) finds that IT-enabled platforms cannot be used as a substitute for agents.

A few studies address channel and delivery aspects in the insurance domain. For example, Dumm and Hoyt (2003) argue that electronic or virtual platforms cannot completely replace traditional channels in the PCI domain. Garven (2002) posits that online insurance distribution will enhance competitiveness and minimise price risk. Chou *et al.* (2004) study the relationship between insurance and ICT for health insurance and find that third-party payments increase the probability of technology adoption by hospitals. Bazini and Madani (2015) study the role of ICT in customer relationship management(CRM). Some studies in the PCI domain attribute the cause of slow ICT adoption by the PCI industry to product complexity (Donaldson *et al.*, 2000; Swiss Re, 2000). However, there has been, as yet, no academic study that has addressed this issue from the perspective of risk aversion. The current study attempts to bridge this gap.

3. Theoretical Framework

This study aims to understand the role of risk aversion on the technology-driven industry growth. For this purpose, this study has utilised three existing theories to build the theoretical framework for current work in two parts in the following manner;

3.1 Main effect

We have used Schumpeter's (1934) theory to formulate the first part of the three hypothesises. According to Schumpeter's (1934), concentrated markets are favorable for technology-driven growth. In emerging & developing PCI markets, few firms dominate the markets[3] (Hussels *et al.*, 2005). Therefore, the current study has tested the effect of ICT penetration on PCI consumption.

[3] International Insurance Fact Book, 2015

Theories on technology-led economic growth, suggest a positive impact of ICT on PCI consumption.

3.2 Interaction effect

An individual's level of risk aversion influences both ICT adoption and PCI consumption. Theoretically, the level of risk aversion positively impacts insurance purchase behavior but, adversely impacts technology adoption behavior (Agarwal and Prasad, 1999; Riddell, & Song, 2012; Szpiro, 1985; Outreville, 1990; Browne, Chung, & Frees, 2000). Therefore, it is important to understand how the level of risk aversion would impact insurance purchase via online platforms. Similar to the earlier studies in this area, the current study has used secondary education, tertiary education and, uncertainty avoidance index as proxies for risk aversion (Outreville, 1990; Browne *et al*., 2000; Esho, Kirievsky, Ward & Zurbruegg, 2004; Dragos, 2014; Trinh, Nguyen, & Sgro, 2016). And, internet penetration is used to measure the effects of Internet Communication Technology (Chinn & Fairlie, 2010; Sassi & Goaied, 2013). The extant literature showed that that secondary education positively impacts PCI demand, while tertiary education negatively impacts PCI demand(Outreville 1990; Browne *et al*., 2000; Esho *et al*., 2004; Trinh *et al*., 2016). A similar observation is shown in Figure 1. On the other hand, survey-based studies on adoption of IT have found that the level of education is directly related to use of Internet technology (Agarwal and Prasad, 1999; Riddell & Song, 2012; Wozniak, 1984; Krueger, 1993; Lleras-Muney and Lichtenberg, 2002). Therefore, a conceptual framework for present study has been drawn in Figure 2.

