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RELATIONSHIP BETWEEN ECONOMIC DEVELOPMENT AND FEMALE LABOR FORCE PARTICIPATION IN ASEAN COUNTRIES (2000 to 2017)

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This thesis is submitted to the Board of Examination as partial fulfillment of the requirement for the Degree of Master of Applied Statistics

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ABSTRACT

This paper investigates the relationship between economic development and female labor force participation in ASEAN countries over the period 2000-2017. In this study, the secondary data are used, and they are calculated through STATA program. The three panel data regression models (ordinary least square, fixed effect and random effect) are employed to examine the impact of the economic development on female labor force participation. Descriptive statistics has been analyzed such us trend of female population, female labor force participation, female employment by economic activity and GDP per capital. GDP per capital is considered as a proxy indicator of economic development. Based on empirical results, the variables of GDP per capital, female employment in agriculture and female secondary school enrollment are found as statistically significant variables. The coefficient estimates of female employment in agriculture and female employment in services indicate that they are also positive effect on female labor force participation. The results of this paper suggest that there is a U-shaped relationship between economic development and female labor force participation rates.

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LIST OF ABBREVIATIONS

ASEAN	: Association of South East Asian Nations
GDP	: Gross Domestic Products
LM	:Lagrange Multiplier
LDCs	: Less Developed Countries
LSDV	: Least Squares Dummy Variable
GLS	: Generalized Least Squares
FEM	: Fixed Effect Model
REM	: Random Effect Model
ECM	: Error Component Model
FGLS	: Feasible Generalized Least Squares Estimator
OLS	: Ordinary Least Square

CHAPTER I

INTRODUCTIONS

1.1 Rationale of the Study

Every country tries to find possible ways to advance economy and develop. Developing countries especially try to achieve economic growth through projects, since growth can fulfill the various needs of the country and the people, raise living standards, create jobs and promote wellbeing. ASEAN as developing countries aim for market economy by accordance with the economics objectives to achieve economic growth. Growth usually needs an optimum allocation of fundamental productive factors, labor and resources. Labor are specifically importance since resources, capital, equipment and technology alone cannot implement development projects without labor. People will be benefitted from these projects ultimately. Therefore, information about demography and labor force are crucial in the planning of any development project. Therefore, it is vital for any country to conduct analysis to understand the population, demography and labor force information.

Labor force improvement relies on the population of the country. Increase fertility rate, increase in the number of 0 to 14 age group and improved health care can all contribute to the increase of labor force in the future. Moreover, deploying over 60 skillful workers in the active labor can also increase labor force. World population increases gradually, and it needs to fulfill the need of increased population by creating livelihood, health care, education, other social and economic needs. In general, population growth can increase labor supply. Increase in the number of workforces affects labor supply. However, population growth may or may not be consistence with the increase in the supply of labor force. It is also important to create employment opportunities for the increased labor force so that they can take part in the productive activities, in manufacturing and services industry. This in turn will help economy growths and ensures the optimum allocation of resources. As consequence, there will also be increases in the productivity, GDP, economic growth rate, improvements in the living standards.

Labor is a major input for productive factors, which includes both male and female workforces. Since women institutes around half of the working-age

population, it is important to understand the role of women labor forces in the development as well as women's contribution towards poverty alleviation. If an economy creates enough jobs for women, it can help the growth of economy a lot. Traditional norms and practices confine women in secondary role as housekeepers, family stewards and boost men generally as bread winners. However, since the advancement of technology and universal education has emancipated women from being secondary role in economy and more and more women are taking active economic functions. Women labor force has been crucial in education sector, manufacturing and office works, some government services and private businesses. More and more women are also taking up entrepreneur role and set up thriving businesses of their own.

There are a number of economics researches that find strong link between female labor force participation and rapid economic development. These studies show how increased female labor force participation contributes towards economic development. It can also lead to an increased aggregate economic efficiency as well as the development of the country. Borjas (2005) point out that the increase in the female labor force participation rate was more pronounced in developed countries than in less developed countries (LDCs) due higher wages and technological development in the advanced economies. The trends in the developing countries tell the different story. It is evident from various researches that in the early phases of economic development the female participation increases specially as unpaid family worker in the agriculture sector enter labor force in mass. Later, female employment share has taken up gradually in the manufacturing and services sector. In addition, in terms of the effect of education on women, Todaro and Smith (2009) pointed out that increasing the education of females not only increases their productivity on the farm and in the factory but also results in greater labor force participation, later marriage, lower fertility and greatly improved child health and As female's education improves so do their opportunities in the services sector. Education not only guarantees higher income but also provide opportunities in the labor market. Therefore, there exist a strong causality between female labor force participation and the level of economic development.

Several researchers referred a U-shaped relationship between female labor force participation and economic development. There is a considerable amount of literature that has provided evidence for the hypothesis, as well as time series studies

for developed countries such as the United States (Goldin, 1995). Few papers have been tested the U-shape hypothesis within the context of developing regions and countries, however (Tansel, 2001). Even fewer have been done econometric research focused specifically on the MENA region (Verme, 2014). Understanding the relationship between economic development and female labor force participation is important for a variety of reasons. The U-shape hypothesis suggests that there is a sort of tradeoff between gender equality and economic growth during a country's development. Studying this relationship is important for academics and policy makers alike to identify trends in labor force participation and to design and implement policy to that end.

1.2 Objectives of the Study

The objectives of the study are:

i. To analyze the female labor force situation in ASEAN countries.
ii. To investigate the relationship between economic development and female labor force participation in ASEAN countries.

1.3 Method of Study

The study used descriptive analysis and different panel data analysis to investigate the relationship between economic development and female labor force participation in ASEAN countries. Panel data analysis methods (Ordinary Least Square Model, Fixed Effect Model and Random Effect Model) were used to examine the effects of the economic development on female labor force participation. Breusch-Pagan-Godfrey test and Wooldridge test were used to diagnostic checking on heteroskedasticity and serial correlation in the appropriate model. In addition, Feasible Generalized Least Squares Model was also used to remedy heteroskedasticity and serial correlation in the model.

1.4 Scope and Limitations of the Study

The scope of the study is based on the impact of economic development on female labor force participation in ASEAN countries from year 2000 to year 2017. The required data are obtained from the World Development Indicators (2018) published by World Bank.

1.5 Organization of the Study

This study consists of five chapters in all. Chapter I involves the rational, the objectives, the research methodology, the scope and limitation of the study and organization of the study. The literature review is presented in chapter II. Chapter III deals with the theoretical background of panel data regression model. Chapter IV show of the findings of the labor force situation in ASEAN countries and present the panel data regression model of the relationship between economic development and female labor force participation in ASEAN countries. All findings are concluded in the last chapter V.

CHAPTER II
LITERATURE REVIEW

2.1 Female Labor Force Participation and U-Shaped Hypothesis

Several researchers studied that economic development and female labor force participation have a U-shaped relationship. The U-shaped hypothesis states that at the beginning of economic development, the agricultural sector is the dominant on the economy. Therefore, women are economically active in agricultural sector and female labor force participation rates are high. As a country's economy undergoes structural changes and transitions from agriculture to industry though, women's labor force participation rates tend to fall. In the growing industrial and service sectors women may not be able to complete with men because of their social barrier such as tradition, culture and household responsibilities. After a little while, economic development requires more female labor and demand for female workers will increase. In later stages of economic development, as female education increases, fertility rates decline and business-friendly socio-cultural attitudes evolve, the participation rate increases. Some economists believe that there is a strong link between female labor force participation and economic development. These economists show how increased female labor force participation contributes significantly to increased economic development. It can also lead to an increased aggregate economic efficiency as well as the development of the country.

Goldin (1995) studied the relationship between economic development and female labor force participation in United States by using time-series. The study found that major supporting evidence for the U-shaped hypothesis. Female labor force participation fell during the early stages of economic growth and rose later as development continued and also suggested that education is one of the major factors for experiencing the upward portion of U-shaped curved. Moreover, increasing access to childcare facilities and the availability of part-time jobs allow women to work outside the home while raising children. By this point, the substitution effect leads to

higher potential female wages which overcomes the income effect, raising female labor force participation as income per capital rises.

Kottis (1990) studiedthe relationship between economic development and female labor force participation in Greece by using OLS method at two different times, for both 1971 and 1981. The results indicated education and unemployment have the most influential effects on female labor force participation.

Tansel (2001)investigated the relationship between economic development and female labor force participation in Turkey by using time series evidence on provinces and found evidence for the U-shaped hypothesis. The study incorporates 4 different models by pooling the data of 67 provinces of Turkey for 1980, 1985 and 1990. In this study also used regional dummies and found significant regional disparities in female labor force participation. The measure of economic development used was the logarithm of the per capital Gross Provincial Product (GDP of the provinces). A linear and a quadratic term in log per capital Gross Provincial Product are included. Unemployment rate, education, urbanization rate and industrial share are considered as the main determinants of female labor force participation in Turkey.

CakIrOnur , (2008) studied the relationship between economic development and female labor force participation rate in Turkey in 1980-2000 within the framework of U-shaped hypothesis. Panel data regression models were used in the study. The study incorporates 5 different models to measure different determinants of female labor force. In this study, different unemployment patterns, urbanization rate and total fertility rate on female labor force participation are found to be negative. It is also found that education and agriculture share in the employment have positive effects on female labor force participation. And then, both econometric models and time series evidences suggest that Turkey is still experiencing the downward portion of U-shaped.

