

FACTORS THAT AFFECT FARMLAND CONVERSION IN CHINA AND INDONESIA

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ABSTRACT

The first challenge in this century is to maintain or increase the farmland because land is the determinant factor. China and Indonesia have a considerable population, have the same major food crops, and have been facing a problem with farmland conversion. The problem will be focused on the following issue whether factors are affecting farmland conversion in China and Indonesia. This research used the data from The World Bank in 1982 - 2014 and used Auto-Regressive Distributive Lags (ARDL) as the data analysis. In the short-run, investment and urban population are significant variables to affect the farmland conversion in China and Indonesia. The employment merely affects for farmland conversion in China, while the agriculture GDP and railways affect for Indonesia. In the long-run, employment and railways affect farmland conversion in China; however, the agriculture GDP, investment, and urban population are significant for Indonesia. Some policies which needed to prevent farmland conversion began stipulated zoning and spatial planning in central and local government, and incentives for the farmer.

Contribution/ Originality

This is first study on farmland conversion in China and Indonesia. There are few studies has been conducted about farmland conversion in China and Indonesia separately. However, farmland conversion is still infancy in the current literature insights. This article using slightly complete of the macro economy indicator.

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1. INTRODUCTION

In 2030, the productivity of land should rise to fulfill food demand when forest area had no change. The productivity of labor has to rise in households if the target for poverty reduction and decreasing the poor ends to materialize (Timmer, 2014).

China and Indonesia are the important agricultural countries in Asia. China is the most population as well as the most food consumer country in the world. Whereas, Indonesia is the largest population in South-East Asia and the fourth most populous in the world. Indonesia and China have a vast population, 3.5% Indonesia and 18.67% China population of the total world population. Thus, the challenge for Indonesia and China to supply 22% food for the world population, and the first challenge is to maintain the farmland. Similarly, Indonesia and China have the same major food crops. For Indonesia, currently, significant crops are rice, maize, soybeans, peanuts, cassava, and tuber, respectively. Meanwhile, for China, the staple foods are wheat, rice, soybean, maize, and tuber.

China and Indonesia have been facing problem-related farmland conversion simultaneously. The intensity of farmland conversion in developed countries much lower than developing countries, which is Indonesia and China are part of developing countries. For instance, farmland conversion in the Netherlands was 17 hectares per day during 1996-2000. On the conversely, China experienced 802 hectares of farmland converted per day in 2004 and Indonesia had 514 hectares of farmland converted per day during 2000-2002 (Tan *et al.*, 2009). Many reasons why farmland conversion in developing countries increase continuously, for instance, in China and Indonesia, likely caused by housing and industry area demand, infrastructure development, as well as no proper spatial planning to protect farmland. Moreover, boom population has been pressuring to farmland as well as a change of government policy.

Pressure for farmland in China caused by the change of government and rural community insight. Rural communities have more opportunities livelihood, not only as a farmer who lived in rural but also works in the services sector which means move to the urban area. Moreover, infrastructure development extremely rapid in China since 1990. New construction of highways, airports, railways, and many more have been farmland change to another purpose.

In Tomohon, Indonesia, economic factors, landscape factors, and food security factors are ultimate factors that influence land conversion (Benu *et al.*, 2013). In Karawang, Indonesia, land conversion in Indonesia was started in the 1980s when the Government became more open for investment (Irene, 2015). In Indonesia, the situation almost similar to China, much prominent rice production area had been changing by economic factors, mainly caused by investment.

Rural collectives are the owner all of the farmland in China. The households were given use right for the amount of the land for themselves in the 1980s. They have had the right to lease to others since 2008. Only 4 million had large-scale farming is 2% of the total, found by the recent census. In China, the change of farmland caused by change of government policy, because farmer no right for sold the land. In Indonesia, a farmer could sell the land if they have the right. Otherwise, if farmer get the land through the agrarian reform as stipulated by The Farmer Protection and Empowerment Act (Law Number 19/2013), they have no property right. This study focused on determining factors affecting farmland conversion in China and Indonesia.

2. METHOD OF THE STUDY

2.1. Theoretical framework

Let X_t be farmland derived from fixed stock of natural land reserves (X) applying labor L_t . Thus, the land is treated as a natural capital form in this model and can write the motion equation for farmland as:

$$X_{t+1} = X(1 - \delta_x) + \psi, L_t, x, X_0 \text{ given, } X_t \leq \bar{X} \dots\dots\dots (1)$$

The parameters $\psi > 0$ are structurally estimated. According to Kuznets Theory, we develop the theory which agriculture GDP and employment are factors which increasing the farmland, whereas investment and urban population are factors which increasing the farmland conversion.

Capital in this study represented farmland and investment, whereas labor represented employment in agriculture (e.g., [Hietel et al., 2007](#)). Farmland conversion influenced by urban population (e.g., [Azadi and Barati, 2013](#)) and railways for goods transport (e.g., [He et al., 2012](#)) as a represent increasing development.