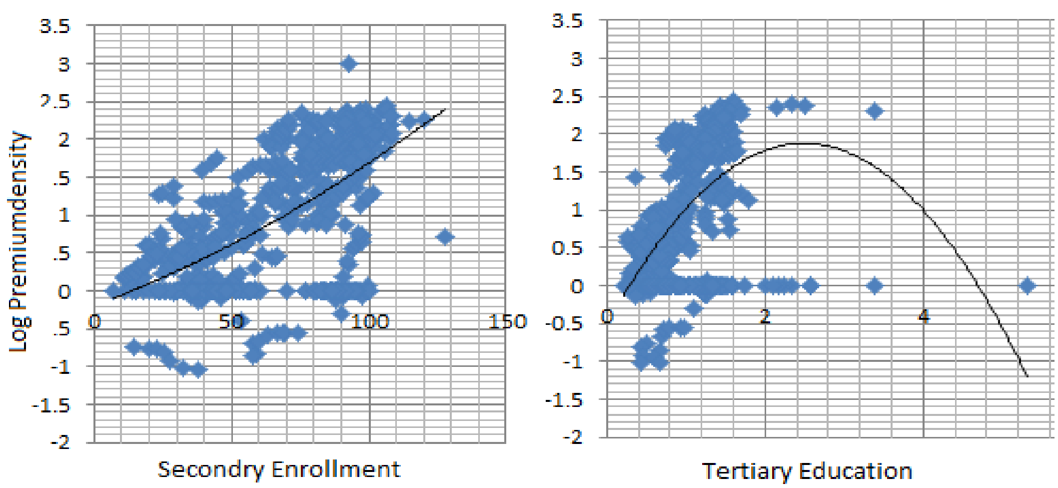

Figure 1. Scatter plotted between log premium density and two groups of education level

Notes: Two groups of education referred in this figure are secondary enrollment & tertiary enrollment (emerging markets and developing countries).

Data Sources: Sigma, 2014; and World Bank, 2014

Theory suggests that level of risk aversion can significantly influence ICT adoption in the domain of PCI. Figure 2 depicts that the relationship between ICT penetration and educational levels is nonlinear. Therefore, educational levels and UAI can have a significant influence on adoption of online platforms in PCI domain. Jaccard, Turrisi, & Jaccard (2003) explains that the interaction term exists when effect of independent variable on dependent variable differs due to third variable. And, they further explained that there should be a non-linear relationship between two variables (moderator & independent variable). In the current discussion, both the conditions are fulfilling. Therefore, we developed the second part in all the three hypothesises with interaction term to test moderating effect of risk aversion on technology adoption.

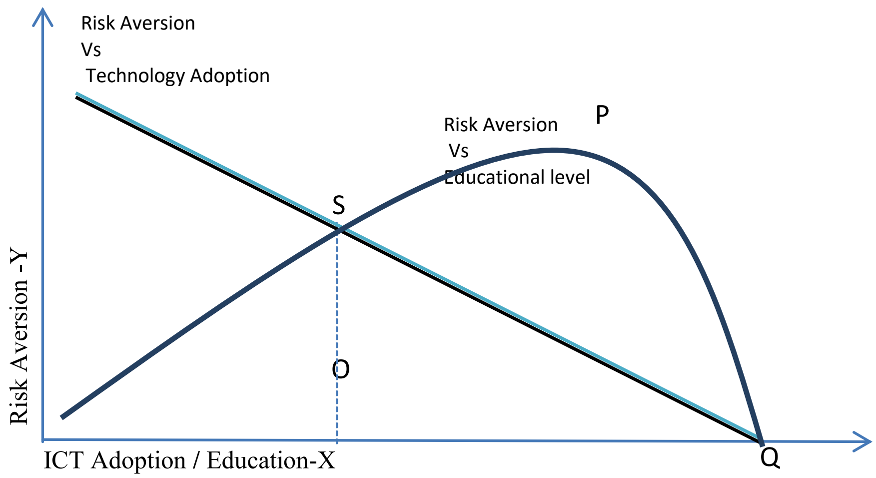

Figure 2. The theoretical relationship among insurance buying, educational level, and the behavior of technology adoption

Notes: Derived from figure 1 by juxtaposing two figures along with technology adoption curve; Before border line O, there is secondary and after O, there is tertiary education.

H_1: Other things being equal, with secondary education as a risk aversion measure, Internet penetration would positively affect PCI demand, and there would be a significant impact of interaction effect (between secondary enrollment and IT penetration) on PCI consumption.

H_2: Other things being equal, with tertiary education as a risk aversion measure, Internet penetration would positively impact PCI demand, and there would be a significant impact of interaction effect (between tertiary enrollment and IT penetration) on PCI consumption.

