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THE SPATIAL STRUCTURAL ANALYSIS OF MICROFINANCE INSTITUTIONS OF CAMBODIA

Mr. Phon Sophat Faculty of economics, Thammasat University.

1. Introduction

The real growth rate of GDP in Cambodia has been revealed well and noticedly burst in recent decades. There are main driven sectors to push this country going well with this growth as manufacture sector, agriculture, Services and constructions. As in the figure 1 reveals that in average of growth, Cambodia has had 6.5% to 7% growth rate in economy. Furthermore, Cambodia's economy growth is projected around 7% in 2017 and slightly to 6.2% in 2021 by IMF while Myanmar and Lao seem the same growth in average from 7% to 8% per annuam. **Figure 1**: The real GDP growth (Percent) in CLMV countries



Source: IMF (2016)

Foreign Direct Investment approved consists the largest share was from China (23.97 percent and their source of extensive investment in the field of resource developments as rubber, and tourism where Korea is at second rank at 10.68 percent. And the other major sources are Malaysia, Taiwan, Hong Kong, and Thailand, whose investment comes mainly from garment industry companies (CDC,2016). This capital flows tremendously with industries and services pattern and this makes more activities in economy as well as financial soundness. Cambodia financial condition resumes accommodating economic growth. Domestic credit growth in banks

accelerated further to 27 percent year on year in 2016Q2, well spurred on by rising domestic demand for consumption and construction (CEA,2016).



Figure 2: Foreign Direct Investment



Figure 3: Cambodia financial sector



Furthermore, due to this figure 2 mentioned clearly that Cambodia banking sector has spurred well from years to years. As this data found that Cambodia has had increased in average credit growth about 30 percent (year on year), increasing bank credit to GDP ratio to 62.7 percent by 2015. In mid 2016, MFIs loans approached to 3.3 billion USD with 2 million borrowers (CEA, 2016). In addition, via figure 2 reveals that Cambodia has burst the deposit by 29.7% while entire loans about 35.1%. Along with figure 3, this states that Cambodia loan outstanding of MFIs are allocated with rural and remote areas classified well as mention in graph following. Phnom Penh City and Kondal province are highest loan outstanding among the MFIs in Cambodia while some remote areas are lack of financial services as loan and deposits. This also shows that the branch of vital microfinance institutions and rural credit operators in Cambodia. In 2015, depositors rose to 17.38% from 2,2592,601 to 2,650,188 while the borrowers went up to 15.58% from 443,482 to 512,582 .While deposit to GDP is 61.85% and credit to GDP about 63.46% in 2015 (NBC). To support with development and financial development has tremendously improved well with new 57 operational branches, 3, 808 POS and new 178 ATM machines terminals, as well as issuing the 143,012 new debit cards and new 8,575 credit cards entire country.



Figure 4: Cambodia Loan Outstanding by Province (Only 45 MFIs and 7 NGOs)

Source: CMA, 2016

This study research will mainly focus on

- 1. How MFIs in Cambodia effects to poverty rate with each geography area?
- 2. How MFIs and lightnight pictures related to poverty in Cambodia?
- 3. How characteristic of MFIs drift to help poors in remote area in Cambodia?

This research papers will be covered five parts while acknowledges of Cambodia's Microfinance institutions and spatial autocorrelation in the econometric growth model for section II. This section also explains the process of computing the spatial Weight Matrix and the concept of Moran's I and Geary's C index , Moran quartile map, percentile map too. Section III provides the empirical analysis of the spatial structural analysis with vital variables and LISA cluster map, global clustering and local clustering model and Ordinary Least Squares regression , Spatial Lag regression and Spatial Durbin Error regression model. Furthermore, I have employed the spatial Lag and error model in order to check the robustness results. Section IV will discuss the results of the econometric models and some discussions about the results and implications trends. Section V will cover the conclusion and some implications.

II. Literature Reviews

Many research papers have been revealed about many techniques and discussion about trade and macroeconomic growth views while fewer researchers have been focusing on with this spatial autocorrelation model to financial sector. Due to Carlton(2001) mentioned that the success of a microfinance program largely depends on the interaction between the characteristics of the program and the context in which the program is implemented. So, the location base for a particular MFI is fundamental in ensuring the success of that institutions. Focarelli and Pozzolo (2000) stated that banks prefer to have branches in other locations where expected profits are larger and the prospects of expected economic growth are higher too. As now the competitive market, so marketing is the customer oriented operation that is very important for the success of any banks. Therefore they are needed to think and evaluate options and strategize in building efficient branch in marketing strategies (Lee and Fukui, 2003) based on the mechanism between customers and the nearest marketplace.