Chapman, Kelsey A.(2015) investigated the relationship between economic development and female labor force participation in the Middle East and North Africa (MENIA) for the period of 1990-2012 by using a panel data set of 20 countries in the region. The study found that there is a U-shaped relationship between economic growth and female labor force participation rates. It has done by using a fixed effects model with determinant variables for education, fertility, unemployment and

urbanization. The study found that the coefficient estimate on education is the most puzzling, having a negative sign and implying that increased education leads to lower female labor force participations.

Humaira Husain (2016) investigated the relationship between female labor force participation rate and economic growth for Bangladesh over the period 1991-2012. The results indicate that Bangladesh the rising portion of U curve is explained by women's active participation in manufacturing and service sector. U holds for Bangladesh using the static model, where the log of per capital GDP is considered as a proxy indicator of economic development. Women are still economically active in the agricultural sector and female labor force participation has positive impact on economic growth.

2.2 Status of ASEAN Women

Girls and boys are treated equally when they are born. However, women are culturally regarded as the weaker sex, similarly to many other Asian cultures. According to culture and heritage, women are left behind men. But women and men are key persons for every household and nowadays most of the women are involving in household's income earning. Women's entering in economy is gradually increasing nowadays in the world. Women effort is key element in household economy. They are the ones who handle to earn major income and who consume the least in family. They are the ones who solve the basic needs of family and who more shoulder the big duty of family.

Women participation in economy is poverty reduction issue and women are most vulnerable to the poverty and its incidence in their families because they are income earning in their household's expenditure including health and education purpose, rather than by men's uses in that matter. The increasing of female labor force participation in the economy helps in reducing gender disparities in education, improving maternal health, increasing female employment in different sectors of the economy, affirmation the hidden contribution of women as unpaid family worker. Increasing the education of females not only increases their productivity on the farm and in the factory but also greater labor force participation rate, later marriage, lower fertility and greatly improved child health and nutrition.

CHAPTER III
REEARCH METHODOLOGY

This study is undertaken based on panel data of ASEAN countries. The relationship between economic development and female labor force participation is calculated by using different panel data estimation methods.

3.1 Panel Data

Panel data are also called longitudinal data or cross-sectional time-series data. These longitudinal data have "observations on the same units in several different time periods"(Kennedy, 2008). A panel data set has multiple entities and each of which has repeated measurements at different time periods. Panel data may have individual (group) effect, time effect, or both, which are analyzed by fixed effect or random effect models. Baltagi (2001) point out, "Panel data give more informative data, more variability, less collinearity among the variables, more degrees of freedom and more efficiency". Given well-organized panel data, panel data models are definitely attractive and appealing since they provide ways of dealing with heterogeneity and examine fixed or random effects in the longitudinal data. A panel data set contains N cross section units that are collected at different time periods (T). Therefore, the total number of observations is nT. Panel data are measured at regular time intervals such as; year, quarter, and month). A panel may be long or short, balanced or unbalanced, and fixed or rotating.

3.2 Advantages of Panel Data

The following are the advantages of panel data by Baltagi (2001);

1. Contrary to time series and cross-section models, panel data suggests that countries, firms, products are heterogeneous and it controls heterogeneity so as not to take the risk of biased results. Time-series study or cross-section analyses are not able to control individual invariant and time invariant variables.
2. Since panel data uses both cross-section and time series, panel data give more informative data, more variability, less collinearity among variables, more degrees of freedom and more efficiency.

3. Compared to time series and cross-section models, panel data can detect and measure errors better.
4. Panel data is much better and efficient for studying with more complicated behavioral models.

3.3 Panel Data Regression Models

The regression models based on the panel data are called panel data regression models. Panel data models investigate group (individual-specific) effects, time effects, or both. These effects are either fixed effect or random effect. A fixed effect model investigates if intercepts vary across groups or time periods, whereas a random effect model explores differences in error variances.

3.3.1 The Ordinary Least Square Regression Model

A panel data model approach is most simply because it combines only time series and cross section data. In this model is not considered time and individual dimensions, so it is assumed that the behavior of corporate data is the same in various periods. This method can use the ordinary least square to estimate the panel data model. The ordinary least square model can be written as:

$$y_{it} = \alpha_i + \beta X_{it} + u_{it} \qquad (3.1)$$

Where, y_{it} = the dependent variable observed for individual i at time t.

X_{it} = the time-variant 1x k (the number of independent variables) regressor vector

β = k x 1 matrix of parameters

α_i = constant

u_{it} = the error term

i = 1,2,…,N

t = 1,2,…,T

i is the i^{th} subject and t is the time period for the variables

3.3.2 Fixed Effect (Within) Model

$$y_{it} = \alpha_i + \beta X_{it} + u_{it} \quad (3.2)$$

Where, y_{it} = the dependent variable observed for individual i at time t.

X_{it} = the time-variant 1x k (the number of independent variables) regressor vector

β = k x 1 matrix of parameters

α_i = constant

u_{it} = the error term

i= 1,2,…,N

t= 1,2,…,T

i is the i^{th} subject and

t is the time period for the variables

Equation(3.2) is known as the fixed effect(regression) method(FEM). The team "Fixed Effects" is due to the fact that, although the intercept may differ across subjects, each entity's intercept does not vary over time, that is, it is time-invariant. The fixed effect model examines differences in intercepts, assuming the same slopes and constant variance across entitles or subjects. The fixed effect assumption is that the individual-specific effects are correlated with the independent variables. Since a group(individual specific) effect is time invariant and considered a part of the intercept, u_{it} is allowed to be correlated to other regressors. A within group effect model does not need dummy variables.

3.3.3 Random Effect Model

Even the fixed effect model is not difficult to apply but it is not appropriate for estimation if data have high degrees of freedom or a large number of cross-section data. The random effects of both cross- section and time series time series data are included with error term. This model is called error component model(ECM).

The assumption is that there are other factors which might affect dependent variable in the regression analysis but are omitted from the investigation causing what is called random error term. This model will estimate panel data where interference variables may be interconnected between time and between individuals. The advantage of using the Random Effect model is to eliminate heteroscedasticity. This

model is also called the Error Component Model (ECM) or Generalized Least Square (GLS) technique.

In the random effect model, residuals may be interconnected between time and between individuals or cross sections. Therefore, this model assumes that there is a difference of intercept for each individual and the intercept is a random variable. So in the random effect model there are two residual components. The first is the residual as a whole where the residual is a combination of cross section and time series. The second residual is an individual residual which is a random characteristic of the i-th unit observation and remains at all times. Then, the random effects model can be written as:

$$y_{it} = \alpha_i + \beta X_{it} + u_i + \varepsilon_{it} \quad (3.3)$$

Where, y_{it} = the dependent variable observed for individual i at time t.

X_{it} = the time-variant 1x k (the number of independent variables) regressor vector

β = k x 1 matrix of parameters

α_i = constant

ε_{it} = the residual as a whole where the residual is a combination of cross section and time series

u_i = the individual residual which is the random characteristic of unit observation the i-th and remains at all times.

i = 1,2,…,N

t = 1,2,…,T

i is the i^{th} subject and

t is the time period for the variables

3.3.4 Fixed Effects versus Random Effects Model

1. If T(the number of time series data) is large and n(the number of cross-section units) is small, there is likely to be little difference in the value of the parameters estimated by FEM and ECM. Hence the choice here is based on computational convenience. On the score, FEM may be preferable.

2. When n is large and T is small, the estimates obtained by the two methods can differ significantly. In ECM $\beta_{1i}= \beta_1 + \varepsilon_i$ where $\varepsilon_i$is the cross- sectional random component whereas in FEM, β_{1i}treats as fixed and not random. In that case, FEM is appropriate, if the cross-section units in the sample are regarded as random drawing, then ECM is appropriate.
3. If the individual error component ε_i and one or more regressors are correlated, then ECM estimators are biased, whereas those obtained from FEM are unbiased.
4. If n is large and T is small, and if the assumptions underlying ECM hold, ECM estimators are more efficient than FEM.
5. Unlike FEM, ECM can estimate coefficients of time-invariant variables. The FEM does control for such time-invariant variables, but it cannot estimate them directly, as is clear from the LSDV or within-group estimator models. If it is assumed that $\varepsilon_i$and $X's$ are correlated, FEM may be appropriate. In FEM each cross-sectional unit has its own (fixed) intercept represents the mean value of all the (cross-sectional) intercepts and the error component ε_i represents the (random) deviation of individual intercept for this mean value.

3.4 Testing for Appropriate Model

Breusch-Pagan Lagrange Multiplier test, F-test and Hausman test were used to choose the appropriate model for female labor force participation.

3.4.1 Breush and Pagan Lagrange Multiplier Test (LM)

The Breush and Pagan Lagrange Multiplier Test carried out on the estimates of the random model showed that the random effect model was appropriate for the data. The null hypothesis of the random effect model is that individual-specific or time-series error variances are zero ($\sigma_u{}^2 = 0$).

Test hyphothesis is:

Null Hypothesis : The random effect model is not appropriate.

Alternative Hypothesis : The random effect model is appropriate.

3.4.2 F- Test

In order to check significant between ordinary least squares model and fixed effect model, F statistics is used. F-test is a statistical test that is used to determine whether two population having normal distribution have the same variance or standard deviation. F test has null hypothesis is OLS model and the alternative hypothesis is fixed effect model.

$$F_{1-way} = \frac{(ESS_R - ESS_U/(N-1)}{ESS_U/((T-1)N-k)}$$

Where,

ESS_R = the residual sum of squares under the null hypothesis

ESS_U = the residual sum of squares the alternative hypothesis

3.4.3 Hausman Test

The Hausman specification test compares the fixed and random effects under the null hypothesis that the individual effects are uncorrelated with the other regressors in the model [Hausman(1978)]. If H_0 is rejected, a random effect model produces biased estimates, violating one of the Gauss-Markow assumption; so a fixed effect model is preferred. Hasusman's essential result is that the covariance of an efficient estimator with difference from an efficient estimator is zero [Greene (2003)]. Hausman test is good way to choose which model is better for the researches. The test statistics developed by Hausman test has an asymptotic Chi-square distribution.