H_3: Other things being equal, with Uncertainty Avoidance Index (UAI) as a risk aversion measure, Internet penetration will positively impact PCI demand, and there would be a significant impact of interaction effect (between Uncertainty Avoidance Index and IT penetration) on PCI consumption.

Control variables	Proxies	Expected Relationship with demand for PCI
Income	GDP per Capita at a constant price of 2010	Positive
Risk exposure	Urbanization in country	Positive
Risk Aversion	secondary level Enrollment	Positive
	Tertiary Enrollment	Negative
Income Disparity	Gini Index	Negative
IT Diffusion in society	IT penetration	Not Known

4. Data & Methodology

PCI consumption is defined in this work as the sum of the individual firm and household consumption. This macroeconomic industry consumption analysis assumes that within the country, individuals and firms are homogeneous (Browne *et al*., 2000;). The data for the information communication technology under study is proxied by Internet penetration (Chinn & Fairlie, 2010; Sassi & Goaied, 2013). We have tested three models with a different proxy variables for our model to make the results of this study more robust. For the present study, we have collected data mainly from two sources; World Bank and, and Swiss Re. The definition and list of emerging markets and developing countries is based upon the World Economic Outlook Report, April 2015. The number of emerging markets and developing countries taken under the current study was 111. But we could get data for only 75 countries. The study has taken data for nine years between 2006 and 2014. This time frame is deemed suitable for the current work because, in developing economies, the information communication technology started influencing the insurance firms only from 2006 (Swiss Re, 2017). Since some independent variables for many countries are either completely missing or available for few years, the current study has estimated the results by using unbalanced panel data.

4.1 Control variables

Our primary focus in the current study is to test empirically the role of ICT on PCI demand in the background of risk aversion behavior. In this work, other than IT penetration, secondary education, tertiary education, and UAI, the study has used only three control variables namely, per capita GDP, urbanization, and Gini Index. The study used per capita GDP in US $ at a constant price of 2010 for individual income. The urbanization is proxied for risk exposure. The third control variable is income inequality, which was proxied with the Gini Index. These proxies are widely used in PCI domain (Outreville, 1990; Browne *et al*., 2000; Esho *et al*., 2004; Trinh *et al*., 2016).

For estimating results, the current study has employed dynamic panel data method, and solved it by using two estimation techniques, i.e., OLS, and GMM. The dynamic panel data method includes a lag term of the dependent variable, to examine the dynamic adjustments in the PCI consumption equation. The panel data controls many omitted country-specific and period-specific effects (Greene, 2011) such as difference across the country risk management practices, and cyclic business fluctuations. Thus, panel data provides more robust results. Also, in studies on insurance demand, the problem of endogeneity has been persistent. Therefore, to resolve the issue of endogeneity, GMM difference estimation is used.

To increase the accuracy of our results, we have conducted panel unit root test. The results show that four of the variables has unit root but, the problem is resolved after taking first difference. The OLS panel estimation has three techniques for estimating results, i.e., random effects, pooled effect, and fixed effect. To determine the most appropriate technique out of three, we conducted a variety of tests. We have conducted the Wald Test, and Lagrange Multiplier (LM) test to check the relative efficiency of heterogeneous fixed or random effect-effect estimation against the homogeneous pooled OLS estimation. Further, we computed F value in our models and found it to be statistically significant at (one-tailed), which indicates that the null hypothesis of zero correlation between the observable country-specific effects and the explanatory variables in the model can be rejected. Thus the fixed effect model can still derive consistent estimates but random effect model cannot; therefore we have used here a fixed effect model. For random effect, study data need to be drawn from a large population (Baltagi,1995).

