THE EFFECTS OF RURAL, URBAN POPULATION AND HIGHER EDUCATION ON EMPLOYMENT BY GENDER IN MYANMAR

Pwint Phyu Aung*

Abstract

This study investigates the effects of rural population, urban population, and higher education on employment by gender in Myanmar. It draws upon a panel database of 20 observations collected from CSO, Myanmar and World Bank Indicators (1996 to 2015). The study offers findings on employment by gender in Myanmar. Whenever increase in rural population by one million leads to increase both male and female employments to population ratios. An increase in a thousand number of total enrollments in higher education reduces both male and female employments to population ratios. There is also positive and significant effect of total number of graduates in higher education on both male and female employments to population ratios in Myanmar. However, the total number of graduates in higher education is inversely related to both male and female self-employed in Myanmar. Total number of graduates in higher education is much less than that of enrollments in higher education therefore the percentage share of graduates should be increased to the desire level. There is not too much high gender disparity with respect to employment to population ratio and self-employed in Myanmar. If women are university graduates and post-graduate qualifications, opportunities for women to obtain employment in line with their high qualifications must be ensured.

Keywords: Employment by Gender, Higher Education, Rural Population, Urban Population, Total Enrollment

Introduction

According to the National Census 2014 conducted by the Government of Myanmar, 36 million people out of the country's 51 million people or 70% of total population live in rural areas and the overwhelming majority of whom are engaged in agriculture. Agriculture plays a large part in Myanmar's economy, accounting for 25% of exports, 40% of imports, and approximately 70% of employment. Rural population in Myanmar refers to people living in rural areas as defined by national statistical offices. It is calculated as the difference between total population and urban population. Although Myanmar is trying to escape from low income country status defined by the World Bank clarification, substantial disparities in housing and living conditions exist between rural and urban areas and between different parts of the country. The country has a relatively low unemployment rate of 4.02 percent and gross domestic product (GDP) growth rate is 7.7%, with strong expansion in construction, manufacturing, and services. According to UNDP 2015 Human Resource Development Report, global gender inequality index of Myanmar ranks as 85th of 187 countries and gender inequality index value is 0.413. The female labor participation rate is 50.6% and that of males is 85.6%. Globally life expectancy for women is 73.6 and men is 69.4. The Union level sex ratio is 93 males to 100 females. Men have a life expectancy of 60 years and women have 69 years.

Currently, Myanmar has the advantage of the demographic advantage afforded by the relatively large proportion of prime working age adults though preparing for the effects of population ageing is needed. There are 4.5 million people aged 60 and over that represents 8.9% of total population in Myanmar. According to 2014 Myanmar Population and Housing Census

* Dr, Lecturer, Department of Applied Economics, Yangon University of Economics

Report on Migration and Urbanization, only (10.4%) of recent migration within Myanmar is rural-to-urban and the largest movements are instead urban-to-urban (47.2%). Therefore urbanization is gradually increasing along with remaining a predominantly rural society in Myanmar. Many people want to migrate internally as they want to improve their income, employment gaps, educational opportunities, social network, personal values, exposure, and better living standards and to avoid poor socio-economic conditions.

The general education system in Myanmar is 5 years of primary schooling, 4 years of secondary schooling and 2 years of high schooling (i.e., 11 years of schooling) plus higher education. The main supporter of education and training for higher education is the Ministry of Education (MOE) in Myanmar. Higher education consists of bachelor, masters and PhD levels. Depending upon the stream and subject, the bachelor level may be of three to five years' duration. The duration of the master level is generally of two years. Some universities also offer programs like master programs and post-graduate diploma. Male literacy rate is 92.6% and female 86.9% (persons aged 15 years and over).Therefore, investing in and strengthening a country's education sector is important to the development of country and its people to be skilled labor force. In this paper, simple definition of the formal sector employment involves all people who job with normal hours and regular wages, and are recognized as income sources on which income taxes must be paid and earnings are taxed as well as counted in GDP. On the other hand, the informal sector employment refers to those workers who are self-employed, or who are contractor with other people or enterprise or temporary workers or paid family workers.