Test hypothesis is:

Null Hypothesis : The random effect model is appropriate.

Alternative Hypothesis : The fixed effect model is appropriate.

3.5 Diagnostic Checking

Breusch-Pagan-Godfrey test and Wooldridge test were used to diagnostic heteroskedastic and serial correlation in the model.

3.5.1 Breusch-Pagan-Godfrey Test

The Breusch-Pagan-Godfrey Test (sometimes shorted to the Breusch-Pagan test) is a test for heteroscedasticity of errors in regression. Homoscedasticity in regression is an important assumption; if the assumption is violated, won't be able to use regression analysis. If the test statistic has a p-value below an appropriate threshold (e.g. $p < 0.05$) then the null hypothesis of homoskedasticity is rejected and heteroskedasticity assumed.

Test hypothesis is:

Null Hypothesis : The error variances are homoskedasticity.

Alternative Hypothesis : The error variances are heteroskedasticity.

3.5.2 Wooldridge Test

Serial correlation in random or fixed effects models derived by Wooldridge (2002) is attractive because it can be applied under general conditions and is easy to implement. Serial correlation occurs in time-series studies when the errors associated with a given time period carry over into future time periods. If the test statistic has a p-value < 0.05 then the null hypothesis is rejected.

Test hypothesis is:

Null Hypothesis : There is no serial correlation.

Alternative Hypothesis : There is serial correlation.

3.5.3 Feasible Generalized Least Squares Estimator

Park (1967) proposed a feasible generalized least-squares(FGLS) for the data with heteroskedasticity as well as for temporal and spatial dependence in the residual of time-series cross-section models. FGLS produce an efficient estimation for the case where the number of T(time period) is greater than or equal to the number of N (cross-section).The FGLS estimation method takes into account heteroskedasticity and auto-correlation. The error terms can be written as

$$E[\varepsilon\varepsilon'] = \Omega = \begin{bmatrix} \sigma_{11}\Omega_{11} & \sigma_{12}\Omega_{12} & \cdots & \sigma_{1N}\Omega_{1N} \\ \sigma_{21}\Omega_{21} & \sigma_{22}\Omega_{22} & \cdots & \sigma_{2N}\Omega_{2N} \\ \vdots & \vdots & \ddots & \vdots \\ \sigma_{N1}\Omega_{N1} & \sigma_{N2}\Omega_{N2} & \cdots & \sigma_{NN}\Omega_{NN} \end{bmatrix}$$

Where

$$\Omega_{ij} = \begin{bmatrix} 1 & \rho_j & \rho_j^2 & \cdots & \rho_j^{T-1} \\ \rho_i & 1 & \rho_j & \cdots & \rho_j^{T-2} \\ \rho_i^2 & \rho_i & 1 & \cdots & \rho_j^{T-3} \\ \cdots & \cdots & \cdots & \ddots & \cdots \\ \rho_i^{T-1} & \rho_i^{T-2} & \rho_i^{T-3} & \cdots & 1 \end{bmatrix}$$

As FGLS panel data model is also named as the Parks-Kmenta method (Kmenta 1986). In FGLS model, the regression is estimated by using regular OLS. In order to estimate assumed error AR(1) serial correlation coefficient ρ, the estimation residuals is utilized. This coefficient is used to transform the model to eliminate error serial correlation. Substitute $\widehat{\Omega}$ for Ω using estimated ρ and σ^2, then obtain the FGLS estimator of β as

$$\hat{\beta}_{\text{GLS}}=(X'^{\widehat{\Omega}}X)^{-1}X'\widehat{\Omega}^{-1}y.$$

CHAPTER IV
ANALYSIS OF PANEL DATA REGRESSION MODELS

In this chapter, firstly, trend of female population, female labor force participation, female employment by economic activity and GDP per capital are studied. Secondly, the panel data regression models are applied for the relationship between economic development and female labor force participation in ASEAN countries.

4.1 Trend of Female Population

The labor force is congruent with the total population, it is important to understand the population and its' composition. Population is a major factor to be considered in the economy of the countries, industries and other public services sector. Development planning needs information about natural resources as well as the dynamic of the population. Population, labor force and employment are closely related and compositional features of population like age groups, gender ratio, growth over time, etc. affect the growth of labor force. However, growth in general population doesn't grantee automatic growth in labor force. It depends largely on the creation of new jobs and improvement of living standards, etc. In general, the changes in population dynamic are a key factor to understand the situation of labor force.Female population is the percentage of the population that is female. Population is counts all residents regardless of legal status or citizenship.

Table (4.1)

Female Population in ASEAN Countries

Year	Myanmar	Brunei Darussalam	Cambodia	Indonesia	Lao PDR	Malaysia	Philippines	Singapore	Thailand	Vietnam
2000	24089962	164416	6247770	105659995	2673777	11376249	38710922	1962216	31858181	40339930
2001	24361275	168021	6378242	107066151	2719910	11618587	39568588	2021689	32187722	40761945
2002	24614141	171181	6500501	108470614	2765742	11850200	40436782	2049959	32484847	41163646
2003	24849526	173951	6615657	109875995	2811705	12074667	41300381	2030062	32754201	41550240
2004	25069952	176429	6725418	111283970	2858278	12297494	42139060	2061744	33004499	41927659
2005	25277962	178684	6831349	112697082	2905737	12522561	42939599	2109667	33242497	42301133
2006	25472150	180728	6933490	114113394	2954577	12751208	43693432	2167069	33468089	42672670
2007	25653372	182567	7032435	115537045	3004653	12981866	44408074	2242873	33679476	43044663
2008	25829264	184300	7131009	116983225	3054818	13212120	45105957	2345804	33880023	43422816
2009	26009932	186049	7232756	118471491	3103529	13438289	45818893	2399863	34073807	43813577
2010	26202314	187921	7340159	120013716	3149735	13657904	46569076	2429972	34263751	44221287
2011	26410742	189944	7454417	121616827	3192856	13870041	47365187	2473739	34451329	44648282
2012	26632789	192123	7574842	123271003	3233530	14076056	48198297	2531841	34636099	45093052
2013	26860449	194420	7699565	124950432	3273474	14278456	49051544	2572741	34816548	45550974
2014	27081932	196752	7825695	126619172	3315121	14480856	49899689	2606984	34990204	46015083
2015	27289148	199083	7950995	128250415	3360149	14685797	50724449	2638421	35155047	46479613
2016	27478842	201419	8075001	129834450	3409177	14894008	51520528	2672718	35310921	46943305
2017	27654949	203749	8198028	131375660	3461501	15104524	52293794	2674905	35458012	47405623

Source: World Development Indicators (2018)

Table (4.1) show that Indonesia has the highest female population than the other countries. It was 131.38 million in 2017. It is also the fourth largest country in the world by population. Philippines has the second highest female population and Vietnam has the third highest among ASEAN countries. The female population in Myanmar was 27.65 million in 2017. Looking back, in the year of 2000, Myanmar had a female population of 24.09million.Myanmar's female population has increased 26.8 % in 2017. Brunei Darussalam has the lowest female population according to the smallest country in Southeast Asia. Today, women need to take part in the work force, to be in line with the current living standards for the family. Market economy creates many of jobs for women and women are now running in par with men in labor market. However, new types of job are need for those women who take care of home as well as do paid job. Mostly, urban women are working full-time in government, private sector and trading etc., and at the same time they are housewives as well. Since women are participating in the economic activities and in the labor force together with the men, this paper observes that creating decent jobs for women can help the economy develop further.

4.2 Female Labor Force Participation

The labor force participation rate is the most important indicator of a population's inclusion in the labor force. It is defined as the percentage of the working-age population who are economically active, where economically active includes the number of employed and unemployed persons. The participation rate is typically calculated for the population aged 15 and over. However, it can easily be calculated for the population aged 15-64 years.