Furthermore, Ray and Mahapatra (2014) employed OLS to find the factors that influence penetration of MFIs between Indian states. Their founding shows that MFIs branches into states with higher per capita GDP and better rural infrastructure but lack banking facilities and some states where there exist low human capital (measured by national literacy rate). In addition, Vanroose (2015) finds in Peru how local factors influenced the probability for a district to have an MFI by adopting a Logit regression. Its finding reveals that districts with the higher rate of infrastructure development have higher probability of getting an MFI. Moreover, he notices that the likelihood of MFIs extension into market gap is higher with higher levels of development area while MFIs are likely inclined to move to districts with commercial bank presence.

In the other hand, for spatial autocorrelation technique with all these fields as definition was given as the spatial structure in the quantitative data provides the information about the similarity of the characteristics (income growth of neighboring provinces) via the distance between the locations (provinces) and the spatial autocorrelation of the variables explains how this variation is affected by the distance (Fortin and Dale; 2009). Balisacan and Briones (2006) searched about the measure of neighborhood effects in their intra country growth regression models and used the potential spatial and spillover effects which shows how the average growth rate of per income and poverty in the Philippine provinces was affected by its neighboring provinces with controlling for other factors affecting income growth. The finding shows that a negative spatial correlation among the neighboring province, as the average growth rate of their homeland province increases, the average growth rate of per income of their homeland province increases, the average growth rate of per income of their homeland province increases, the average growth rate of per income of their homeland province increases, the average growth externalities.

III. METHODOLOGY RESEARCH

From Lucas (1988) and Lucas (2001) decomposed that growth model in which output is generated via a production function as

$$Y = AK^{\alpha} (hL)^{1-\alpha} \tag{1}$$

Whereas Y, A, and K are as usually given definitions and $0 < \alpha < 1$, and is defined as the proportion of total labor time spent working, and h is called the stock of human capital. In this case, We can rewrite as

$$LnY = \ln A + \alpha LnK + (1 - \alpha)(Lnh + LnL)$$
⁽²⁾

In term of production per capita as function as

$$y = Ak^{\alpha}h^{1-\alpha} \tag{3}$$

So we can reach as

$$Lny = \ln A + \alpha Lnk + (1 - \alpha)(Lnh)$$
(4)

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Where A(.) is total factor productivity, K capital, total labor force H and average level of human capital l. So due to Stephan Brunow and George Hirte (2008), the collecting terms yields with full specified my total factor productivity function can be derived as

 $A(.) = T \exp\{\alpha \text{ District branch MFIs }+\delta \text{ TFmale }+\pi \text{Tmales}\}$ So $K(.) = f\{\text{Total outstanding loans, Total deposits}\} \text{ and TFmale}$ Where h= f {density of population with each provinces } and y represents as each poverty rates

Hence I can approach (3) as

$$y=T \exp{T \exp{\alpha \text{ District branch MFIs}} + \delta \text{ TFmale } + \pi \text{Tmales}}k^{\alpha}h^{1-\alpha}$$
 (4.1)

Where T is constant and function of TFmales { loan, deposit) and Tmales { loan, deposit } So due to this research, my model would be following:

 $\ln poverty = \beta_0 + \beta_1 \ln depo + \beta_2 \ln loan + \beta_3 \ln T fmale + \beta_4 \ln Tmale + \beta_5 \ln district + \beta_6 \ln pop + \varepsilon$ (5) From (5), the spatial error model (Cliff and Ord 1981) can be approached as regression equation as (6)

 $\ln poverty = \beta_0 + \beta_1 \ln depo + \beta_2 \ln loan + \beta_3 \ln T fmale + \beta_4 \ln Tmale + \beta_5 \ln district + \beta_6 \ln pop + (I - \rho W)^{-1}u$

Where W is a spatial weights matrix.