There are several human-behavior components that influence the farmland conversion ([Hietel et al., 2007](#); [Jinyan et al. 2010](#)), including (1) demography such as population density and age structure, (2) employment and economy such as off-farm job alternative and working outside rural area, and (3) agricultural structure such as farmland coverage and production type. Change of land use throughout the nation dominated by urban and industrial land expansion. In recent years, transportation development, for instance new highways, railways, airports, seaports, and pipelines, has also been a major reason of land conversion, especially in the eastern and central regions ([He et al., 2012](#); [Jiang and Zhang, 2016](#); [Shi et al., 2016](#)). In China, the most considerable reducing magnitude for arable land reached 371.83 km²; the increased using land came mainly from the conversion of arable land for economic development ([Li et al., 2016](#)).

2.2. The benchmark models

China and Indonesia are the biggest countries in each region that have been facing the same several challenges. Developing countries, having the enormous amount of population and mainland, as well as rapid development in the urban area, are the same characteristics between two countries. However, China and Indonesia have a different basis for farmland regulation. Some farmers in Indonesia are having farmland property right, otherwise, in China, farmers merely having farmland use right.

The variables used in this study were: amount of farmland conversion in Indonesia and China, V (hectares), agricultural gross domestic product, AGDP (constant 2010, million USD), investment, INV (million, USD), employment in agriculture, EMP (%), urban population, UPOP (million), and railways for goods transported, RAI (million ton-km).

The farmland conversion measurement used the equation of land depreciation. The farmland conversion determined by calculating the farmland depreciation partially. The partial farmland depreciation explained as follow:

$$V = LND_t - LND_{t-1} \dots\dots\dots (2)$$

Where:

- V = farmland conversion (hectares)
- LND_t = farmland area in year-tth (hectares)
- LND_{t-1} = farmland area in the year before tth (hectares)

In this study, the dependent variable is the amount of farmland conversion (V), and the independent variables are the agricultural gross domestic product, (AGDP), investment (INV), employment in agriculture (EMP), urban population (UPOP), and railways for goods transported (RAI). To analyze the factors affected farmland conversion in China and Indonesia, we used the same model from both countries, the following model estimated is specified as:

$$V_t = \beta_0 + \beta_1AGDP_t + \beta_2INV_t + \beta_3EMP_t + \beta_4UPOP_t + \beta_5RAI_t + \varepsilon_t \dots\dots\dots (3)$$

In order getting the elasticity of coefficients and omit the outliers effect, the variables have to transform into the linear function. The form of a linear function of the equation becomes:

$$LV_t = \beta_0 + \beta_1LAGDP_t + \beta_2LINV_t + \beta_3LEMP_t + \beta_4LUPOP_t + \beta_5LRAI_t + \varepsilon_t \dots\dots\dots (4)$$

where: LV_t = Logarithmic transformation of farmland conversion; $LAGDP_t$ = Logarithmic transformation of AGDP; $LINV_t$ = Logarithmic transformation of investment; $LEMP_t$ = Logarithmic transformation of employment in agriculture; $LUPOP_t$ = Logarithmic transformation of urban population; and $LRAI_t$ = Logarithmic transformation of railways for good transported. The error term (ε_t) included the represents of the remove variables in the model and to capture all errors of the coefficient, parameter variations, and errors of the model. $\beta_0, \beta_1, \beta_2, \beta_3, \beta_4,$ and β_5 are the elasticities to be estimated.

The first thing did with the time series data is testing for stationarity. The critical characteristic of stationarity time series, because we can study its behavior only for the time period under consideration. Each set of time series data will be for a particular episode (Gujarati and Porter, 2009). This article used the tests of Phillips-Perron (PP) and Augmented Dickey-Fuller (ADF) to test the stationarity and order of integration of the variables in critical values of 5%.

We used the ARDL co-integration approach which built by Pesaran and Shin (1999) and Pesaran *et al.* (2001). There are three advantages in comparison with other previous and traditional co-integration methods. Firstly, the ARDL no need all the variables under observation to be integrated of the same order. Secondly, the ARDL test relatively more efficient. Lastly, unbiased estimates of the long-run model (Harris and Sollis, 2003). Based on the approach by Pesaran and Shin (1999), Pesaran *et al.*, (2001), as well as Harris and Sollis (2003), the ARDL approach involves estimating the conditional error correction version of the ARDL model for variable under estimation. The ARDL (p, q1, q2, ..., qk) is given by the following equation:

$$\alpha(L, p)y_t = \alpha_0 + \sum_{i=1}^k \beta_i(L, q) + \lambda_wt + \varepsilon_t \dots\dots\dots (5)$$

where:

$$\alpha(L, p) = 1 - \alpha_1L - \alpha_2L^2 - \dots - \alpha_pL^p$$

$$\beta_i(L, q_i) = \beta_{i0} + \beta_{i1}L + \beta_{i2}L^2 + \dots + \beta_{iq_i}L^{q_i}$$

y_t is an independent variable, α is the constant term, L is the lag operator, for instance $L_{yt} = y_{t-1}$. Furthermore, w_t is s x 1 vector of deterministic variables, for instance, intercept term, time trends, or exogenous variables with fixed lags. The long-run equation concerning intercept and time trend can be written as follows:

$$y = \alpha_0 + \alpha_t + \sum_{i=1}^k \beta_i x_i + \gamma w_t + \eta_t, \text{ where: } \alpha = \frac{\alpha_0}{\alpha} (L, p) \dots\dots\dots (6)$$