Table (4.2)

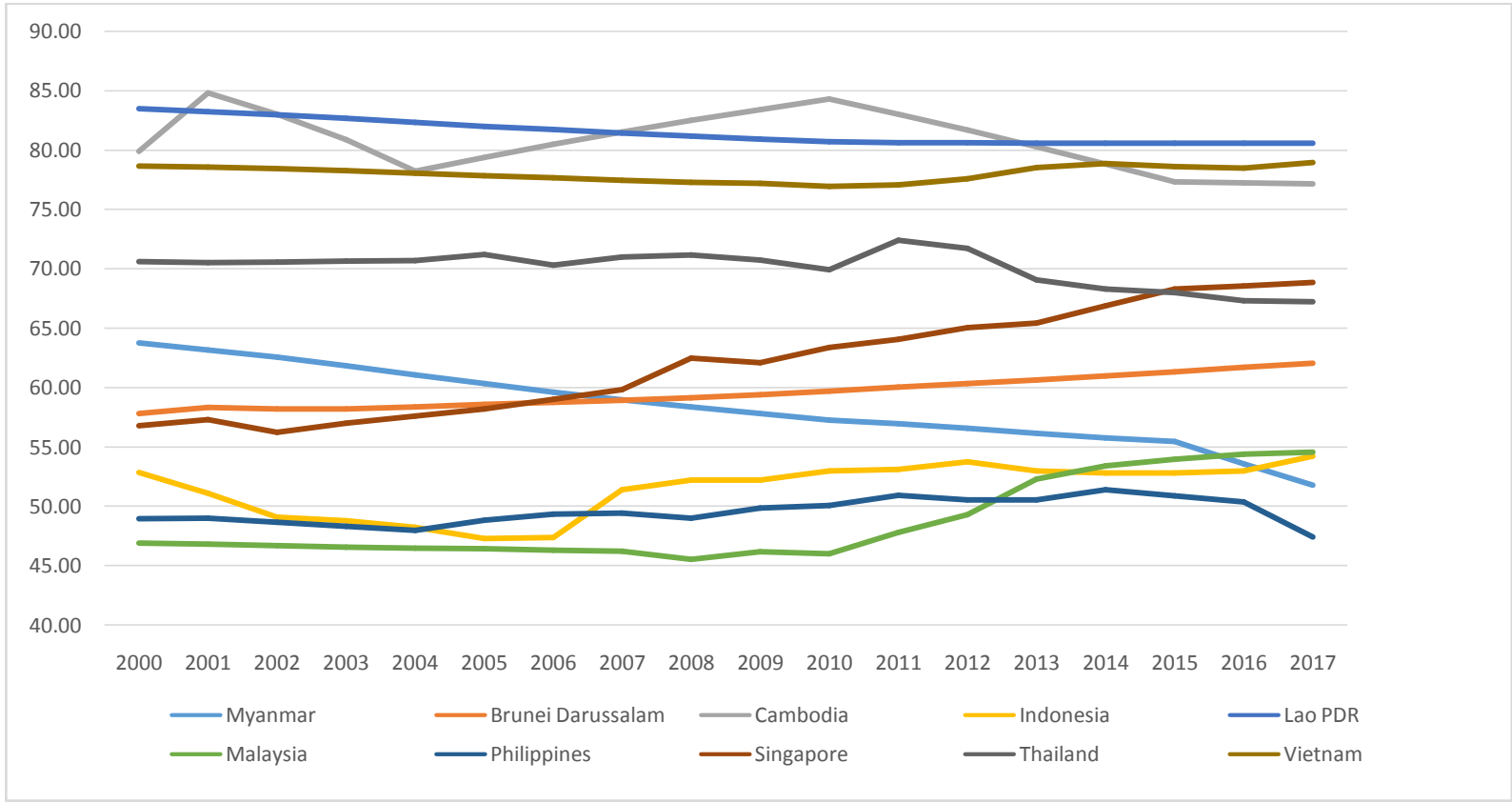
Female Labor Force Participation Rate in ASEAN Countries

Year	Myanmar	Brunei Darussalam	Cambodia	Indonesia	Lao PDR	Malaysia	Philippines	Singapore	Thailand	Vietnam
2000	63.76	57.79	79.86	52.83	83.46	46.89	48.96	56.79	70.61	78.65
2001	63.17	58.30	84.81	51.09	83.21	46.82	48.98	57.29	70.52	78.55
2002	62.53	58.20	83.01	49.06	82.94	46.69	48.63	56.21	70.57	78.42
2003	61.80	58.20	80.86	48.77	82.64	46.56	48.28	57.00	70.66	78.26
2004	61.07	58.34	78.21	48.22	82.32	46.45	47.97	57.58	70.70	78.05
2005	60.33	58.59	79.37	47.29	81.99	46.40	48.83	58.20	71.21	77.83
2006	59.61	58.75	80.48	47.34	81.72	46.29	49.34	59.00	70.31	77.64
2007	58.94	58.91	81.51	51.37	81.43	46.19	49.42	59.80	70.97	77.43
2008	58.36	59.12	82.48	52.18	81.15	45.52	48.97	62.48	71.13	77.28
2009	57.78	59.38	83.41	52.21	80.90	46.16	49.83	62.08	70.73	77.18
2010	57.25	59.68	84.29	52.97	80.69	46.01	50.04	63.38	69.92	76.92
2011	56.93	60.01	83.02	53.11	80.63	47.78	50.91	64.05	72.41	77.05
2012	56.54	60.32	81.68	53.73	80.60	49.29	50.53	65.01	71.72	77.58
2013	56.13	60.64	80.27	52.96	80.58	52.26	50.51	65.42	69.04	78.50
2014	55.75	60.96	78.81	52.81	80.57	53.41	51.38	66.86	68.27	78.86
2015	55.44	61.31	77.30	52.77	80.56	53.93	50.86	68.30	67.98	78.59
2016	53.56	61.68	77.21	52.98	80.55	54.36	50.37	68.52	67.28	78.46
2017	51.76	62.05	77.15	54.22	80.55	54.56	47.41	68.86	67.21	78.94

Source: World Development Indicators (2018)

Figure (4.1)

Female Labor Force Participation Rate in ASEAN Countries



Source: World Development Indicators (2018)

Table (4.2) shows the trends in female labor force participation rates by country. It is easy to observe the decline in female labor force participation rates. In the Figure (4.2), it can be seen that Lao has the highest female labor force participation rate among this countries. It can compare the female labor force participation rates in 2000 and 2017. In 2000, 83.46 percent and in 2017, 80.55 percent respectively. Among this study countries, Cambodia has the highest female labor force participation rate before 2010, then its rate declined after 2010. It was 84.29 percent in 2010. After 2010, it was 77.15 percent in 2017. But Cambodia has the third highest female labor force participation after Lao and Vietnam among ASEAN countries. At the beginning of economic development, industrial transition hinders female labor force participation. Apart from that culture, social custom and household responsibilities of females may also affect female labor force participation. All of these impede female labor force participation. After a certain point, the industrial structure improves and educational background of females, social custom and household responsibilities of females changes.

4.3 Female Employment by Economic Activity

This studied female labor employment in agriculture and services sectors in ASEAN countries. Employment is defined as persons of working age who were engaged in any activity to produce goods or provide services for pay or profit, whether at work during the reference period or not at work due to temporary absence from a job, or to working-time arrangement. The agriculture sector consists of activities in agriculture, hunting, forestry and fishing and the services sector consists of wholesale and retail trade and restaurants and hotels; transport, storage, and communications; financing, insurance, real estate, and business services; and community, social, and personal services.

Table (4.3)

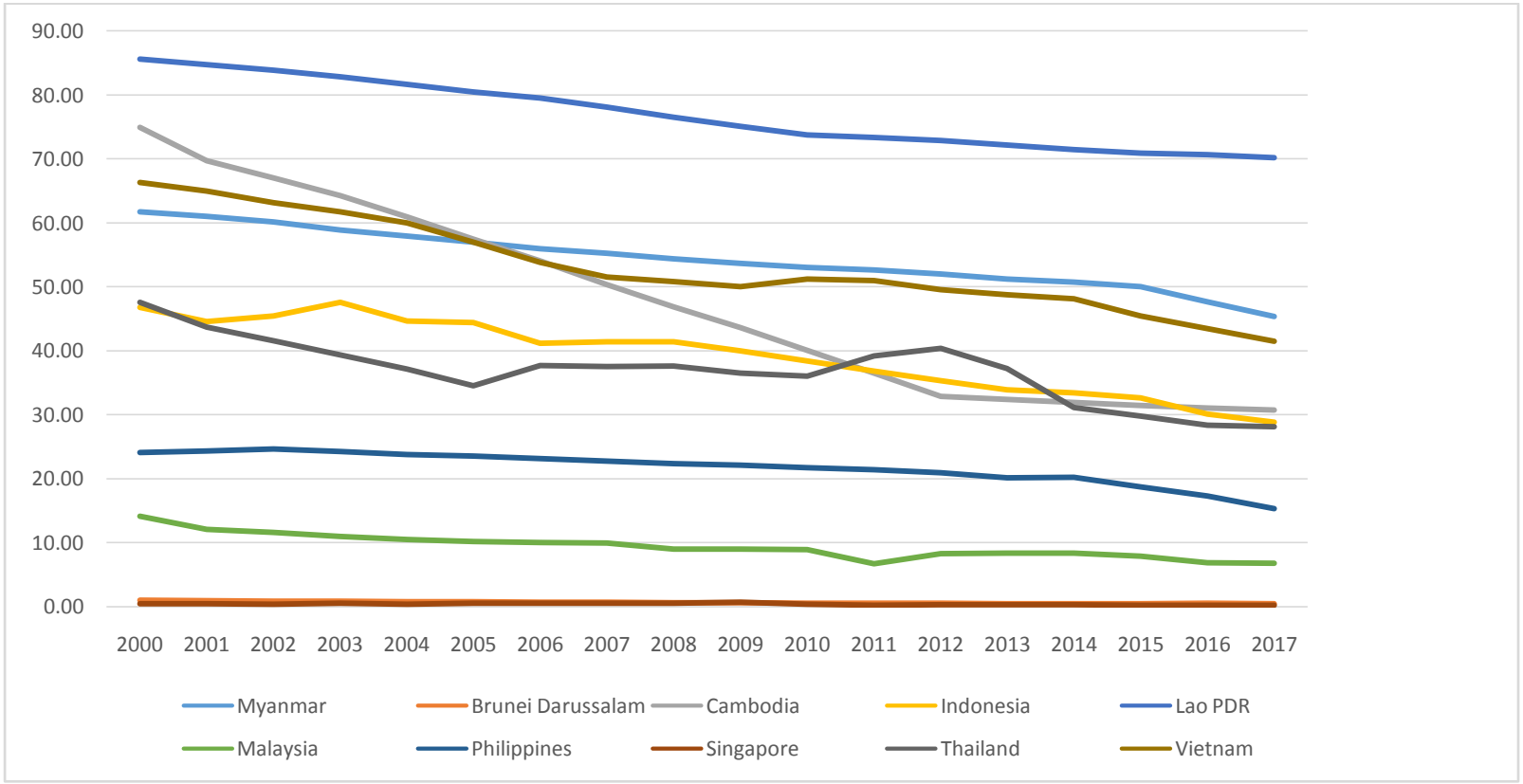
Female Employment by Economic Activity, ASEAN Countries (%)