To account for the spatial spillovers among neighboring provinces, I additionally introduced the spatial lags of the explanatory variables. From Anselin,2003 ,This (6) will be described as following:

$$\begin{aligned} \ln poverty &= \beta_0 + \beta_1 \ln depo + \beta_2 \ln loan + \beta_3 \ln T f male + \beta_4 \ln T male + \beta_5 \ln district + \beta_6 \ln pop \ (7) \\ &+ \beta_7 \ln lightnight + \beta_8 w \ln poverty + \beta_9 w \ln depo + \beta_{10} w \ln loan + \beta_{11} w \ln T f male \\ &+ \beta_{12} w \ln T male + \beta_{13} w \ln district + \beta_{14} w \ln pop + \beta_{15} w \ln lightnight + u \end{aligned}$$

The Durbin model generated with the spatial error model when its coefficient equals the coefficients of the exogenous variables times the spatial coefficient. Due to developing countries as Cambodia, the data is extremely hard to collect and assemble it .So some data could be some issues and not accurate too. So In this paper, I have introduced the raw data from Cambodia Microfinance Association and International Monetary fund, National Committees for Sub national Democratic Development of Cambodia (NCDD) and National Institute of Statistic of Cambodia. These main variables are going to be from many sources which are combined altogether and process with some programs as well as GeoDa , GeoDa space and QGIS too.

Variable	Description	Source	
LOGPOVERTY	Poverty rate from each provinces	IMF	
LOGPOP	Population of each provinces	NCDD	
LOGLOAN	Total outstanding loans from MFIs	СМА	
LOGTDEP	Total deposits from MFIs	СМА	
LOGDISTRI	Total MFIs' branches in districts	СМА	
LOGFMALEL	Total females employed loan in area	СМА	
LOGMALEL	Total males employed loan in area	СМА	
LOGFMDEP	Total females deposited money in area	СМА	
LOGLIGHT	Light night data from satellite data	QGIS	
LOGVILLAGE	Total villages with loan operations	СМА	
LOGINCOME	Total income average from each provinces	NIS	

Table1: Descriptions of the data set and the source of the data

Notes: all variables are proxy as logarithm in order to access data in programs.

III. FRAMEWORK

• Data processing



Source: GeoDa workbook.

IV. EMPIRICAL ANALYSIS OF THE MICROFINANCE INSTITUTIONS

In this research will be employed the data from Cambodia Microfinance Association (CMA), GIS administrative data ,National Institute of Statistic and Lightnight data from satellite too for 2007-2008-2011 and from data shape file in Cambodia. In order to use these data, I have combined this CMA's data into shape file data joining in QGIS software and used in GeoDa and GeoDa space software to run Moran's I test , LISA and all spatial regression models.



Figure 5: Moran's I scatter of Total loans and LISA significance map: 2007-2008-2011

In 2007, the Moran's I shows positively with values of 0.2574 which means that Cambodia's financial loan has existed the high uses of loan in communities and districts, furthermore, from LISA significant map also said that most of financial loans are allocated in some areas around city only as well as Champong Cham, Kandal, KompongSom, Svay Rieng and Ratanak kirri province too with significant p-value in 0.05% and Prey Veng and Phnom Penh with significant in 1% while others are not significants. Furthermore, In 2008, with the Moran I test mentioned that 0.145 and LISA stated that Cambodia's Loan service has very tinny amount of spreadness and only one province applied enough in 1% of P-value. The lack of financial services to geographies of Cambodia and population is Banteay Mean Cheay but It's still limited and low supple. In addition, in 2011, Cambodia's loan has tremedously increased with Moran Test significant (0.389) and 2 provinces (K.Cham and Takeo) are sifnificant with propotion of geographies and amount of loan in that area while Svay Rieng is low significant in propotion and Kandal, Phnom Penh, Prey Veng and Ratanak Kirri with lowest propotions of loans in area.



Figure 6: Moran's I scatter of Average Income and LISA significance map: 2011

Due to this average income which was created by National Institute of Statistic (NIS) shows that Cambodia's income of people has tremendously located in city and especially in some provinces nearby capital city. By this map, Cambodia's income is merely separated huge gap in city and remote area while Moran I value is 0.024. There are 4 provinces in high - high level as Phnom Penh , Prey Veng , K.Cham , Kandal province too.