Following the study from Owusu and Asumadu-Sarkodie (2017) and Ifa and Guetat (2018), this study employs the ARDL econometric approach due to its advantage over other econometric variables in small sample size. The ARDL model in this study as follows:

$$\Delta LV_t = \alpha + \delta_1 LV_{t-1} + \delta_2 LAGDP_{t-1} + \delta_3 LINV_{t-1} + \delta_4 EMP_{t-1} + \delta_5 UPOP_{t-1} + \delta_6 RAI_{t-1} + \sum_{i=1}^p \beta_1 \Delta LV_{t-i} + \sum_{i=0}^p \beta_2 \Delta LAGDP_{t-i} + \sum_{i=0}^p \beta_3 \Delta LINV_{t-i} + \sum_{i=0}^p \beta_4 \Delta LEMP_{t-i} + \sum_{i=0}^p \beta_5 \Delta LUPOP_{t-i} + \sum_{i=0}^p \beta_6 \Delta LRAI_{t-i} + \varepsilon_t \dots\dots\dots (7)$$

Where Δ indicates the first difference operator, α denotes the intercept, and ρ denotes the lag order, and ε_t indicates the error term. The relationship between the variables are examined with F-test based on the null-hypothesis of no co-integration between *LV*, *LAGDP*, *LINV*, *LEMP*, *LUPOP* and *LRAI* ($H_0: \delta_1 = \delta_2 = \delta_3 = \delta_4 = \delta_5 = \delta_6 = 0$), contrary to the alternative hypothesis of co-integration between *LV*, *LAGDP*, *LINV*, *LEMP*, *LUPOP*, and *LRAI* ($H_1: \delta_1 \neq \delta_2 \neq \delta_3 \neq \delta_4 \neq \delta_5 \neq \delta_6 \neq 0$). The estimated F-statistic compared with the critical values of the lower and upper bounds.

2.3. Data

This study used annual time series secondary data. This data collected from the World Bank over the period 1982 - 2014. Another main data sources are the National Statistics Bureau in both countries, the Food and Agriculture Organization, and the Ministry of Agriculture.

3. RESULT AND DISCUSSION

The tests of Phillips-Perron and Augmented Dickey-Fuller (ADF) for test the stationarity and order of integration of the variables use critical threshold 5%. Based on Table 1, almost all of the variables non-stationarity in level I(0), so we must check stationary at first and second difference. Furthermore, based on Table 2, in the first difference, there are a few variables have non-stationarity. However all variables are stationary in the second difference for both countries. Based on Table 2, the ARDL approach, therefore, can be made to test the hypothesis.

Table 1: Stationary at level I(0)

PP Test	China			Indonesia		
	t-statistics	Critical values 5%	Prob.	t-statistics	Critical values 5%	Prob.
V	-1.9241	-2.9571	0.3175	-1.1939	-2.9571	0.6648
AGDP	4.8018	-2.9571	1.0000	4.5054	-2.9571	1.0000
INV	1.0291	-2.9571	0.9959	0.6639	-2.9571	0.9893
EMP	0.4628	-2.9571	0.9826	-3.7004	-2.9571	0.0089
UPOP	8.5582	-2.9571	1.0000	-2.1003	-2.9571	0.2458
RAI	-0.7594	-2.9571	0.8169	-0.8298	-2.9571	0.7968
ADF Test						
V	-1.5380	-2.9571	0.5019	-1.0048	-2.9639	0.7385
AGDP	5.2340	-2.9571	1.0000	4.9512	-2.9571	1.0000
INV	3.6308	-2.9918	1.0000	0.5750	-2.9571	0.9867
EMP	1.4330	-2.9677	0.9986	-3.5001	-2.9571	0.0145
UPOP	-0.6995	-2.9604	0.8324	-1.7645	-2.9604	0.3903
RAI	-1.0484	-2.9604	0.7230	-0.8656	-2.9571	0.7860

Table 2: Stationary at level I(1) and I(2)