4.2 The specification of model for estimation methods

$$y_{i,t} = \alpha_i y_{i,t-1} + \beta_i X_{i,t} + \mu_i + \varepsilon_{i,t} \quad (1)$$

Here, the subscript i denotes the number of countries i = 1, 2, 3,…, 75; and subscript denotes the time t= 1, 2, 3,…, 9; y_{it} denotes premium density and premium penetration; α_i denotes country specific intercepts, $\beta_1, \beta_2, \beta_{3,}$ are country specific slope parameters; and $\varepsilon_{i,t}$ are the random error terms. $y_{i,t}$ is dependent variable and, $y_{i,t-1}$ is lag dependent variable. $X_{i,t}$ is a column vector of time varying independent variables. Whereas, μ_i captures variable intercepts that are omitted and specific to a subject.

4.3 Estimation method

We used the fixed effect model but the LSDV with the small time period (T< 30) produces at least 20% biased estimates (Judson and Owen, 1999). Therefore, we also used GMM system estimator.

Since the OLS estimation for a regression equation with dynamic term, is unable to resolve the issue of endogeneity as the same error term $\varepsilon_{i,t}$ enters the equation for every observation in group i (Green, 2011). The difference estimator method can address this issue.

This method uses first difference of equation (1)

$$(y_{it} - y_{it-1}) = \alpha\,(y_{it-1} - y_{it-2}) + \beta_2\,(x_{it} - x_{it-1}) + (\varepsilon_{i,t} - \varepsilon_{\mathrm{i,t-1}}) \quad (2)$$

Moment generating condition $\mathrm{E}[k_{i,t-s}(\Delta\varepsilon_{i,t})] = 0$ (Where s ≥ 2; t = 3,4,5,…,T; $k_{i,t} = (x_{it}, y_{it})$.

However, the first difference method may also produce imprecise results with significant biases if the variance of permanent effects exceeds the transitory shocks (Blundell and Bond, 1999). Thus, the correlation between independent variables and invariant country-specific factors result in additional moment conditions such that

$$\mathrm{E}[(x_{i,t}, y_{i,t})(\varepsilon_{i,t} + u_{i,})] = 0 \; (s = 1;\ t = 3, 4, \ldots, T;\ k_{i,t} = (x_{i,t}, y_{i,t}) \quad (3)$$

where t = 3 and s = 1.

This additional moment condition along with difference estimator method is popularly known as GMM system estimator. Arellano and Bond (1991) has developed this estimation technique. This technique is improved version of previous estimation technique and therefore, provides more reliable results. However, consistency of GMM technique depends upon a number of assumptions, especially the assumption of serial correlation in error terms and validity of instruments. Therefore, along with estimation results, diagnostic results are also carried out.

5. Panel Data Estimation

Table 1(A) Determinant of PCI with Internet penetration: Panel Data Results (OLS)

Independent Variables	Model 1	Model 2	Model 3
D(Internet Penetration)	-0.648 (0.108)	- 0.776*** (0.001)	-0.812* (0.900)
D(Internet-Penetration)*D(Secondary Edu)	-0.054 (0.142)		
D(Internet -Penetration)*D(Tertiary Edu)		5.948** (0.022)	
D(Internet -Penetration)*UAI			-0.025** (0.015)
D(Secondary Edu)	2.864* (0.079)		
D(Tertiary Edu)		-107.195 (0.272)	
UAI			0.011 (0.851)
Gini Index	-2.385*** (0.006)	-2.967** (0.038)	0.019 (0.900)
GDP/Capita	0.007*** (0.000)	0.006*** (0.000)	0.001** (0.018)
Urban	0.049 0.979	3.144 0.319	0.177** 0.050
PCI(-1)	0.743*** 0.000	0.712*** 0.000	0.920*** 0.000
Constant	77.94 0.278	21.786 0.820	- 4.687 0.489
Summary Statistics			
Cross Section	33	31	43
Observations	136	109	178
F-Statistics	454.91***	94.86***	437.41***
Adjusted R^2	0.959	0.975	0.945

Notes: p -values are given in the brackets. *, ** and *** indicate significance levels of coefficients at 10%, 5% & 1%, respectively. In this panel data analysis stationarity is tested with the help of unit root tests for all the variables as group and as individual variables. The test found that secondary education, tertiary education, and IT-penetration series are non-stationary while the first difference for all the series is stationary. In this analysis, study finds that since data for Uncertainty Avoidance Index is time-invariant and at the same time not available for all the countries under the current study sample, hence models with UAI are estimated with pool regression method. Other two models (model 1 & model 2) are fixed effect models.