Figure 7: Mapping of Cambodia's total loans using the GI's clustering analysis



Source: author's illustration based on CMA's data



Figure 8: Mapping of Cambodia's total deposit using the GI's clustering map

Source: author's illustration based on CMA's data

From figure 7 and 8 showed that Cambodia's financial services as loan and deposit have huge gap with with remote area and city. This means that Cambodia hasn't had the good spreads in these services to societies and mostly related with city than rural areas. And most of concerns provinces with lack of rural financial services which are located far away from capital city .

In order to deal with spatial autocorrelation, a spatial weighted matrix (**W**) would be employed as well and it's based on distance which is mentioned by Brunow (2006). LISA map was employed by spatial weight matrix (see figure 5). In this case, Lightnight data employed with bivariate test , showing positively relate to loan within two provinces(Sihanouk vile and K.Spur) where Moran I is 0.12 positively with quadrant Low –Low to High –High and from Low to High in LISA(see figure 9).

Figure 9: Total loans and Lightnight data : Bivariate analysis



In this above case in 2007 mentioned that total loan on light, there are two provinces which are Sihanouk vile and K.Spur stated that financial service in Cambodia is correlated positively with

light and from low to high level of light as in this above picture. Kompong Spur is low light with loan if compare to Sihanouk Vile province with geography spatial measurement. Furthermore, Cambodia's light and loans are increased tremendously in 2008 and 2011 but only in some locations as city with in high light level around capital city while some provinces in boarder couldn't get that services much (Low-Low) at all. Whereas deposits are still limited with saving and loan. If we calculated with deposit and locations in district level branches shows that Cambodia has had less saving in around country but one capital city exist high level in deposits as figure 10 while most others are not significant level.

Figure 10: Total deposits with district branches of MFIs: Bivariate analysis



In 2007, this stated that Kompong Thom is having the low saving while other nearby provinces having low too, whereas Capital city is still high level of deposit in this spatial level. If we see Low to high level reveals that Koh Kong provinces which is having more tourism attractive places existing more saving from Low to high level. Furthermore, 2011, I observed that Koh Kong is still low to low level while in 2007 mentioned that Low to high level . This means the deposit in this province going down if compared to 2007 or sometimes we can say that low deposit in Koh Kong makes effect from other low deposits nearby that provinces too. As we see this figure, Kompong Cham is going to low to high level in deposit while Koh Kong is low in comparison of spatial measurement. In other case about financial services with poverty in each regions revealed that capital city has had high level while other nearby provinces are still low employing with these services while Kompong Cham and Prey Veng provinces are still consisting the low financial services while capital is high level in 2011. Whereas, other border province as Rotanak Kirri province has low services when other nearby regions are low too. This meant that other provinces are not significant in these services. Cambodia's rural financial

services are lack of spreading these services in rural area and it would impact less to poor. I will search more about these issues in spatial regression in order to make sure that Cambodia's faced or not with some vital variables in this system with employing OLS and Spatial model for next step.

IV.ECONOMETRIC MODEL: SPATIAL REGRESSION MODEL

In order to solve with spatial autocorrelation, spatial weight matrix is needed as well. I have used the spatial weight matrix , W, which is based on distance mentioned by Brunow and Hirted (2006). As we have seen the correlations with each others in some cases like in LISA – map illustration. To control with this issue , I have followed the procedure of model selection as suggested by Florax et al.(2003). I firstly used with OLS estimation and apply with Moran I test and the Lagrange multiplier test for spatial error or Spatial Lag (Anselin and Florax 1995) as well as the corresponding robust LM test. And these above cases will be compared with each others like from spatial lag , OLS and Spatial error and with spatial Durbin model to make sure that the data is good fitness with these models. Due to above framework , I have analysized with this data framework in order to get the result.