Research Questions

This paper provides answers to the following questions.

(i) Do the factors (rural & urban populations, total number of enrolments & graduates in higher education) affect the employment equalities between male employment to population ratio and female employment to population ratio in Myanmar?

(ii) Do these factors affect the employment equalities between male self-employed and female self-employed in Myanmar?

Objective of the Study

The objective of the study is to investigate the effects of rural population, urban population, and higher education on employment by gender in Myanmar.

Method of Study

The main tools used in this study are tabulations, graphs, pie charts and regression analysis. Methodology is the regression analysis with panel data based on quantitative approaches by using STATA that is a syllabic abbreviation of the words statistics and data. To address the research objectives, four models are developed to estimate the effects of rural and urban populations, total number of enrollments and total number of graduates in higher education on gender employment in Myanmar from 1996 to 2015. The source of data used in this study comes from Myanmar Statistical Year Book, CSO and World Development Indicators (WDI) from 1996 to 2015.

Descriptions of models are:

$$METPR = \alpha + \beta_1 (RP) + \beta_2 (UP) + \beta_3 (TNE) + \beta_4 (TNG) + \varepsilon \quad \text{(Model 1)}$$

$$FETPR = \gamma + \delta_1 (RP) + \delta_2 (UP) + \delta_3 (TNE) + \delta_4 (TNG) + \varepsilon \quad \text{(Model 2)}$$

$$MSE = \eta + \theta_1 (RP) + \theta_2 (UP) + \theta_3 (TNE) + \theta_4 (TNG) + \varepsilon \quad \text{(Model 3)}$$

$$FSE = \lambda + \Upsilon_1 (RP) + \Upsilon_2 (UP) + \Upsilon_3 (TNE) + \Upsilon_4 (TNG) + \varepsilon \quad \text{(Model 4)}$$

where,

METPR = Male employment to population ratio

FETPR = Female employment to population ratio

MSE = Male self-employed

FSE = Female self-employed

RP = Rural population (millions)

UP = Urban population (millions)

TNE = Total number of enrollments in higher education (thousand numbers)

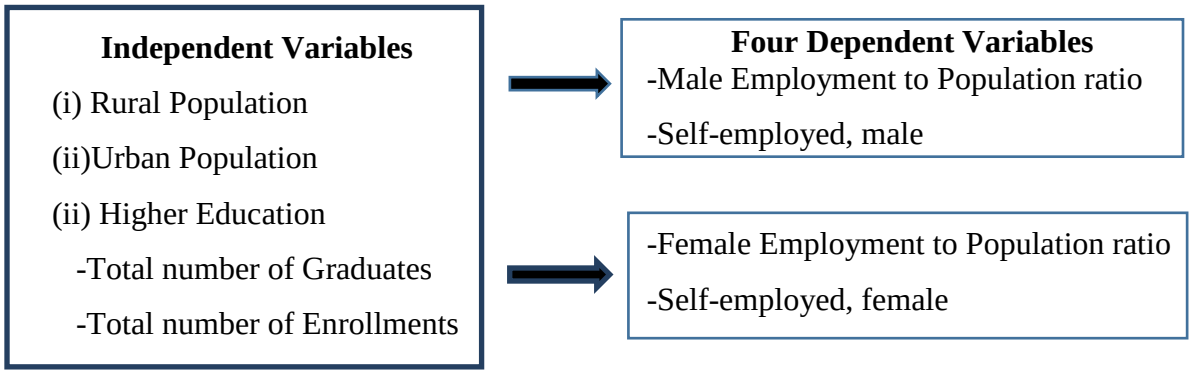
TNG = Total number of graduates in higher education (thousand numbers)