PP Test: First difference	China			Indonesia		
	t-statistics	Critical values 5%	Prob.	t-statistics	Critical values 5%	Prob.
V	-3.345	-2.960	0.021	-4.017	-2.960	0.004
AGDP	-2.756	-2.960	0.076	-2.244	-2.960	0.196
INV	-6.934	-2.960	0.000	-5.426	-2.960	0.000
EMP	-2.445	-2.960	0.139	-7.532	-2.960	0.000
UPOP	-1.663	-2.960	0.440	-2.320	-2.960	0.172

RAI	-3.099	-2.960	0.037	-5.492	-2.960	0.000
PP Test: Second difference						
V	-6.73	-2.96	0.00	-11.87	-2.96	0.00
AGDP	-9.53	-2.96	0.00	-11.26	-2.96	0.00
INV	-10.68	-2.96	0.00	-11.57	-2.96	0.00
EMP	-6.17	-2.96	0.00	-23.28	-2.96	0.00
UPOP	-3.80	-2.96	0.01	-4.81	-2.96	0.00
RAI	-8.65	-2.96	0.00	-26.25	-2.96	0.00
ADF Test First Difference						
V	-3.139	-2.960	0.034	-4.900	-2.964	0.000
AGDP	-2.641	-2.960	-0.096	-2.466	-2.960	0.133
INV	0.158	-2.976	0.964	-5.412	-2.960	0.000
EMP	-3.575	-2.968	0.013	-7.524	-2.960	0.000
UPOP	-1.768	-2.960	0.389	-2.320	-2.960	0.172
RAI	-3.126	-2.960	0.035	-5.466	-2.960	0.000
ADF Test Second Difference						
V	-5.276	-2.968	0.000	-7.389	-2.968	0.000
AGDP	-9.511	-2.964	0.000	-7.113	-2.968	0.000
INV	-7.114	-2.976	0.000	-8.340	-2.968	0.000
EMP	-6.279	-2.964	0.000	-6.486	-2.964	0.000
UPOP	-3.757	-2.964	0.008	-4.813	-2.964	0.001
RAI	-7.891	-2.964	0.000	-5.438	-2.972	0.000

The ARDL approach available the values of AGDP, INV, EMP, UPOP, and RAI, the ARDL approach available, not only in the past values but also in the current value. The numbers of delays for China and Indonesia are (3, 2, 3, 3, 3, 3) and (2, 1, 3, 2, 3, 1), for each variables respectively (Table 3).

Table 3: ARDL result

Variables	China: ARDL (3, 2, 3, 3, 3, 3)				Indonesia: ARDL (2, 1, 3, 2, 3, 1)			
	Coef.	Std.error	t-Stat.	Prob	Coef.	Std.error	t-Stat.	Prob
V (-1)	0.3199	0.1949	1.6418	0.1446	0.7846	0.1601	4.9020	0.0004
V (-2)	-0.0604	0.1348	-0.4482	0.6675	-0.5989	0.1272	-4.7094	0.0005
V (-3)	0.1358	0.0871	1.5599	0.1628	-	-	-	-
AGDP	0.0001	0.0001	1.4392	0.1933	0.0003	0.0001	2.5214	0.0268
AGDP(-1)	0.0000	0.0001	-0.0867	0.9333	-0.0002	0.0001	-1.5687	0.1427
AGDP(-2)	-0.0001	0.0001	-2.0245	0.0826	-	-	-	-
INV	0.0000	0.0000	-2.7474	0.0286	-0.0001	0.0001	-2.7427	0.0178
INV(-1)	-0.0001	0.0000	-4.1502	0.0043	-0.0001	0.0001	-1.9015	0.0815
INV(-2)	0.0000	0.0000	1.5248	0.1711	0.0001	0.0001	2.1730	0.0505
INV(-3)	0.0000	0.0000	2.0165	0.0836	-0.0001	0.0000	-1.7824	0.1000
EMP	1.3873	0.4164	3.3319	0.0126	-0.0216	0.0871	-0.2484	0.8080
EMP(-1)	-1.1976	0.5953	-2.0117	0.0841	0.0135	0.0132	1.0158	0.3298
EMP(-2)	-0.3570	0.4778	-747175.00	0.4793	0.0349	0.0137	2.5543	0.0253
EMP(-3)	1.0915	0.4622	2.3616	0.0502	-	-	-	-
UPOP	1.3620	0.3972	3.4289	0.0110	-1.5828	0.7079	-2.2361	0.0451
UPOP(-1)	-3.1983	0.7383	-4.3318	0.0034	2.0712	1.1940	1.7346	0.1084
UPOP(-2)	2.3345	0.6051	3.8584	0.0062	0.9400	1.2392	0.7585	0.4628
UPOP(-3)	-0.4570	0.4243	-1.0769	0.3172	-2.0930	0.7912	-2.6454	0.0214
RAI	-2.3266	2.6831	-0.8671	0.4146	0.0009	0.0003	3.2361	0.0071
RAI(-1)	-6.2594	3.3151	-1.8881	0.1010	-0.0005	0.0002	-2.1858	0.0071
RAI(-2)	-6.2515	3.7382	-1.6723	0.1384	-	-	-	-