Poverty	OLS estimates		ML spat error		ML spat Durbin	
Toverty	2007	2011	2007	2011	2007	2011
CONSTANT	2.400**	0.486	2.52**	0.219	5.538**	0.615
LOGDEP	-0.015	-0.012	-0.020	-0.015	-0.003	-0.012
LOGDISTRI	0.038	0.037**	0.029	0.022**	0.041	0.026**
LOGFMALEL	0.005	0.000	0.030	-0.004	-0.02	0.001
LOGFMDEP	-0.050**	-0.010	-0.051**	-0.006	-0.06**	-0.011
LOGLIGHT	-0.026	-0.012	-0.029	-0.019**	0.006	-0.018
LOGMDEPO	0.100**	0.024	0.111**	0.011	0.107**	0.006
LOGTLOAN	-2.470	-0.054	-2.533*	-0.008	-3.59**	-0.019
LOGTMALEL	-0.029	0.019	-0.063*	0.012	0.031	0.020
W_LOGDISTRI					0.06	0.000
W_LOGFMDEPO					-0.076**	0.022
W_LOGMDEPO					0.114**	-0.007
W_LOGPOVERT					-0.110**	0.012
W_LOGTLOAN					-3.392**	-0.042
λ			-0.41**	0.722**	0.848**	0.419**
AIC			-58.341	-84.306	-68.653	-79.295
Moran I	0.37	0.36				
Sp err LM	0.139	2.191				
Sp err rob LM	6.901**	0.184				
Sp lag LM	4.153**	5.557**				
Sp lag rob LM	10.914**	3.550				

Table2: Results of regressions with comparison models

Notes: *p< 0.01, ** p<0.05, ***p<0.001. In parentheses, "sp" spatial; "sp error spatial. λ is coefficient of spatial autocorrelation; "LM" is spatial LM test; rob LM is robust spatial LM test; sp lag is spatial lag.

4

Due to estimation employed with ML spatial Durbin model has been stated that total deposit in Cambodia has insignificant all years. Because of poverty in each areas which is induced not to save in microfinance and banking in Cambodia. While some deposits seem only in capital city.

In addition, above district branches of microfinance is positively related with poverty significantly within 2011 only. This means that in 2007, rural microfinance in Cambodia has less branches in districts and not effective to rural people at all, oppositely alliance in 2011. As this table, the female total loans haven't effected with poverty which is contrast of my assumptions while total loans did. Due to total female deposits have revealed that's significant at p-value at 5% but negative trends in 2007 but not in 2011. This figure mentioned that if most of total female deposits in Cambodia have increased one percentage, it will affect to the poverty deduction about 5% in each province for 2007 but it's insignificant and negatively related in 2011.Lightnight data divulged that most of light data has insignificant with negative relate but in spatial Error model in 2011 said that light has negatively connected with poverty and significant one. We can say that the more electricities in the most cities, the less poverty too in those provinces. Whereas, deposit of males has significant and positively connect with poverty. It shows that the more male deposits in MFIs or banks make more poverty. This seems that it would be right in real situations of Cambodia while most of men in Cambodia have given his income to his wife who has no job to do but farm or taking care the child only.

In the variable of total loans outstanding shows negatively relates while some years are not significant relate and negative too. This means that Cambodia's loan has more in society the more reduces in poverty in each province as well. This assumption can be said that loan is very important to poverty deduction in calculation with spatial error and spatial Durbin model for Cambodia in 2007 while in 2011, there are no significant but it's still negative relates to poverty (see the same discussion of William, 2000 and IMF,1999). At the last variable of Total Male employed the loans which was revealed that Cambodia's rural financial services have limited use with male and females and this figure mentioned that's insignificant for OLS and spatial Durbin model while in spatial error model has significant one in 2007 . Moreover, Cambodia's loan for men has negatively connected with poverty in each area. This shows that loan had been employed in 2007 by men induced well to poverty deduction in Cambodia while in 2011, this service has positively connected with poverty. Increasing use of loan by males in Cambodia in 2011 stated that forced to surge the poverty too. It seems that when we increase the total loans

for males, it will be decreasing with poverty too around 6.3% too. This means contrast results with Zeller et al.(2001) and Corsi et al (2006) stated that MFIs have perceived as a gender sensitive tool aimed at targeting women, because lending to women leads to higher repayment rates, greater social and economic impacts as compared to men.

Moreover, in the spatial error Durbin model has displayed well that neighbor of female deposit has impacted to our poverty deduction too around 7.6% in 2007 while branch in district hasn't significantly related but positive trend, seems the same results from Ledgerwood, 1999.