ε = Error term

Conceptual Framework

According to Sjaastad 1962, Todaro and Maruszko 1987, microeconomic models of migration consider migration as an investment in human capital. Traveling costs, costs of job search and training, and also psychological costs are included on the cost side. On the benefit side, the expected wage differential as well as nonmarket benefits of migration such as better access to health are considered. According to Lucas (2004), thinking of rural–urban migration is in terms of life learning because urban areas are places where migrants can accumulate the skills required by modern production technologies. On the other hand, there may be income inequality as a result of economic growth of poor countries according to Kuznets (1955) because industrialization and urbanization change the distribution of income in a developing economy and productivity in urban areas grows faster than in rural areas. Spitz-Oener (2006) found that the more workers held a college degree from 8% in 1979 to 16% in 1999, whereas there is a significant decline in the proportion of employees without formal diploma in Germany and more and more enterprises require employee who should have higher education attainments. Moreover, large numbers of university graduates or new entrants entering labor market have been unemployed or underemployed for many years in Germany. Similarly, the problem of unemployed university graduates has been exacerbated in China since the expansion of the higher education system in 1999. Then again, most fresh graduates would like to pursue high wage jobs with a desirable working environment.

But Cali and Menon (2009) found that the growth of urban areas in India has had a systematic and significant poverty-reducing impact on surrounding rural areas due to increase in rural non-farm employment, urban-rural remittances, increase in rural land prices and decrease in consumer prices. Teal (2011) found that there was significant evidence of increasing returns to education in Africa, the most educated people often challenge a mismatch between their training and available jobs. Roubaud and Torelli (2013) pointed out that this gap might be why Africa's urban youth often seek to jobs in the informal rather than formal sector.



Source: *Own Compilation*

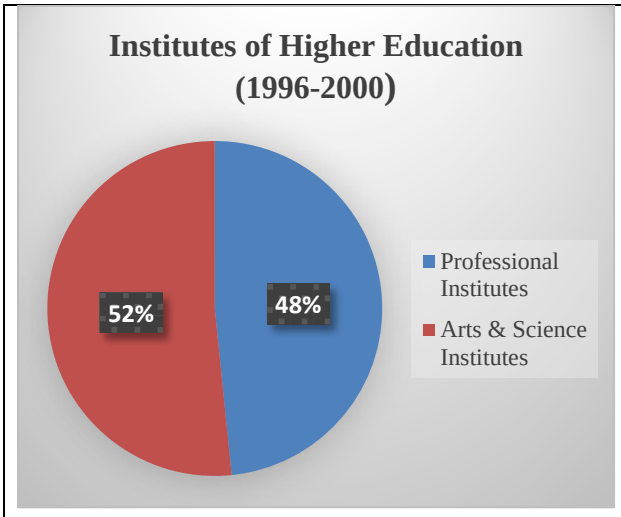
Figure 1 Conceptual Framework of the Study

Therefore the conceptual framework is based on the above illustration. Myanmar has a wealth of natural resources, a young and inexpensive workforce with strong expansion in construction, manufacturing, and services. Like other developing countries, the rapid growth of rural-urban migration has been a common feature of Myanmar. In addition, education enables girls and women to reach their full potential – in parity with boys and men – at their homes, communities, institutions of influence and workplaces. Even the overwhelming majority of who are engaged in agriculture, there is increased work available in manufacturing in urban centers to draw the young women away from the rural areas.