Year	Myanmar		Brunei Darussalam		Cambodia		Indonesia		Lao PDR		Malaysia		Philippines		Singapore		Thailand		Vietnam	
	Agri	Serv	Agri	Serv	Agri	Serv	Agri	Serv	Agri	Serv	Agri	Serv	Agri	Serv	Agri	Serv	Agri	Serv	Agri	Serv
2000	61.73	25.96	1.01	88.74	74.91	15.47	46.74	38.30	85.61	10.68	14.11	56.99	24.05	62.67	0.46	76.15	47.55	35.14	66.28	23.60
2001	60.99	26.53	0.95	88.75	69.68	18.14	44.52	39.36	84.72	11.33	12.04	58.27	24.31	63.17	0.51	78.43	43.69	37.91	64.97	23.88
2002	60.12	27.25	0.89	88.81	66.98	19.85	45.40	38.82	83.84	11.97	11.61	61.12	24.63	63.59	0.41	78.80	41.54	39.26	63.13	25.16
2003	58.89	28.40	0.84	88.84	64.22	21.51	47.54	37.30	82.83	12.70	10.96	62.18	24.24	64.16	0.52	78.87	39.34	40.57	61.71	25.32
2004	57.93	29.24	0.80	88.91	60.88	23.75	44.62	41.17	81.64	13.63	10.46	64.70	23.75	64.84	0.42	79.83	37.11	42.09	59.99	26.28
2005	56.98	30.09	0.76	88.91	57.47	26.08	44.38	39.71	80.49	14.49	10.13	65.49	23.49	65.28	0.54	81.96	34.55	42.55	56.96	28.25
2006	55.98	30.99	0.71	89.05	54.01	28.36	41.13	43.52	79.54	15.13	9.98	65.30	23.15	65.80	0.53	82.04	37.70	41.95	53.78	30.31
2007	55.22	31.60	0.67	89.09	50.34	30.85	41.40	43.57	78.06	16.28	9.90	67.39	22.74	66.40	0.52	81.60	37.56	42.15	51.48	32.43
2008	54.41	32.28	0.64	88.77	46.83	33.10	41.36	44.06	76.51	17.51	8.92	68.40	22.37	66.89	0.52	82.17	37.59	42.91	50.82	32.66
2009	53.64	32.91	0.59	88.76	43.58	34.90	39.94	45.65	75.05	18.63	8.95	71.11	22.12	67.27	0.71	82.48	36.55	44.69	50.02	33.00
2010	53.03	33.34	0.56	88.87	40.04	37.08	38.40	46.65	73.76	19.53	8.88	70.65	21.75	67.82	0.42	84.01	36.06	45.74	51.19	31.55
2011	52.62	33.55	0.53	88.78	36.47	39.23	36.79	48.15	73.36	19.94	6.66	71.86	21.40	68.33	0.25	85.36	39.20	44.03	50.95	32.49
2012	51.98	34.03	0.50	88.76	32.85	41.49	35.26	48.96	72.89	20.42	8.25	71.40	20.93	69.00	0.29	85.25	40.37	42.14	49.51	33.65
2013	51.26	34.60	0.47	88.68	32.38	42.16	33.91	50.36	72.14	21.23	8.36	71.69	20.11	69.76	0.32	85.17	37.21	44.42	48.78	34.25
2014	50.72	34.94	0.45	88.61	31.87	42.85	33.37	51.21	71.47	21.93	8.35	71.93	20.19	69.72	0.29	87.43	31.15	48.25	48.13	34.37
2015	50.07	35.42	0.48	89.17	31.46	43.37	32.61	51.63	70.92	22.50	7.88	72.88	18.69	71.31	0.26	87.60	29.82	49.38	45.45	35.24
2016	47.70	37.31	0.49	89.79	31.07	43.84	30.07	53.94	70.61	22.82	6.81	73.22	17.30	72.76	0.25	87.71	28.42	51.07	43.49	35.74
2017	45.38	39.19	0.44	90.34	30.72	44.38	28.82	54.52	70.18	23.28	6.71	73.51	15.32	74.78	0.24	87.85	28.16	51.47	41.47	36.71

Source: World Development Indicators (2018)

Figure (4.2)

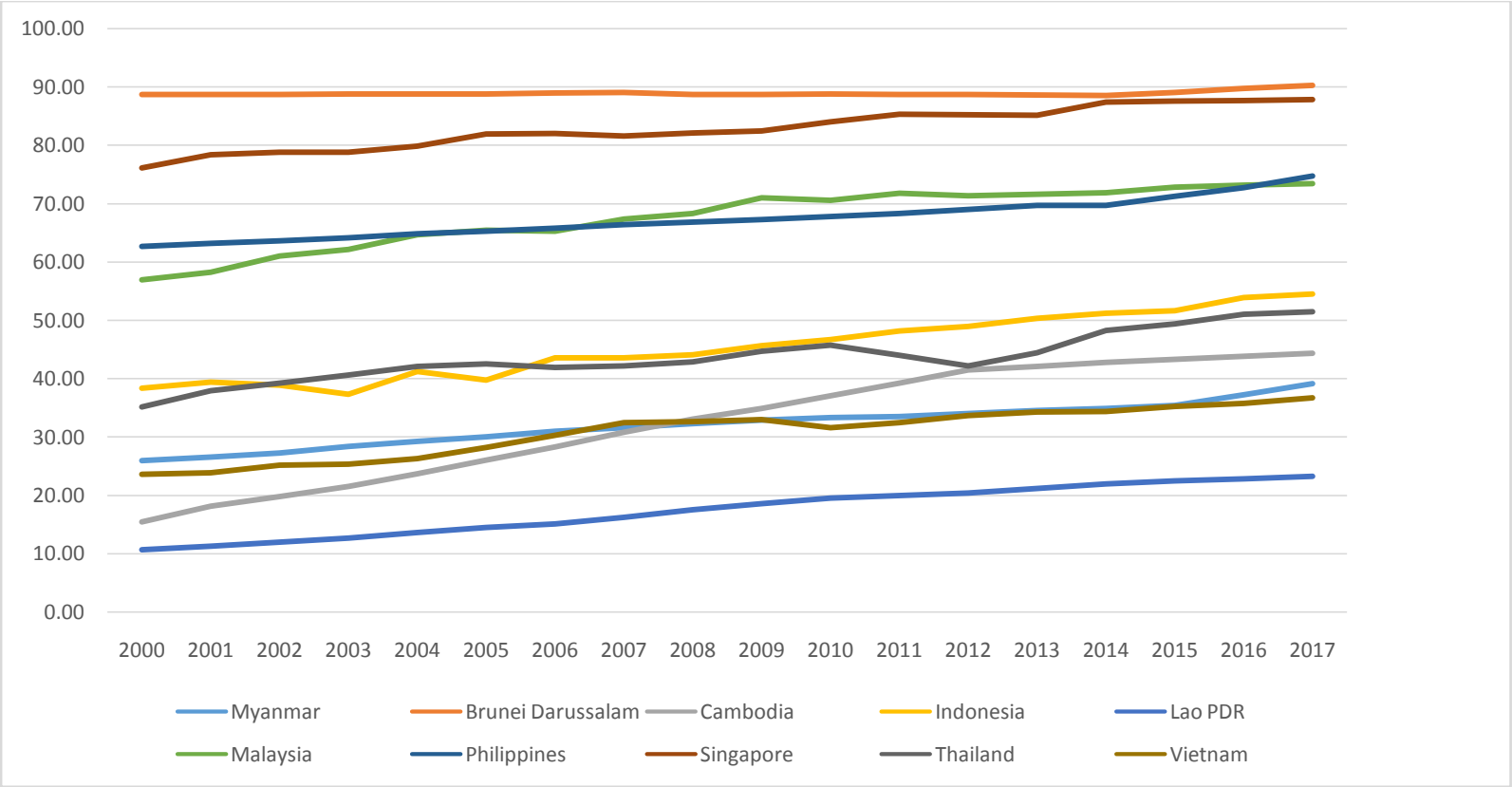
Female Employment in Agriculture, ASEAN Countries (%)



Source: World Development Indicators (2018)

Figure (4.3)

Female Employment in Services, ASEAN Countries (%)



Source: World Development Indicators (2018)

Table (4.3) indicates the economic activity and female labor force participation in ASEAN countries. Figure (4.3) shows the drastic decline in female employment in agriculture and this decline obviously hinder the female labor force participation rate. In 2000, agriculture plays the important role by highest percent. During 2004 to 2006,Myanmar, Lao, Cambodia and Vietnam led in absolute productivity levels among ASEAN countries. In 2013, female employments in ASEAN countries are extremely low in agriculture sector and in 2017 it drops to lowest percent by reaching its lowest. Figure (4.4) shows the trends in female employment in services sector by country. The above data demonstrates that the economy is moving towards a more services sector. In the last decades, countries have rapidly begun to experience the transformation of its service base compared to 2000. Especially, starting from 2015 to 2017, female employment is extremely high in service sector. According to the result, women become more and more active in the service sector.