Furthermore, Total neighbor male deposits have significantly associated with poverty with 11.4% if total male deposit increased 1% in 2007 while it's negatively brought into poverty constraint in 2011. However, in this vital variable also stated that poverty in neighbor regions have forced to decrease our poverty by 11% in 2007 while it's insignificantly associated in 2011and other variable demonstrated that the increase of neighbor loans will eliminate our poverty too. So in this case, due to table 2, I have looked at the differences between each variable in models and more details too with each models within neighbor effective variables to our regions. The main variables are about the financial products and association with spatial geography and poverty. I also carried out a cross sectional analysis regional heterogeneity might not be controlled well for. Fortunately I had introduced the way to solve it by using the matrix measurement in spatial distance too. In table 3 mentioned that some of these respects to available variables as total outstanding loans, total deposits, branches and characteristic of users will be stated in above figures too. In our main regressions I consider the agglomeration effects with total loans and deposits and poverty with geographies in Cambodia. Finally I have used the spatial distance decay and continuity queen for robustness check which is displayed in table 3 with the same techniques as below. W distance is standing for weight spatial distances decay matrix while W Gueen is Weight continuity Gueen matrix. After applying this model, the result reveals that all remains the same magnitude while ML spatial Error is still best model to be used due to AIC and comparison of OLS and ML spat error and ML spat Durbin. This situation, OLS would be the available too but if we take a look with coefficient of W distance in ML spatial error and OLS and with coefficient ones stated that W distance in ML spatial error are better than like with total outstanding loan and Total male loans and total deposits too.

OLS estimates		ML spat error		ML spat Durbin	
W_Gueen	W_Distance	W_Gueen	W_Distance	W_Gueen	
2.406**	2.52**	1.527**	5.538**	4.218**	
-0.016	-0.020	0.002	-0.003	0.004	
0.038	0.029	0.0127	0.041	0.022	
0.006	0.030	-0.019	-0.02	-0.021	
-0.050**	-0.051**	-0.028**	-0.06**	-0.052***	
-0.0262	-0.029	-0.027**	0.006	-0.007	
0.100**	0.111**	0.050**	0.107**	0.085***	
-2.474	-2.533*	-1.619	-3.59**	-2.845**	
-0.029	-0.063*	0.024	0.031	0.033	
			0.06	0.049	
			-0.076**	-0.066***	
			0.114**	0.089*	
			-0.110**	-0.082***	
			-3.392**	-2.466**	
	-0.41**	0.879**	0.848**	0.927***	
-57.335	-58.341	-66.295	-68.653	-76.952	
1.708					
3.367					
8.968**					
10.627**					
	stimates <u>W_Gueen</u> 2.406** -0.016 0.038 0.006 -0.050** -0.0262 0.100** -2.474 -0.029 -57.335 1.708 3.367 8.968** 10.627**	stimatesML spat W_Gueen $W_Distance$ 2.406^{**} 2.52^{**} -0.016 -0.020 0.038 0.029 0.006 0.030 -0.050^{**} -0.051^{**} -0.0262 -0.029 0.100^{**} 0.111^{**} -2.474 -2.533^{*} -0.029 -0.063^{**} -0.029 -0.063^{**} -0.41^{**} -57.335 -58.341 1.708 3.367 8.968^{**} 10.627^{**}	stimatesML spat error W_Gueen $W_Distance$ W_Gueen 2.406^{**} 2.52^{**} 1.527^{**} -0.016 -0.020 0.002 0.038 0.029 0.0127 0.006 0.030 -0.019 -0.050^{**} -0.051^{**} -0.028^{**} -0.0262 -0.029 -0.027^{**} 0.100^{**} 0.111^{**} 0.050^{**} -2.474 -2.533^{*} -1.619 -0.029 -0.063^{*} 0.024 -57.335 -58.341 -66.295 1.708 3.367 8.968^{**} 10.627^{**} 0.627^{**}	stimatesML spat errorML spat W_Gueen $W_Distance$ W_Gueen $W_Distance$ 2.406^{**} 2.52^{**} 1.527^{**} 5.538^{**} -0.016 -0.020 0.002 -0.003 0.038 0.029 0.0127 0.041 0.006 0.030 -0.019 -0.02 -0.050^{**} -0.051^{**} -0.028^{**} -0.06^{**} -0.0262 -0.029 -0.027^{**} 0.006 0.100^{**} 0.111^{**} 0.050^{**} 0.107^{**} -2.474 -2.533^{*} -1.619 -3.59^{**} -0.029 -0.063^{*} 0.024 0.031 0.06 0.06^{**} 0.06^{**} 0.114^{**} -0.41^{**} 0.879^{**} 0.848^{**} -57.335 -58.341 -66.295 -68.653 1.708 3.367 8.968^{**} 10.627^{**}	