Results and Discussion by Tabulation, Graphs, and Pie Charts

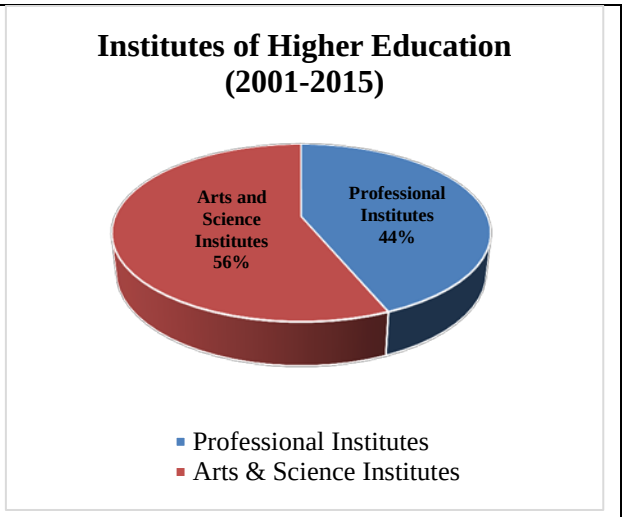
Figure (2) panel (a) presents the results for percentage shares of Professional Institutes (48%) and Arts and Science Institutes (52%) on average from 1996 to 2010. Panel (b) shows that there is increasing in the number of institutes in both institutes but the percentage shares of Arts and Science Institutes (56%) is higher than that of Professional Institutes (44%) from 2001 to 2015. In panel (c) and (d), the number of Professional Institutes and Arts and Science Institutes are shown from 1996 to 2000 and from 2001 to 2015. According to the results of figure (2) panel (e), 234,430 has been graduated (i.e., 24% of total enrollments in higher education) out of 730,060 enrollments per year in higher education on average from 1996 to2015. Panel (f) presents percentage shares of rural and urban population in which 34.09 million people are living in rural areas (i.e., 70% of total population) and only 14.41 million people are in urban area (i.e., 30% of total population) on average from 1996 to 2015. According to the results of figure (2) panel (g), we can see that there is not too much difference in employment to population ratio by gender (52% for male and 48% for female). Likewise, figure (2) panel (h) shows that there is almost the same in percentage shares of self-employed by gender on average from 1996 to 2015.

Panel (a)



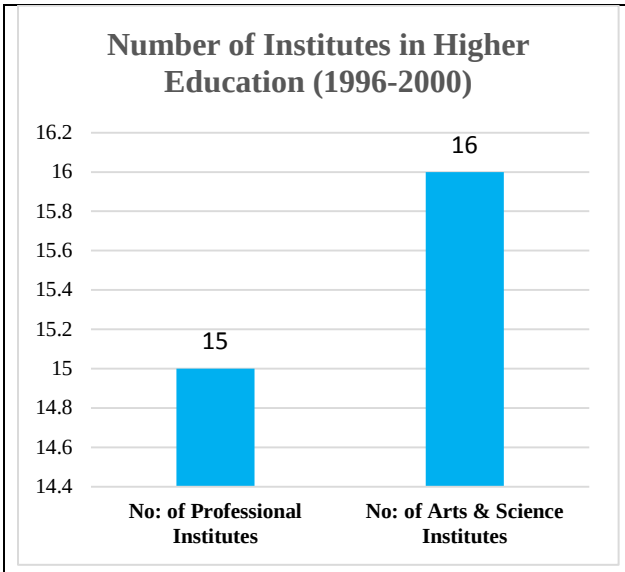
Source: Myanmar Statistical Year Book, CSO (2000-2015)

Panel (b)



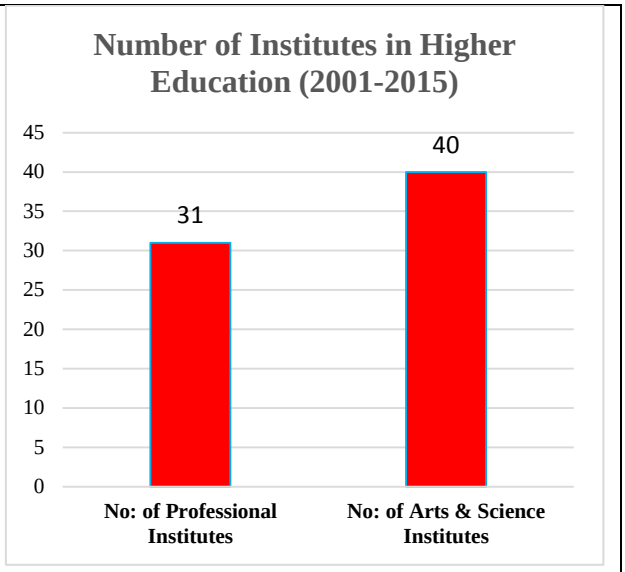
Source: Myanmar Statistical Year Book, CSO (2000-2015)