RAI(-3)	27.1586	5.8635	4.6318	0.0024	-	-	-	-
C	6.0137	28.6333	0.2100	0.8396	89.4343	24.8059	3.6054	0.0036
Model Criterion:								
R-squared	0.9987			0.9830				
Adjusted R-squared	0.9945			0.9588				
F-statistic	239.9249			40.7257				
Prob(F-statistic)	0.0000			0.0000				

To verify the existence of the long-term co-integration relationship, we use the bounds test. The results of F-statistics confirm that there exist long-term co-integration relationship, both in China and Indonesia. The F-statistics values in China Model (14.91517) and Indonesia Model (11.70412) that is above the critical level threshold of 1%, 2.5%, 5%, and 10%, therefore, the hypothesis of H0 rejected, and subsequently, the hypothesis H1 is accepted, which indicates the existence of long-term co-integration relations.

Table 4: ARDL bounds test

Test statistic	China		Indonesia	
	Value	K	Value	K
F-statistic	14.91517	5	11.70412	5
Critical value bounds				
Significance	I0 Bound	I1 Bound	I0 Bound	I1 Bound
10%	2.26	3.35	2.26	3.35
5%	2.62	3.79	2.62	3.79
2.5%	2.96	4.18	2.96	4.18
1%	3.41	4.68	3.41	4.68

3.1. In the short-run

The notion of co-integration equation (CointEq (-1)) defines the delayed residue originating from long-term equilibrium equation. The negative sign of its estimated coefficient, as well as the statistical significance of China and Indonesia, confirm the presence of error correction. The coefficient of the co-integration equation explains the order in which the variable V (farmland conversion) will be mobilizing towards the long-term target. For our ARDL models, this coefficient is estimated to be 9.469895 for China and -0.814302 for Indonesia (Table 5).

Table 5: Short-run estimation and cointegrating form

Variables	China: ARDL (3, 2, 3, 3, 3, 3)				Indonesia: ARDL(2, 1, 3, 2, 3, 1)			
	Coef.	Std.erro r	t-Stat.	Prob	Coef.	Std.error	t-Stat.	Prob
D(V (-1))	-10.562	0.1047	-100.8926	0.0000	0.5989	0.1272	4.7094	0.0005
D(V (-2))	0.2328	0.0871	2.6747	0.0318	-	-	-	-
D(AGDP)	0.0001	0.0001	1.4392	0.1933	0.0003	0.0001	2.5214	0.0268
D(AGDP(-1))	0.0001	0.0001	2.0245	0.0826	-	-	-	-
D(INV)	0.0000	0.0000	-2.7474	0.0286	-0.0001	0.0001	-2.7427	0.0178
D(INV(-1))	0.0000	0.0000	-1.5248	0.1711	-0.0001	0.0001	-2.1730	0.0505
D(INV(-2))	0.0000	0.0000	-2.0165	0.0836	0.0001	0.0000	1.7824	0.1000
D(EMP)	1.3873	0.4164	3.3319	0.0126	-0.0216	0.0871	-0.2484	0.8080
D(EMP-1)	0.3570	0.4778	0.7472	0.4793	-0.0349	0.0137	-2.5543	0.0253
D(EMP-2)	-1.0915	0.4622	-2.3616	0.0502	-	-	-	-
D(UPOP)	1.3620	0.3972	3.4289	0.0110	-1.5828	0.7079	-2.2361	0.0451
D(UPOP-1)	-2.3345	0.6051	-3.8584	0.0062	-0.9400	1.2392	-0.7585	0.4628
D(UPOP-2)	0.4570	0.4243	1.0769	0.3172	2.0930	0.7912	2.6454	0.0214
D(RAI)	6.2515	3.7382	1.6723	0.1384	0.0009	0.0003	3.2361	0.0071

D(RAI-1)	-27.158	5.8635	-4.6318	0.0024	-	-	-	-
CointEq(-1)	9.4699	0.1579	59.9820	0.0000	-0.8143	0.1370	-5.9440	0.0001

For AGDP, the present and the delayed value of one year ($t - 1$) not statistically significant effect on the farmland conversion in China, on the contrast, the present value of AGDP in Indonesia has positive effect on the farmland conversion. This result in China agreed with the resulting study did by [Zhang and Wang \(2014\)](#) which said when economic growth in China reaches a certain level people pay more and more attention to the protection of land resources, farmland conversion rate would decreased.

Concerning the variable of INV, we note that the present value affects the farmland conversion negatively for both countries. About the EMP variable and UPOP variable, the present value of has quietly strong affects the China farmland conversion positively, in additional, the first delayed value ($t - 1$) for UPOP variable have affect the China farmland conversion negatively. However, the EMP for the first delayed ($t - 1$) and UPOP variables in the present value and the second delayed ($t - 2$) significantly affect the Indonesia farmland conversion.