Table3: Robustness checks: The comparison of spatial weights matrix

Estimates: spatial distance decay vs. Continuity Queen

Notes:*p< 0.01, ** p<0.05, ***p<0.001. In parentheses, "sp" spatial; "sp error spatial. λ is coefficient of spatial autocorrelation; "LM" is spatial LM test; rob LM is robust spatial LM test; sp lag is spatial lag.

V. Conclusion

First, this paper will cover two contributions on the Cambodia's economy as banking systems located within branches and poverty and other main variables which are introduced with clustering model analysis and spatial analysis which consists of three models as OLS model regression, ML spatial Error and ML spatial Durbin model to know how the effects of branches of microfinance in districts, users of MFIs and productions of rural microfinance impacted to poverty with each provinces of Cambodia. Furthermore, with these techniques will be found the effects from neighbors to our regions and within dependence variable too. In this first part mentioned well about the locations of microfinance institutions and poverty trend, as this results reveal that most of Cambodia 's microfinance institutions are located in city and some high economical provinces nearby capital city only as in clustering map at figure 10. And furthermore, total loans and deposits of Cambodia seem classifications of customers who live in remote area and city. As from bivariate analysis stated that light data is related positively with

loans outstanding and poverty. This means that wherever they have had the electricity in their locations are mainly better or easier to get loan or more development than other city. This can be said that locations would be more developed than others both with better household's income and possibility of getting the rural financial services in those locations too. As figure 8 reveals that Cambodia's deposit are also setting the difference classifications as well as female and male, introduced in 2007, 2008 and 2011 that Cambodia's total deposits are not spreading well while it goes to only the city and tourism provinces while some boarder provinces like Stung Treng , Rottanak Kirri , Mondul Kirri are still very low and many other provinces are not significant too. In addition of this, most of microfinance and banks are rarely located with above remote province too (see clustering analysis in figure 10).

Second from this part, It will be employed the spatial model in order to deep down more with some main variables which are independent variables and dependence variable as poverty too. Yet it would be three results to compare with more appropriate models and robustness check too. So it said that Cambodia's total deposits from MFIs is negatively related with poverty in each provinces with insignificant level too. This means that Cambodia's less deposit in rural area and if deposit increase 1 percent ,So poverty will decrease about 1.5% too in 2007. This would have the national policy to save with microfinances or banks in order to get the poverty deduction for households too. Female deposits look very awesome in 2007 like this variable is negatively related with significant value too. This means that most of women saving in Cambodia can reduce the poverty in their provinces and themselves too where men saving are positively related. This can say that characteristic of saving deposits in Cambodia are two classifications for men and women who are tremendously different translations too. The more men deposits in the microfinances or banks, the more poorer in their provinces and themselves. This shows some evidences that most of Cambodia's men are the family leader and income finders too while the women usually stay at home with caring their children, especially in rural area. As lightnight data shows that Cambodia's light has negatively significant with poverty (see table 2). The more electricity or light in that city increase, the more decrease of poverty in that areas too, while some infrastructure as electricity providers have limited to spread till rural area around country(see table 2).Furthermore, total outstanding loans has negatively associated with poverty as table 2 in 2007 while it's not related in 2011. This reveals that MFIs' total loans are very important to decrease the poverty rate of Cambodian within each provinces. The highest thresholds in coefficient and significant value with rural financial product (loan) is massive tool to generate the rural employments and other social economic activities too in ML spatial error regression model as in table2. In addition, some neighbor variables are very effective to each provinces too like female deposits, male deposit, total loans and neighbor poverty too with negative relations and significant levels. Those mean that decrease of our regional poverty is referred to neighbor's economic activities too. The more increase of poverty in neighbor provinces forced to decrease the inner our poverty rate too as well other variables like total loans , total deposit too.

For the more implicational research should be extended the models and source of data used with some new variables and mechanism of financial products of Cambodia.

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