Table 1(B) Determinant of PCI without Internet- penetration: Panel Data Results (OLS)

Independent Variables	**Model 1**	**Model 2**	**Model 3**
D(Secondary Edu)	0.11 (0.466)		
D(Tertiary Edu)		-20.380** (0.020)	
UAI			0.074*** (0.000)
GDP/Capita	0.002*** (0.000)	0.005*** (0.000)	0.001*** (0.000)
Urban	1.225*** (0.007)	0.0402** (0.043)	0.042* (0.074)
PCI(-1)	0.670*** (0.000)	0.722*** 0.000	0.887*** 0.000
Constant	-28.219** (0.038)	-14.107 (0.418)	-1.059 (0.483)
Summary Statistics			
Cross Section	81	74	92
Observations	452	437	739
F- Statistics	289.326***	372.811***	5342.37***
Adjusted R^2	0.985	0.98	0.967

Test Statistics

	Model 1	**Model 2**	**Model 3**
Housman & Wald Test	Fixed effect is better than pooled & random	Fixed effect is better than pooled & random	pooled effect is better than fixed & random
Cross Section	Fixed	Fixed	None
Period	None	None	None
Heteroscedasticity Test	Heteroskedastic (p=0.00)	Heteroskedastic (p=0.00)	Heteroskedastic (p=0.00)
Serial Correlation	NO	NO	NO

Note: p -values are given in the brackets. *, ** & *** indicate significance at 10%, 5% & 1%, respectively. Here stationarity is tested for all the variables as group together and at the same time as an individual variable. The test results show that secondary education, tertiary education, IT-penetration series are non-stationary while, the first difference of all these series is stationary. In this analysis, study finds that since data for Uncertainty Avoidance Index is time-invariant and data for the same is not available for all the countries under the current study sample. Similarly, data for Gini index is also not available for all the countries in the study sample. Therefore, fixed effect analysis is not possible for the models where any of the two (UAI or Gini Index) variables is present.

Table 2 Determinant of PCI with Internet- Penetration & Mobile Users: Panel Data Results (GMM)

Independent Variable	**Model 1**	**Model 2**	**Model 3**
Internet –Penetration	-5.951***	-1.311 *	-2.182**
	0.005	0.054	0.012
Internet penetration* Secondary Edu	0.042**		
	0.172		
Internet penetration*Tertiary Edu		0.270*	
		0.079	
Internet penetration*UAI			-0.949***
			0.000
Secondary Edu	-1.030		
	0.209		
Tertiary Edu		-226.477***	
		0.000	
UAI			32.046
			0.152
Gini Index	-2.631***	-5.070***	-4.952***
	0.000	0.000	0.000
GDP/Capita	0.011***	0.008***	0.008***
	0.000	0.000	0.000
Urban	33.031***	14.852***	9.766***
	0.000	0.000	0.000
PCI(-1)	0.538***	0.429***	0.421***
	0.000	0.000	0.000
Summary Statistics			
Cross Section	25	25	25
Observations	116	93	99
F - Statistics[p-value]	[0.000]	[0.000]	[0.000]
J - Statistics	16.848	14.758	16.186
Arellano-Bond Serial Correlation Test[p-value]			
AR(1)	[0.687]	[0.467]	[0.599]
AR(2)	[0.187]	[0.212]	[0.221]

Notes: (1) *, **, *** indicate significance levels of coefficients at the 10%, 5% and 1% level, respectively. (2) Since GMM methodology is based on difference estimation method to remove cross-section effect, model with Uncertainty Avoidance Index could not be estimated. Other limitation includes period effect. The models in our analysis could not incorporated period effect. However ICT may have important implications along time scale.