Finally, the RAI variable has a slightly strong negative role in stimulating farmland conversion in the first delayed value ($t - 1$) in China. This result getting a different result with study did by [Wang and Sun \(2016\)](#) which found that investment in transportation infrastructure affects rural development in China positively. Regarding cereal yield, a 1 percent increase in the road infrastructure (road length) leads to around 0.05 percent increase in cereal yield in the short-, and approximately 0.19 percent increase in the long-run. Our study got a different result because we use merely the data about railways. On the contrast, in the present value, RAI significant to affect farmland conversion in Indonesia.

Railways developed and used merely in Java, Indonesia. Other islands have railways from Dutch inheritance; however, people generally have been using the road or other transportation. Since 2010, three non-continuous railway networks in Sumatera, Kalimantan, and Sulawesi islands are being developed. The development of railways in Indonesia slower than China, because of the land acquisition, political will, and funding.

Chinese farmers never have the land; however, they do generally have long-term contractual rights to use it. When farms were first de-collectivized in 1978–1983, farm households typically got the right to farm a specified plot of land for one to three years. By the mid-1980s, household farm assignments generally extended to fifteen years, but these rights were insecure ([Kroeber, 2016](#)). The Government should determine the mechanism and regulation to organize this problem. The planning of a contract considers the future condition, including the internal and external factor, for instance, family size, local area planning, and market orientation. If the government changed the policy, the government should respect the contract with a farmer. The contract of farmland had better stipulated by the central government to avoid difference opinion of each local government.

3.2. In the long-run

In the long-run, for EMP and RAI variables significant with farmland conversion in China; however, in Indonesia, AGDP, INV, and UPOP variables are significant affect the farmland conversion. For more detail, Table 6 provides long-run coefficients from China and Indonesia. The performance of agriculture data in China presents the reason why EMP affect farmland conversion, 27.7 percent of the workforce employed in agriculture, 28.8 percent in industry and 43.5 percent in services in 2016. Since 2011, the majority of China's labor force has been employed in the service sector.

Table 6: Long-run coefficients

Variables	China				Indonesia			
	Coef.	Std.error	t-Stat.	Prob	Coef.	Std.error	t-Stat.	Prob
AGDP	0.000	0.000	0.226	0.827	0.000	0.000	3.312	0.006
INV	0.000	0.000	1.018	0.343	0.000	0.000	-3.524	0.004
EMP	-0.098	0.039	-2.532	0.039	0.033	0.106	0.309	0.763
UPOP	-0.004	0.017	-0.251	0.809	-0.816	0.201	-4.069	0.002
RAI	-1.301	0.334	-3.900	0.006	0.000	0.000	1.283	0.224
C	-0.635	3.026	-0.210	0.840	109.829	26.142	4.201	0.001

The result presents AGDP affect farmland conversion in Indonesia positively. The result difference with another study which showed in Sleman, Yogyakarta Province, Indonesia, the internal factors which significantly influence the farmland conversion is the price of land and land location, while the variable GDP in the agricultural sector negatively (Harini *et al.*, 2012).

In the future, the agricultural land conversion would continue unless there is no government reaction to reduce it (Azadi *et al.*, 2011), and the policy should support by agricultural land policies (Makbul and Ratnaningtyas, 2017). Therefore, actions by the government become the important thing to reduce the farmland conversion.

Conversion of land caused by a lack of understanding by the community or government officials on spatial planning (Budhi *et al.*, 2017). Difference insight between the Governments sector will happen because they must do some duties, for example as strategies to mitigate climate change, in the future we may see increasing land used for the production of biofuels, or for afforestation, instead of for food production (Lantz *et al.*, 2017). In this side, the Central Government must have sharp vision, mission, and strategy to become synergy for all sector. For China and Indonesia, agriculture is the primary sector. The government must fulfil the food needs of the people. In the future, the biggest challenge is about the food because increasing the population, global warming, and many threatened to make fertile farmland decreased, and import will increased. Therefore, the Government must develop the perception is agriculture the most important things for the country.

We can see in the long-run, for the China model, based on the obtained results 1 unit decrease for RAI, decreasing in farmland conversion about 1.301082. In the long-run, science and technology development could increase agriculture productivity. The discovery of superior seeds, implementation the good of agricultural practices, and other supportive policies which related the agriculture technology are a determinant factor for agriculture in the future.

3.3. Robustness check

In the case of time series, the stability test or structural changes test, examine the stability of the estimated coefficients of the equation shows the presence of a structural change in the correlation (Ifa and Guetat, 2018). The CUSUM test then adapted to test the hypothesis of stability of the long-run relationship between farmland conversion and its determinants. For China and Indonesia, noted that the curves of the CUSUM and CUSUMSQ tests are within the limits of the confidence interval at the 5% threshold. These results present the chosen model for estimating the relationships between the farmland conversion and determinants if the other variables are stable.