Panel (c)



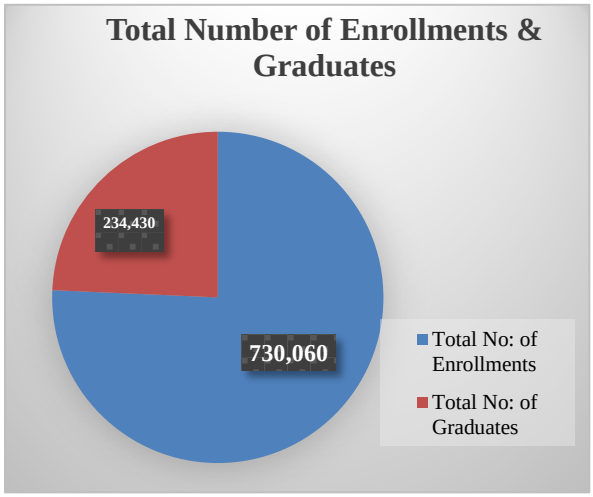
Source: Myanmar Statistical Year Book, CSO (2000-2015)

Panel (d)



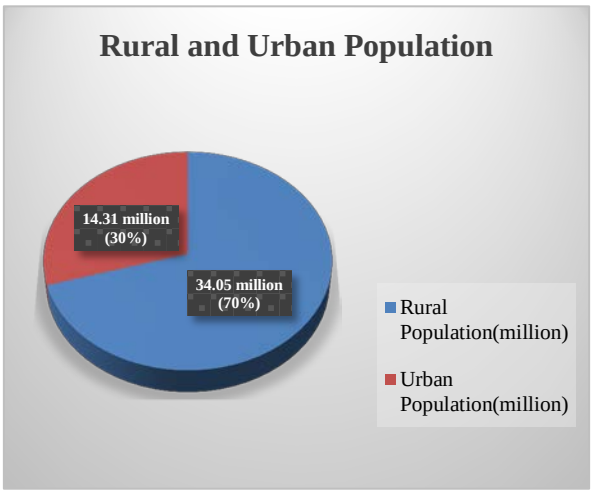
Source: Myanmar Statistical Year Book, CSO (2000-2015)

Panel (e)



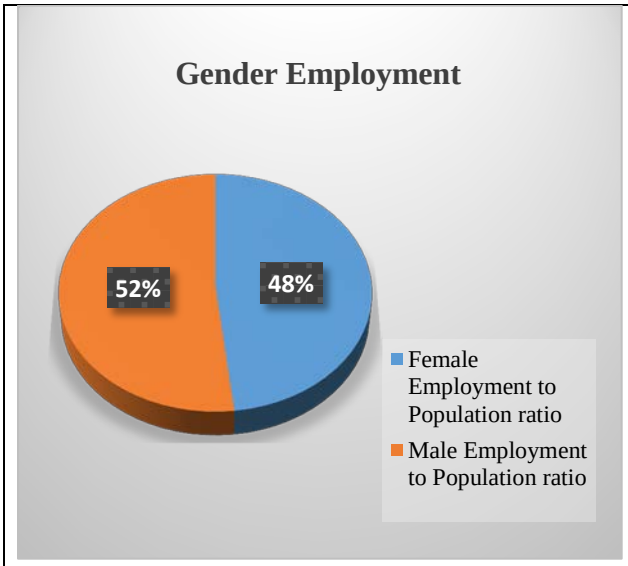
Source: Myanmar Statistical Year Book, CSO (2000-2015)

Panel (f)



Source: Database from World Development Indicators (1996-2015)

Panel (g)



Source: Database from World Development Indicators (1996-2015)

Panel (h)

Source: Database from World Development Indicators (1996-2015)

Figure 2 Pie Charts and Tabulation Results

The number of higher education institutions has been expanded since 1988. The following table indicates the number of higher education institutions in the 2014-2015 Academic Year.