6. Results and Discussion

Table 1(B) lists the reference models for control variables. In Table 1(A), there are three models, i.e. model 1, model 2 and model 3. In all three models, we have used three different variables for risk aversion. In model 1, secondary education is found to be significant at 10% level and has positive impact on insurance buying. Other than this, neither IT penetration nor interaction of IT penetration and secondary education are found significant. The Gini Index and GDP/Capita are also found to be significant at 1%. However, in model 2, where tertiary education is taken as a measure for risk aversion, IT penetration and the interaction between tertiary education and IT penetration are found to be significant at 1% and 5% levels of significance, respectively. In model 2, IT penetration is negative while, interaction term is positive. However, tertiary education is not found to be significant. In model 3, Uncertainty Avoidance Index is taken as a measure of risk aversion. Again in this model, IT penetration, as well as interaction term between UAI and IT penetration, is found significant at 10% and 5% significance levels, respectively. Similar to model 2, in model 3, risk aversion term UAI is not found to be significant. However, unlike model 2, the interaction term is found to be negative. In Table 2, in place of OLS method, GMM estimation method was used. GMM method provides more refined results. In model 1, IT penetration was significant at 1% level but negative. However, all three control variables were found to be significant at 1% level. In model 2, all the three terms, i.e. IT penetration, interaction term between IT penetration and tertiary education and, tertiary education are significant at 10% ,10% and, 1% significant levels, respectively. In model 3, IT penetrations, as well as the interaction between IT penetration and UAI, are found significant at 5% and 1% significance levels, respectively. In addition, all three control variables were significant at 1% in the GMM model. Finally, Table 1(B) is the reference table and presents the proxies of risk aversion and control variables except the proxy for income variation. In the three models, except for secondary education in model 1, all the other risk aversion variables were found to be significant. However, amplitudes were different from the results of our models seen in Tables 1(A) & 1(B).

The results in our models are different from proposed hypotheses. For instance, in hypothesis 1, we expected positive impact of IT penetration on insurance demand and negative interaction effect. But OLS results in Table 1(A) shows no significant impacts of both the terms, but there is positive impact of secondary education.

If we go by the GMM estimation results in Table 2 for hypothesis 1, IT penetration was seen to have negative and significant effect on insurance buying but, the interaction between secondary education and IT penetration is again insignificant. These results contradict the first part and make the second part of our test hypothesis inconclusive.

This result essentially means that due to opposite nature of insurance buying and technology adoption behavior(risk aversion), the main effect is negative. However, people with secondary education are not very comfortable with technology adoption. Therefore, the model that includes secondary education is unable to predict its role in regulating the ICT adoption behavior in PCI domain.

In second hypothesis, we argued that IT penetration would positively impact PCI markets in the presence of tertiary education as risk aversion variable. The result again is different from our hypothesis. In of the second model shown in table 1(A), IT penetration is negative at 1% significance level whereas, interaction term is positive at 5% significance level. Again, the first part of our results is contradictory to our hypothesis. However, the second part of our hypothesis was confirmatory. Interestingly, results GMM estimation in Table 2 supported the results from model 2 in table 1(A). Control variables in model 2 of table 1(A), 1(B) and, 2 also indicated the same results.

The result in the second hypothesis had negative main effect and positive interaction effect, which shows that due to the contradictory role of risk aversion in case of technology adoption behavior and insurance buying behavior, coefficient of IT penetration is negative. However, tertiary education positively impacts technology adoption behavior. This leads to positive coefficient of the interaction term. This essentially means that tertiary education reduces the negative impact of ICT adoption behavior in PCI domain.

In the third hypothesis, we argued that IT-penetration would positively impact PCI demand and the interaction term between IT penetration and UAI would be significant. In our estimation results of model 3 in table 1(A) and table 2, the first part is contradictory to our hypothesis while second part was confirmatory to our proposed hypothesis. The control variables in table in 1(A) showed similar trend as shown in our estimation table 1(B). In table 2, estimation results show better strength of control variables in terms of significance level.