The CUSUM and CUSUMSQ tests indicated in graphic form Figure 1 and 2. For the CUSUM test, the blue line should between red upper and lower line for both countries. For CUSUMSQ test for China the blue line outside the red line from 1995 to 2009. We supposed because the Government changed the policy, for instance, in the 1990s, emerged “three rural areas” policy and this policy had effective on implementation after that period. The policies include agriculture, farmer, and rural and the adjustments for the policies finished in around 2000s.

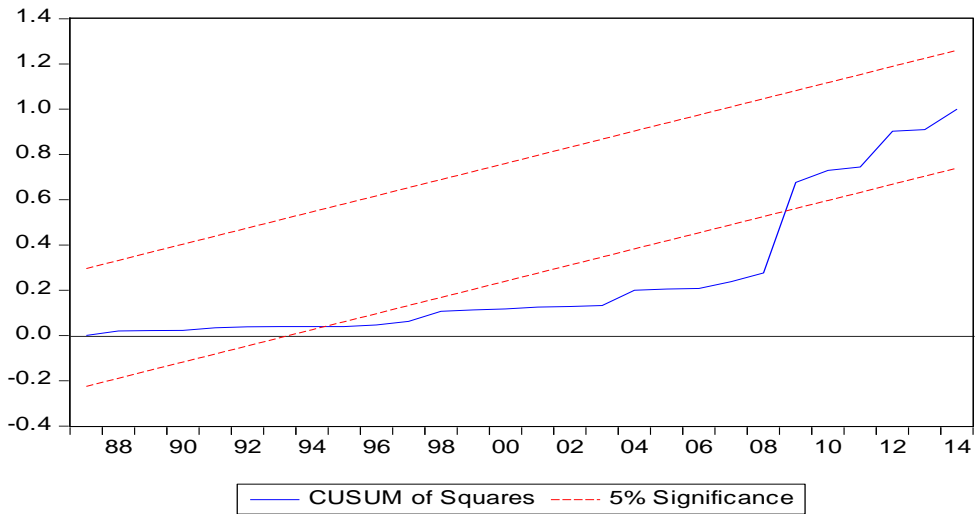
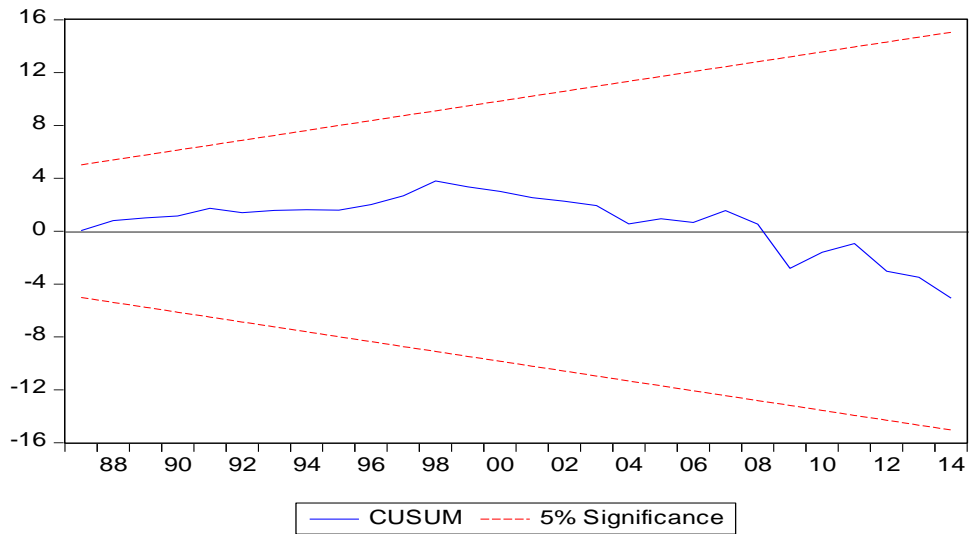
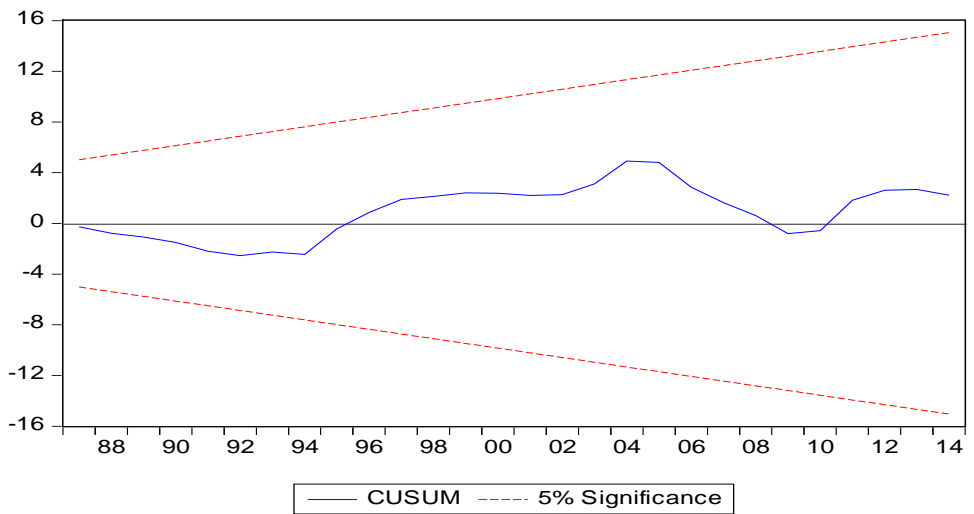