Table 1 Higher Education Institutions

PROFESSIONAL INSTITUTES			
1	Yangon Medicine I	17	Myanmar Aerospace and Engineering
2	Yangon Medicine II	18	Yangon Institute of Economics
3	Mandalay Medicine	19	Monywa Institute of Economics
4	Magway Medicine	20	Meiktila Institute of Economics
5	Yangon Dental Medicine	21	Education,Yangon
6	Mandalay Dental Medicine	22	Education, Sagaing
7	Yangon Medical Technology	23	Agriculture
8	Mandalay Medical Technology	24	Forestry
9	Yangon Institute of Nursing	25	Veterinary Science
10	Mandalay Institute of Nursing	26	Computer
11	Yangon Institute of Pharmacy	27	Arts and Culture, Yangon
12	Mandalay Institute of Pharmacy	28	Arts and Culture, Mandalay
13	Magway Institute of Community Health	29	Myanmar Maritime
14	Public Health, Yangon	30	Myanmar Mercantile
15	Traditional Medicine	31	Marine College
16	Technological University/ Colleges/Institutes		
ARTS AND SCIENCE INSTITUTES			
1	Yangon University	21	National Management College
2	Mawlamyine University	22	Hinthada University
3	Pathein University	23	Yangon University of Foreign Languages
4	Mandalay University	24	Mandalay University of Foreign Languages
5	Magway University	25	Mandalay Evening Classes
6	Taunggyi University	26	Hpa-an University
7	Myitkyina University	27	Lashio University
8	Sittwe University	28	Kalay University
9	Monywa University	29	Bamaw University
10	University of Distance	30	Panglong University
11	Dagon University	31	Maubin University
12	Pyay University	32	Myeik University
13	Meiktila University	33	Loikaw University
14	University of East Yangon	34	Kyaing Tong
15	Taungoo University	35	Bago University
16	Dawei University	36	Shwebo University
17	Yadanabon University	37	Sagaing University
18	Pakokku University	38	Degree Colleges
19	Kyaukse University	39	(Yenanyaung, Myingyan, Moehnyin,
20	University of West Yangon		Taung Goke, Mandalar, International
			Theravada)
		40	Buddhist Missionary University

Source: Myanmar Statistical Year Book, CSO (2015)

Regression Results and Discussion

For Model (1),

METPR^ = *47.226* + *0.928* (RP) + *0.121* (UP) – *0.002* (TNE) + *0.003* (TNG)

(0.000)*** (0.000)*** (0.015)** (0.008)*** (0.005)***

F(4,15) = 56.61 Prob > F = 0.0000 R^2 = 0.9379

From the Model (1) regression analysis, this is clear that there is a strong correlation between the dependent and independent variables. The value of R^2 shows that there is an around 93% variation in male employment to population ratio (METPR) due to all independent variables. The value of F is high with 0.0000 level of significance. It means that the variable used is fit for the model. It further explains that if there is a 1 million rise in rural population, METPR will be increased by *0.928*% at 1% level of significant. In addition, if there is a 1 million rise in urban population, METPR will be increased by 0.121% at 5% level of significant. However, if there is an increase in a thousand numbers of total enrollments in higher education, METPR will be decreased by *0.002*% at 1% level of significant. If there is an increase in a thousand numbers of total graduates in higher education, METPR will be increased by *0.003*% at 1% level of significant.

Note that *p* value is significant at 10% (*), at 5% (**), and at 1% (***). The variance inflation factors (VIF) test is also exercised to fit the model specification and eliminate the multicollinearity problem. Hypothesis testing has been done for each model and Breusch-Pagan/ Cook-Weisberg test for heteroskedasticity is also described to make sure the constant variance. All of the testing results for four models are shown in Appendix.