The results of the third hypothesis are also partially similar to the result of earlier two hypotheses. The first part of hypothesis was similar to the result of hypotheses 1 and 2, while the second part was negative at a significance level of 1% level. This essentially means that uncertainty avoidance index is a better proxy for risk aversion. Therefore, due to risk aversion for technology adoption, the interaction term further increased the negative impact of IT penetration on insurance buying.

The present study shows that due to opposite nature of insurance buying and technology adoption behavior (risk aversion), IT penetration is negative in all the three hypotheses. However, this impact can be altered by factors significantly influencing risk aversion behavior. For example, educational levels affects level of risk aversion. Similarly, we also used Uncertainty Avoidance Index and found that culturally risk-averse people less likely use online platforms for buying insurance products.

7. Conclusion

In the domain of PCI, IT adoption behavior has significant repercussions on insurance buying. In this context, this article shows for the first time that the theoretical logic of positive impact of technology on concentrated markets has further implications of risk aversions. The study has focused on the PCI industry in emerging markets and developing countries. The reason for selecting this group of countries is that underdeveloped markets are rapidly growing and are increasingly adopting ICT in the PCI domain. It is shown in this work that IT penetration is negative and significant in terms of main effect but has positive interaction effect in case of tertiary education, and negative interaction effect in case of Uncertainty Avoidance Index.

One reason for the negative impact may be due to the contradictory behavior required for insurance buying and IT adoption. Another reason behind such outcomes may be that the industry has not used IT related platforms as rapidly as individuals have adopted ICT-enabled platforms. Since the study setting is focussed on emerging and developing countries, this behavior is not surprising. In emerging markets and developing countries, the products continue to be sold by agents. In these countries, online insurance sale is a very recent phenomenon whereas online media are extensively being used for buying other utility products to avoid unnecessary cost. This difference of timing and pace- for ICT adoption by industry and consumer may also result in unfavorable outcomes.

The positive interaction term with tertiary education indicates that people with tertiary level of education use IT platforms for buying insurance products. Therefore, online portals may hinder insurance purchase in the places where people are not educated beyond the secondary levels. Earlier studies on slow adoption of online platforms in insurance sector has focussed on product complexity. Insurance products are legal documents so, it is not easy to simplify these products. However, findings of the current study are more practical and can be used by firms of all size. In emerging markets and developing countries, managers can consider the demographic characteristics in the context risk aversion for designing online channel strategies for sale of PCI products.

The limitation of this research is that we have taken overall property and casualty premium for understanding ICT adoption on insurance buying behavior. However, a more detailed analysis can be carried out by testing this phenomenon with individual product lines, and other proxies for information technology such as mobile penetration.

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Appendix: Descriptive Statistics

Variable	Mean	Median	S. D.	Minimum	Maximum
Dependent Variable					
Insurance Density (U.S.$/Capita)	49.16992	9.36261	105.1948	0	716.3261
Independent Variables					
Income (GDP/Capita)	5387.691	2138.377	9848.63	41.6558	96732.53
Risk Exposure (Urbanization %)	32.37132	1.033625	14.20633	0.21056	77.08693
Risk Aversion(Tertiary)	1.081853	1.07912	0.700548	0.21056	6.31564
Risk Aversion(Secondary Education)	52.2434	59.40621	364.44	0	127.732
IT penetration(IT users /100)	20.84513	13.8	20.13345	0.182048	91.49

Notes: (1)Totally 75 emerging markets and developing countries are considered for above statistics;

(2) The list of emerging markets and developing countries are selected according to the World Economic Outlook Report, 2015;

(3) GDP, Premium density, and Insurance penetration are in constant (2010) U.S. dollars;

(4) Please contact authors regarding more details on the variables, and sources of data used in this work.