4.4 GDP Per Capital (Current US$)

GDP per capita is gross domestic product and it is calculated by dividing by midyear population. GDP is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources. Data are in current U.S. dollars.

Table (4.4)

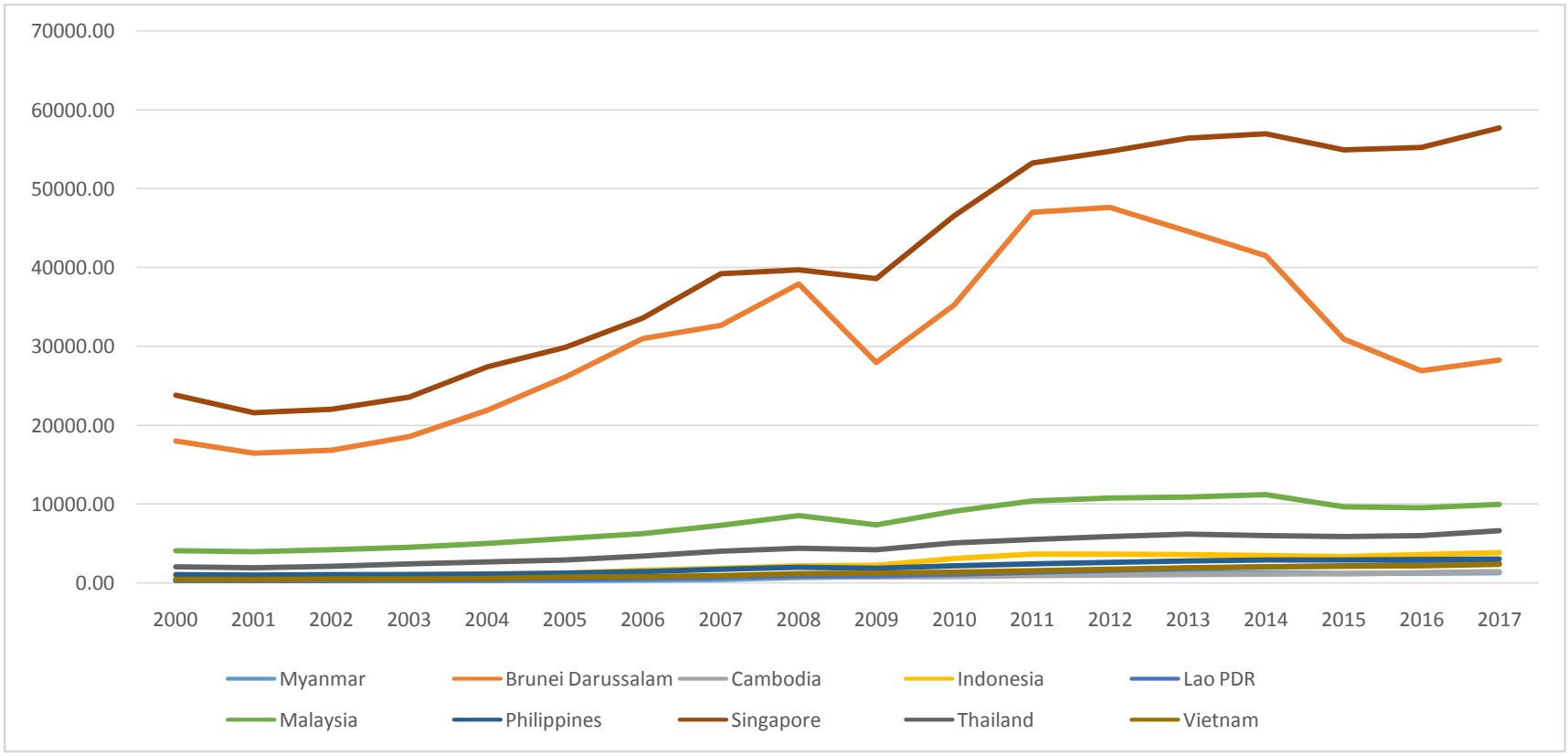
GDP Per Capital of ASEAN countries from 2000-2017

Year	Myanmar	Brunei Darussalam	Cambodia	Indonesia	Lao PDR	Malaysia	Philippines	Singapore	Thailand	Vietnam
2000	193.19	18008.45	302.65	780.09	324.85	4045.17	1038.91	23792.61	2007.56	388.27
2001	138.92	16468.13	321.23	747.98	326.64	3915.12	957.28	21577.08	1893.15	402.83
2002	143.78	16846.02	339.07	899.56	319.83	4167.36	1000.07	22016.83	2096.05	427.84
2003	219.78	18555.57	362.42	1064.51	362.63	4463.68	1010.55	23573.63	2358.93	477.99
2004	219.82	21896.61	408.61	1148.57	417.75	4955.48	1079.04	27405.27	2659.84	543.87
2005	247.24	26102.13	474.22	1260.93	475.42	5593.82	1194.70	29869.85	2893.65	683.60
2006	296.90	30980.97	539.88	1586.21	590.30	6222.98	1391.77	33579.86	3368.95	779.97
2007	410.45	32672.37	631.68	1855.09	709.77	7269.17	1672.69	39223.58	3972.21	901.32
2008	643.95	37951.28	745.79	2160.53	899.50	8513.63	1919.47	39721.05	4378.69	1143.27
2009	741.08	27965.48	738.23	2254.45	948.13	7326.74	1825.34	38577.56	4212.05	1210.69
2010	987.74	35268.10	785.69	3113.48	1141.13	9071.36	2129.50	46569.68	5075.30	1310.37
2011	1186.42	47017.03	882.49	3634.28	1381.43	10405.12	2352.52	53237.56	5491.16	1515.48
2012	1175.56	47651.26	951.11	3687.95	1588.63	10779.51	2581.82	54715.69	5859.89	1722.68
2013	1171.46	44597.28	1013.67	3620.66	1838.81	10882.29	2760.29	56389.18	6168.39	1871.33
2014	1260.42	41530.67	1093.76	3491.60	2017.59	11183.73	2842.94	56957.08	5953.79	2012.05
2015	1138.99	30967.89	1163.19	3334.55	2159.43	9655.14	2878.34	54940.86	5846.39	2065.17
2016	1196.10	26939.42	1269.91	3570.28	2338.69	9515.19	2950.91	55243.13	5979.29	2170.65
2017	1256.66	28290.59	1384.42	3846.86	2457.38	9951.54	2988.95	57714.30	6595.00	2342.24

Source: World Development Indicators (2018)

Figure (4.4)

GDP Per Capital of ASEAN countries from 2000-2017



Source: World Development Indicators (2018)

In Figure (4.4), it can be seen that Singapore has the highest GDP per capital among the countries. Brunei Darussalam has the second highest and its rate declined after 2014 but still higher than the other countries. Malaysia has the third highest GDP per capital after Singapore and Brunei Darussalam. According to figure, the highest GDP per capital of Singapore was $ 57714 in 2017, Brunei Darussalam was US$ 47651 in 2012 and Malaysia was $ 11183 in 2014. GDP per capital of Myanmar, Cambodia, Indonesia, Lao PDR, Philippines, Thailand and Vietnam were slowly began to increase but they are not more than $ 10000 in 2017.

4.5 Panel Data Regression Model of Female Labor Force Participation

Female labor force participation rate is the dependent variable of the model and GDP per capital, female employment in agriculture, female employment in services, total fertility rate, female secondary enrollment rate and female unemployment rate are independent variables.GDP per capital is used as a proxy for economic development. The existence of U-shaped hypothesis is pursued, square of GDP per capital is also added and it is expected to have positive sign. The U-shape hypothesis holds if the estimated coefficients are as follows: $\beta_1 < 0$ and $\beta_2 > 0$. According to the U, at the initial stage of development a country would experience a decline in female labor force participation with economic development, so $\beta_1 < 0$, at the later stage of economic development women get access to education beyond secondary level and jobs are becoming available for women due to expansion of the service sector as well as in manufacturing sector, so $\beta_2 > 0$.

The panel regression model for female labor force participation is as follow;

$$FLFPR_{it} = \alpha_i + \beta_1 \ln GDPC_{it} + \beta_2 (\ln GDPC_{it})^2 + \beta_3 Fagril_{it} + \beta_4 Fserv_{it} + \beta_5 TFR_{it} + \beta_6 FSER_{it} + \beta_7 FUER_{it} + u_{it} \quad (4.1)$$

Where;

i = Country (1,2,…,10)

t = Time (1,2,…,18)

α_i = Intercept

β_1 = Slope of gross domestic product per capital

β_2 = Slope of gross domestic product per capital square

β_3 = Slope of female employment in agriculture

β_4 = Slope of female employment in services

β_5 = Slope of total fertility rate

β_6 = Slope of female secondary school enrollment rate

β_7 = Slope of female unemployment rate

FLFPR = Female Labor Force Participation Rate: is the proportion of the population ages 15 and older that is economically active.

Ln(GDPC) = Log of Gross Domestic Product Per Capital: is a measure of a country's economic output that accounts for its number of people.

$Ln(GDPC)^2$ = Log of Gross Domestic Product Per Capital Square

Fagril = Female employment in agriculture: is the ratio of females employed in agriculture sector

Fserv = Female employment in services: is the ratio of females employed in services sector

TFR = Total Fertility Rate: is the average number of live births that a woman would have under the assumption that she survived to the end of her reproductive life (15 to 49 years of age).

FSER = Female secondary school enrollment rate: enrollment rate is the ratio of children of official school age who are enrolled in school to the population of the corresponding official school age.

FUER = Female Unemployment Rate: is the ratio of unemployed women population to the total women labor force.