Figure 1: Cusum test of china model



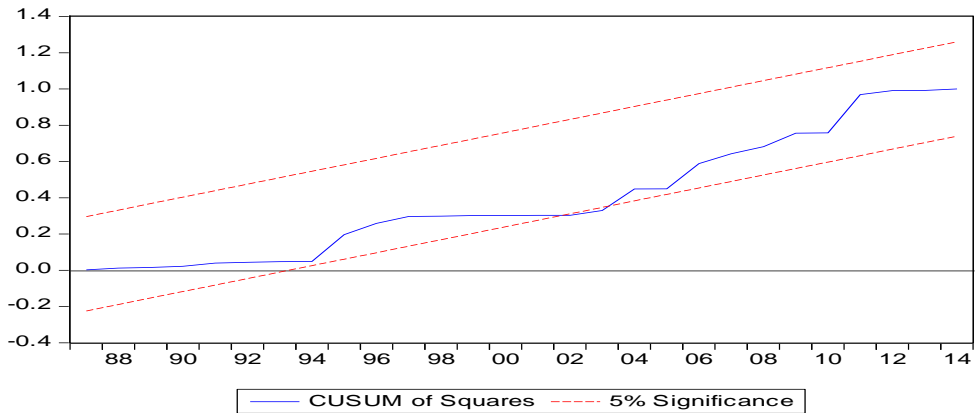


Figure 2: Cusum test of Indonesia model

Proper management and planning may restrict agricultural land conversion. The plan directs urban expansion to desire ways that protect fertile farmland through a stricter implementation of land use and spatial planning or even land conversion laws are needed (Azadi *et al.*, 2011). Indonesia has been acting to prevent farmland conversion since 2009. The act gives an order to the district or municipal governments to make local regulation regarding the protection of farmland sustainability. Till the middle of 2017, just approximately 215 district/municipality governments from total amount 538 district/municipality had been regulation regarding the protection of farmland sustainability. The local government still thought for a short period rather than a future period, because for instance, a benefit for service, housing, and trade sector more significant than the agriculture sector in local government revenue. This condition makes farmland conversion increase continuously. Had better spatial planning policy became the central government policy rather than in local government. Moreover, needed incentives for local government who made this regulation.

In the farmer side, maintain farmland needs more effort, because many issues facing by farmer, for instance: (1) seed and fertilizer price increase faster rather than farmer purchasing power, (2) using water for agriculture purpose had a competition between another sector, (3) lack of agriculture facilities, (4) fluctuate selling price, and (5) tax treatment, especially land and building tax. For this issue, the Government should give the farmer incentives through subsidies and free land and building tax for farmers. Incentives were stimulated for farmer to maintain the farmland. Subsidies can provide for a farmer to get seed and fertilizer at a lower price. Another support can give farmer to obtain the best selling price which produced by the farmer; the Government, therefore, must stipulate the floor price when harvest season.

In another aspect, China has been facing the problem of water consumption which is ever increasing along with population growth, economic development, and a rising standard of living (Zhu *et al.*, 2013). Besides, China is one of the countries suffering from the most severe soil and water loss in the world (Zhen, 2004). Ecosystem degradation obviously and makes environmental conservation agriculture tasks more difficult (Herman *et al.*, 2017). Incentives not only refer to tax but also the infrastructure, include more develop the agricultural irrigation, because farmland facing soil and water loss.

4. CONCLUDING REMARKS

In the short-run, the AGDP and RAI not statistically significant variables affect farmland conversion in China, on the contrary, these variables are significant for Indonesia. INV and UPOP are significant variables to affect the farmland conversion in both countries. The EMP not

statistically significant variable to affect the farmland conversion in Indonesia, however, significant variables for China.

In the long-run, the AGDP, INV, and UPOP not statistically significant variables affect farmland conversion in China, on the contrast, these variables are significant for Indonesia. Moreover, EMP and RAI are significant variables to affect farmland conversion in China, on the contrary, these variables are not statistically significant for Indonesia.

Some policies which needed to prevent farmland conversion began stipulated zoning and spatial planning in central and local government, and incentives for the farmer.

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