For Model (2),

FETPR^ = *34.104* + *1.195* (RP) + 0.*009* (UP) – *0.002* (TNE) + *0.003* (TNG)

(0.000)*** (0.000)*** (0.873) (0.027)** (0.019)**

F(4,15) = 34.01 Prob > F = 0.0000 R^2 = 0.9007

According to model (2) result, R^2 and the value of F are high with 0.0000 level of significance. If there is a 1 million increase in rural population, female employment to employment ratio (FETPR) will be increased by *1.195* % at 1% level of significant. But there is no significant effect of urban population on FETPR even they are positively related. In addition, if there is an increase in a thousand number of total enrollments in higher education, FETPR will be decreased by 0.002% at 5% level of significant. If there is an increase in a thousand numbers of total graduates in higher education, FETPR will be increased by 0.003% at 5% level of significant.

For Model (3),

MSE ^ = *0.341* + *5.671* (RP) – *7.923* (UP) + *0.011* (TNE) – *0 .019* (TNG)

(0.988) (0.000)*** (0.000)*** (0.002)*** (0.001)***

F(4, 15) = 772.34 Prob > F = 0.0000 R^2 = 0.9952

Similarly, R^2 and the value of F in model (3) are high with 0.0000 level of significance. If there is a 1 million increase in rural population, male self-employed (MSE) will be increased by *5.671* % at 1% level of significant. But if there is a 1 million increase in urban population, MSE

will be decreased by *7.923* % at 1% level of significant. If there is an increase in a thousand numbers of total enrollments in higher education, MSE will be increased by *0.011* % at 1% level of significant. If there is an increase in a thousand number of total graduates in higher education, MSE will be decreased by *0 .019* % at 1% level of significant.

For Model (4),

$$\text{FSE} \wedge = 49.967 + 3.758\ (\text{RP}) - 6.904\ (\text{UP}) + 0.011\ (\text{TNE}) - 0\ .019\ (\text{TNG})$$

(0.051)* (0.000)*** (0.000)*** (0.002)*** (0.001)***

$F(4, 15) = 614.68$ Prob > F = 0.0000 $R^2 = 0.9939$

Model (4) results show that R^2 and the value of F are high with 0.000 level of significance. It can be seen that the effects of higher education on female self-employed (FSE) in model (4) are nearly the same as shown in model (3). If there is a 1 million increase in rural population, FSE will be increased by *3.758* % at 1% level of significant. But if there is a 1 million increase in urban population, FSE will be decreased by *6.904* % at 1% level of significant.

Conclusion and Suggestions

This study only focuses on the effects of rural population, urban population, total number of enrollments and graduates in higher education on employment by gender in Myanmar from 1996 to 2015. There is a significant impact of rural population on four dependent variables in all models. Therefore whenever increase in rural population by one million leads to increase both male and female employments to population ratios by *0.928 % and 1.195 %* as well as increase in both male and female self-employed by *5.671% and 3.758%*, respectively. Except in model (2), an increase in rural population by one million leads to increase male employments to population ratios by *0.121* % and decrease in both male and female self-employed by *7.923 % and 6.904 %*, respectively. Whenever increase in a thousand numbers of total enrollments in higher education reduces both male and female employments to population ratios by *0.002%*. But there is a positively and significantly relationships between total number of enrollments and both male and female self-employed. Thus higher the number increases in total number of enrollments, greater the male self-employed and female self-employed by *0.011%*.