4.6 The Ordinary Least Square Model

Table (4.5) presents the ordinary least square model for the relationship between economic development and female labor force participation in ASEAN countries.

Table(4.5)

Results of OLS Regression

Variable	Coefficient	Standard Error	P-value
Constant	66.2388***	23.4475	0.006
Ln(GDPC)	-7.6798**	4.940442	0.023
$Ln(GDPC)^2$	0.9976***	0.3033802	0.001
Fagril	0.5755***	0.1378854	0.000
Fserv	0.1192	0.1788193	0.506
TFR	-2.9016*	1.491388	0.054
FSER	-0.3428***	0.1000211	0.001
FUER	-1.8293***	0.3868391	0.000

Source: STATA output Significance level: ***=.01; **=.05; *=.1

F (7, 108) = 64.44 P-value = 0.0000

Results for the regression coefficient by OLS are shown in Table (4.5). The coefficient of Ln (GDPC) is negative and the coefficient of its square is positive. Therefore, the econometric estimation confirms the U-shape hypothesis on the relationship between economic development and female labor force participation with $\beta_1 < 0$ and $\beta_2 > 0$. Female employment in agriculture is statistically significant at 1 percent level and it has positive impact on female labor force participation rates. Female unemployment rate also had negative effect, although the magnitude of the coefficient was quite small. If female unemployment rate increase by 1%, female labor force participation rate will decrease 1.8293%. It can also conclude that if female unemployment rate increases, female labor force participation rate will be decrease. Total fertility rate and female secondary school enrollment rate have negative impact on female labor force participation rates.

4.7 The Fixed Effect Model

Table (4.6) presents the fixed effect regression model for the relationship between economic development and female labor force participation in ASEAN countries.

Table(4.6)

Results of Fixed Effect Regression

Variable	Coefficient	Standard Error	P-value
Constant	88.0349***	20.74903	0.000
Ln(GDPC)	-15.1060***	3.149835	0.000
$Ln(GDPC)^2$	0.9504***	0.223666	0.000
Fagril	0.2309*	0.1234653	0.064
Fserv	0.4420***	0.1499044	0.000
TFR	0.7048*	1.209982	0.062
FSER	0.0207*	0.0469451	0.059
FUER	-0.0369*	0.3155319	0.097

Source: STATA output Significance level: ***=.01; **=.05; *=.1

F(7, 99) = 10.68 P-value = 0.0000

Sigma_u = 16.786558 Sigma_e = 1.732467 Rho = 0.98946

The results for the fixed effects estimation of the model are shown in Table (4.6). The regression output also confirms the U-shape hypothesis. The coefficient estimates are statistically significant for both GDP per capital variables with $\beta_1 < 0$ and $\beta_2 > 0$.Female employment in agriculture, female employment in services and total fertility rate has positive relationship on female labor force participation. The coefficient estimate on female secondary school enrollment rate is also positive relationship. These results indicate that education increases female labor force participation. If female secondary school enrollment rate rises by 1%, female labor force participation will increase by 0.021%. Therefore it can conclude that if the female secondary school enrollment rate increases, female labor force participation will be increases.

4.8 The Random Effect Model

Table (4.7) presents the random effect regression model for the relationship between economic development and female labor force participation in ASEAN countries.

Table(4.7)

Results of Random Effects Regression

Variable	Coefficient	Standard Error	P-value
Constant	89.99129***	21.93113	0.000
Ln(GDPC)	-12.38772***	3.244435	0.000
$Ln(GDPC)^2$	0.8275808***	0.2297037	0.000
Fagril	0.3074093**	0.1352631	0.023
Fserv	0.2427967**	0.16277797	0.036
TFR	-1.019085	1.298173	0.432
FSER	-0.0086141	0.0541229	0.874
FUER	-0.6075577**	0.3381083	0.072

Source: STATA output Significance level: ***=.01; **=.05; *=.1

Wald $\chi 2$ = 52.62 P-value = 0.0000

Sigma_u = 5.5829371 Sigma_e = 1.732467 Rho = 0.912163

Table (4.7) shows the random effects estimation of the model. The regression output also confirms the U-shape hypothesis. The GDP per capital variables are both statistically significant with $\beta_1 < 0$ and $\beta_2 > 0$.Female employment in agricultural and female employment in agricultural also were found positive effect on female labor force participation. If female employed in agriculture increase by 1%, female labor force participation rate will increase by 0.3074%. Total fertility rate and female secondary school enrollment rate were not statistically significant at 10% level.

4.9 Testing for Appropriate Model

To choose the appropriate model for the relationship between economic development and female labor force participation in ASEAN countries.

4.9.1 Breusch-Pagan Lagrange Multiplier Test

The LM (lagrange multiplier) test is decide to appropriate model between a random effects regression and ordinary least square model regression.

Test hypothesis is:

Null Hypothesis : The random effect model is not appropriate.

Alternative Hypothesis : The random effect model is appropriate.

Test Result

chi2 (10) = 257.10

Prob>chi2 = 0.0000

Decision Rule

P-value >0.05 ; Accept H0

P-value <0.05 ; Reject H0

Conclusion ; The model show that with a Chi-square of 257.10 and P-value 0.0000 is less than 1% level. It means that the null hypothesis is rejected. Therefore, random effect model is appropriate.

4.9.2 F-Test

F-test is used to decide to appropriate model between fixed effects model and ordinary least square model.

Test hypothesis is:

Null Hypothesis : The ordinary least square model is not appropriate.

Alternative Hypothesis : The fixed effect model is appropriate.

Test Result

F test that all u_i = 0

F (9,99) = 133.29

Prob>F = 0.0000

Decision Rule

P-value >0.05 ; Accept H0

P-value <0.05 ; Reject H0

Conclusion ; P-value 0.0000 is less than 1% level. It means that the null hypothesis is rejected. Therefore, fixed effect model is appropriate.

4.9.3 Hausman Test

Tests for the statistical significance of the difference between the coefficient estimates obtained by Fixed Effect and by Random Effect

Test hypothesis is:

Null Hypothesis : Random effect model is appropriate.

Alternative Hypothesis : Fixed effect model is appropriate.

Test Result

chi2 (7) = 26.20

Prob>chi2 = 0.0005

Decision Rule

P-value >0.05 ; Accept H0

P-value <0.05 ; Reject H0

Conclusion ; Since P-value is < 0.05, null hypothesis is rejected. Therefore, it can be concluded that the fixed effect model is more appropriate for this study.

4.10 Diagnostic Checking

The most important assumptions for using fixed effects are that the errors in the regression are homoscedastic and serial uncorrelated.

4.10.1 Testing for Heteroskedasticity

The Breusch-Pagan-Godfrey test is used for the reliability of the results.

Test hypothesis is:

Null Hypothesis : The error variances are homoskedasticity.

Alternative Hypothesis : The error variances are heteroskedasticity.

Test Result

chi2 (10) = 1.60

Prob>chi2 = 0.0000

Decision Rule

P-value >0.05 ; Accept H0

P-value <0.05 ; Reject H0

Conclusion ; Since P-value is < 0.05, null hypothesis is rejected. Therefore, there is heteroskedasticity in the model.

4.10.2 Testing for Serial Correlation

The wooldridge test is used for the reliability of the results.

Test hypothesis is:

Null Hypothesis : There is no serial correlation.

Alternative Hypothesis : There is serial correlation.

Test Result

F (1,8) = 35.110

Prob>F = 0.0004

Decision Rule

P-value >0.05 ; Accept H0

P-value <0.05 ; Reject H0

Conclusion ; Since P-value is < 0.05, null hypothesis is rejected. Therefore, there is serial correlation in the model.

4.11 Feasible Generalized Least Squares Estimator

According to Hausman test result, fixed effect model was defined as appropriate model. And then, testing for heteroskedasticity, there is strong evidence that it exists (p-value = 0.0000). Testing for serial correlation, there is also strong evidence of serial correlation in the errors (p-value = 0.0004). Therefore, it was found that there is heteroskedasticity and serial correlation in the fixed effect model.The feasible generalized least squares method takes into account heteroskedasticity and serial correlation.

Table(4.8)

Results of Fixed Effects Regression with Feasible Generalized Least Squares

Variable	Coefficient	Standard Error	p-value
Constant	66.2388***	22.62452	0.003
Ln(GDPC)	-7.6798***	4.767039	0.007
$Ln(GDPC)^2$	0.9976***	0.2927319	0.001
Fagril	0.5755***	0.1330458	0.000
Fserv	0.1192*	0.1725429	0.090
TFR	-2.9016**	1.439042	0.044
FSER	0.3428***	0.0965105	0.000
FUER	-1.8293***	0.3732615	0.000

Source: STATA output Significance level: ***=.01; **=.05; *=.1

After using feasible generalized least squares method, the coefficient estimates are statistically significant for both GDP per capital variables. The coefficient of $\ln GDPC$ is negative and the coefficient of its square is positive. Therefore, the econometric estimation confirms the U-shape hypothesis on the relationship between economic development and female labor force participation with $\beta_1 < 0$ and $\beta_2 > 0$.Female employment in agriculture, female secondary school enrollment rate and female unemployment rate are statistically significant at 1% level. Total fertility rate is statistically significant at 5% level and female employment in services is statistically significant at 10% level.

The fixed effect model with feasible generalized least squares method for the relationship between economic development and female labor force participation in ASEAN countries can be expressed as follow;

$$FLFPR_{it} = 66.2388 - 7.6798 \ln GDPC_{it} + 0.9976(\ln GDPC_{it})^2 + 0.5755Fagri_{it} + 0.1192Fserv_{it} - 2.9016TFR_{it} + 0.3428FSER_{it} - 1.8293FUER_{it}$$

From the above equation, if female employed in agriculture and female employed in services increase by 1%, female labor force participation will increase 0.5755% and 0.1192% respectively. Therefore, female employment in agriculture and female employment in services are positive relationship on female labor force participation. It is noted that a 1% rises in economic development is linked with -7.6798% decline in female labor force participation shown by estimate of linear term with positive sign of squared term of GDP per capita indicates the joining point of female labor force participation and GDP per capital with a rise economic development to fair levels. The estimate of square term of GDP per capita is (0.9976). Female secondary school enrollment rate is positive impact on female labor force participation. If female secondary school enrollment rate increase by 1%, female labor force participation rate will increase by 0.3428%.The coefficient on total fertility rate and female unemployment rate are negative relationship on female labor force participation.

CHAPTERV
CONCLUSION

5.1 Findings

This study deals with the empirical investigation of relationship between the female labor force participation and economic development in ASEAN countries. The panel data which consists of ten ASEAN countries for the period 2000-2017. In the analysis of the models, female labor force participation rate is the dependent variable of the model and GDP per capital, female employment in agriculture, female employment in services, total fertility rate, female secondary enrollment rate and female unemployment rate are independent variables. According to the results for ordinary least square, fixed effect model and random effect model, it has been found that the GDP per capital variables are both statistically significant with $\beta_1 < 0$ and $\beta_2 > 0$. Fixed effect model is more appropriate than the other models. With the presence of heteroskedasticity and serial correlation, applied fixed effects to feasible generalized least squares method. The econometric results provided evidence for the U-shape hypothesis in the ASEAN countries. This study shows that women are mostly economically active in services sector. And then women are still economically active in agriculture sector. Female employed in agriculture and female employed in services are positive relationship on female labor force participation. There were problems with the estimated model, firstly, it only examined a short period of time. Data on most explanatory variables is only available starting in 2000 and this may be too short of a time period to observe a U-shaped transition. This paper also estimates the threshold level of per capital GDP beyond which the female labor participation expedites growth for ASEAN countries.

5.2 Discussions

Today's women need to take part in the work force, to be in line with the current living standards for the family. Market economy create many of jobs for women and women are now running in par with men in labor market. However, new types of job are need for those women who take care of home as well as do paid job.

Since ASEAN countries women are participating in the economic activities and in the labor force together with the men, this paper observes that creating decent jobs for women can help the economy develop further. As Gaddis (2013) points out, "Data on female labor participation from countries at different income levels are used to infer the relationship within a single country over time". ASEAN is now an important player on the global stage with numerous alliances and business partnerships. Across all nations of ASEAN countries, there is a population of over 622 million people. The region has one of the largest economies in the world and it is believed that by 2050, it will have the 4^{th}-largest economy in the world. It also has one of the biggest labor forces in the world, behind India and China.

5.3 Suggestions and Further Research

Based on the empirical results,

- Particularly the major part of higher education for women.
- Marital status, religious values, social norm and culture attitude, child care policies, congenial work environment might play important role in determining female labor force participation for developing economies.
- For further research, it should be checked whether the estimation results hold for alternative data sources.

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APPENDIX

Summary Table

```
. summarize FLFPR lnGDPC LnGDPC_Sq Fagri Fserv TFR FSER FUER
```

Variable	Obs	Mean	Std. Dev.	Min	Max
FLFPR	180	63.98969	12.42248	45.522	84.81
lnGDPC	180	7.954059	1.545767	4.933934	10.96326
LnGDPC_Sq	180	65.64318	25.61586	24.3437	120.1931
Fagri	180	34.02598	25.01083	.238	85.611
Fserv	180	50.89767	23.64765	10.684	90.343
TFR	180	2.365717	.7105976	1.15	4.311
FSER	116	60.57818	21.70131	11.18099	99.79816
FUER	180	2.798772	1.850273	.476	8.812

Result of OLS

```
. regress FLFPR lnGDPC LnGDPC_Sq Fagri Fserv TFR FSER FUER
```

Source	SS	df	MS
Model	16279.2801	7	2325.61145
Residual	3897.78773	108	36.0906271
Total	20177.0678	115	175.452764

Number of obs	= 116
F(7, 108)	= 64.44
Prob > F	= 0.0000
R-squared	= 0.8068
Adj R-squared	= 0.7943
Root MSE	= 6.0075

FLFPR	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
lnGDPC	-7.679822	4.940442	-1.55	0.123	-17.47264	2.112991
LnGDPC_Sq	.997644	.3033802	3.29	0.001	.3962918	1.598996
Fagri	.5755391	.1378854	4.17	0.000	.3022264	.8488518
Fserv	.1192338	.1788193	0.67	0.506	-.235217	.4736846
TFR	-2.901687	1.491388	-1.95	0.054	-5.857877	.0545029
FSER	-.3428727	.1000211	-3.43	0.001	-.5411319	-.1446135
FUER	-1.829315	.3868391	-4.73	0.000	-2.596097	-1.062532
_cons	66.23884	23.4475	2.82	0.006	19.76183	112.7158

Result of Fixed Effect Regresion

```
Fixed-effects (within) regression               Number of obs      =       116
Group variable: Country_ID                      Number of groups   =        10

R-sq:  within  = 0.4302                         Obs per group: min =         2
       between = 0.0902                                        avg =      11.6
       overall = 0.1369                                        max =        18

                                                F(7,99)            =     10.68
corr(u_i, Xb)  = -0.6677                        Prob > F           =    0.0000
```

FLFPR	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
lnGDPC	-15.10605	3.149835	-4.80	0.000	-21.35601	-8.856095
LnGDPC_Sq	.9504737	.223666	4.25	0.000	.5066717	1.394276
Fagri	.2309126	.1234653	1.87	0.064	-.0140693	.4758945
Fserv	.4420312	.1499044	2.95	0.004	.1445884	.7394741
TFR	.7048491	1.209982	0.58	0.562	-1.696017	3.105715
FSER	.0207877	.0469451	0.44	0.659	-.0723616	.1139369
FUER	-.0369887	.3155319	-0.12	0.907	-.6630725	.5890951
_cons	88.03494	20.74903	4.24	0.000	46.86436	129.2055
sigma_u	16.786558					
sigma_e	1.732467					
rho	.98946086	(fraction of variance due to u_i)				

```
F test that all u_i=0:     F(9, 99) =   133.29              Prob > F = 0.0000

.
```

Result of Random Effect Regresion

```
Random-effects GLS regression                   Number of obs      =       116
Group variable: Country_ID                      Number of groups   =        10

R-sq:  within  = 0.3408                         Obs per group: min =         2
       between = 0.4405                                        avg =      11.6
       overall = 0.5485                                        max =        18

                                                Wald chi2(7)       =     52.62
corr(u_i, X)   = 0 (assumed)                    Prob > chi2        =    0.0000
```

FLFPR	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
lnGDPC	-12.38772	3.244435	-3.82	0.000	-18.74669	-6.028744
LnGDPC_Sq	.8275808	.2297037	3.60	0.000	.3773698	1.277792
Fagri	.3074093	.1352631	2.27	0.023	.0422986	.5725201
Fserv	.2427967	.1627797	1.49	0.136	-.0762456	.561839
TFR	-1.019085	1.298173	-0.79	0.432	-3.563458	1.525288
FSER	-.0086141	.0541229	-0.16	0.874	-.1146931	.0974649
FUER	-.6075577	.3381083	-1.80	0.072	-1.270238	.0551225
_cons	89.99129	21.93113	4.10	0.000	47.00706	132.9755
sigma_u	5.5829371					
sigma_e	1.732467					
rho	.9121631	(fraction of variance due to u_i)				

Breusch and Pagan Lagrangian Multiplier Test

```
Breusch and Pagan Lagrangian multiplier test for random effects

        FLFPR[Country_ID,t] = Xb + u[Country_ID] + e[Country_ID,t]

        Estimated results:
                         |       Var     sd = sqrt(Var)
                 --------+------------------------------
                   FLFPR |    175.4528        13.24586
                       e |    3.001442        1.732467
                       u |    31.16919        5.582937

        Test:   Var(u) = 0
                                chibar2(01) =    257.10
                            Prob > chibar2 =    0.0000
```

Hausman Test

```
hausman fe re, sigmamore
```

	Coefficients (b) fe	(B) re	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
lnGDPC	-15.10605	-12.38772	-2.718332	1.786519
LnGDPC_Sq	.9504737	.8275808	.1228929	.1280854
Fagri	.2309126	.3074093	-.0764967	.0527327
Fserv	.4420312	.2427967	.1992346	.0676239
TFR	.7048491	-1.019085	1.723934	.5822694
FSER	.0207877	-.0086141	.0294018	.0108569
FUER	-.0369887	-.6075577	.5705689	.1527775

```
                b = consistent under Ho and Ha; obtained from xtreg
     B = inconsistent under Ha, efficient under Ho; obtained from xtreg

  Test:  Ho:  difference in coefficients not systematic

              chi2(7) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                      =       34.96
            Prob>chi2 =      0.0000
```

Wald Test for Heteroskedasticity

```
Modified Wald test for groupwise heteroskedasticity
in fixed effect regression model

H0: sigma(i)^2 = sigma^2 for all i

chi2 (10)  =    1.6e+31
Prob>chi2 =      0.0000
```

Wooldridge Test for autocorrelation

```
Wooldridge test for autocorrelation in panel data
H0: no first order autocorrelation
    F(  1,       8) =     35.110
           Prob > F =      0.0004
```