There is also positive and significant effect of total number of graduates in higher education on both male and female employments to population ratios in Myanmar. When a thousand number of graduates in higher education increases, male employment to population ratio and female employment to population ratio also increase by *0.003%*. However, total number of graduates in higher education is inversely related to both male and female self-employed in Myanmar. Therefore an increase in a thousand number of graduates in higher education leads to decrease male self-employed and female self-employed by *0 .019%*. This is because there is a gap between the total number of graduates *234,430* and total number of enrollments *730,060* (i.e., only *24*% is graduates on average per year from 1996 to 2015) and this can be concluded that total number of graduates in higher education is much less than that of enrollments in higher education. So the percentage share of graduates should be increased to the desire level.

Indeed, urban population represents only 30% of total population in Myanmar and it cannot well define on female employment to population ratio (See in model 2). The female labor force participating rate at 50.6% has already lagged behind that of males at (85.6%) and gender inequality index for Myanmar (0.413) is far from a value of 1 signifies extreme inequality. In

general, the good point in this study indicates that there is not too much high gender disparity with respect to employment to population ratio and self-employed in Myanmar. Nevertheless, creation of better workplaces and communities need to reduce the cultural barriers to women staying in the labor force after marriage and childbirth in some work places. In addition, strategic policy should encourage young women especially in both rural and urban areas to improve the better access to education and working opportunities because increasing the labor force participation of women lead to a higher economic growth and development. If women are university graduates and post-graduate qualifications, opportunities for women to obtain employment in line with their high qualifications must be ensured. Moreover, the smaller number of total graduates relative to the total number of enrollments in higher education should be considered by finding the ways and policy instruments for creating better education together with skilled labor force for both male and female.

Acknowledgements

Firstly, I would like to give my special thanks to Professor Dr. Tin Win, Rector, Yangon University of Economics, Professor Dr. Ni Lar Myint Htoo, Pro-Rector, Yangon University of Economics, Professor Dr. Phyu Phyu Ei, Head of Department of Applied Economics, and Professor Dr. Tin Tin Wai, Department of Applied Economics, Yangon University of Economics for their kind permission to submit this research paper to Myanmar Academy of Arts and Science (MAAS). I also thank and recognize the helps of Professor Dr. Cho Cho Thein, Head of Department of Economics, Yangon University of Economics; Dr. Myint San, Director of MARCED and office staff from Myanmar Japan Center (MJC), Yangon in the 8th International Conference on Development Alternatives. Finally, I would like to express my thanks to anyone who I should thank.

References

Cali, M., and Menon, C. (2009). *Does Urbanization Affect Rural Poverty? Evidence from Indian Districts.* Spatial Economics Research Centre (SERC), Discussion Paper No.14.

Kuznets, S. (1955). Economic Growth and Income Inequality. *American Economic Review*, 45(1):1–28.

Lucas, R.E. (2004). Life Earnings and Rural–Urban Migration. *Journal of Political Economy*, 112(1):S29-S59.

Myanmar Statistical Year Book (2000-2015). Central Statistical Organization, Ministry of Planning and Finance, Nay Pyi Taw, Myanmar.

Roubaud, F., and Torelli, C. (2013). *Employment, Unemployment, and Working Conditions in the Urban Labor Markets of Sub-Saharan Africa: Main Stylized Facts*. Retrieved from https://www.researchgate.net/publication/280638676

Sjaastad, L.A. (1962). The Costs and Returns of Human Migration. *Journal of Political Economy*, 70(5):80–93.

Spitz-Oener A. (2006). Technical Change, Job Tasks, and Rising Educational Demands: Looking Outside the Wage Structure. *Journal of Labor Economics*, 24(2):235-270.

Teal, F. (2010). Higher Education and Economic Development in Africa: a Review of Channels and Interactions. *Journal of African Economies*, Working Paper No.33.

Todaro, M.P., and Maruszko, L. (1987). Illegal Migration and US Immigration Reform: A Conceptual Framework. *Population and Development Review*, 13(1):101–114.

The Republic of the Union of Myanmar (2014). *Myanmar Population and Housing Census, Policy Brief on Education :The Union Report.*

The Republic of the Union of Myanmar (2014). *Myanmar Population and Housing Census, Policy Brief on Gender Dimensions.*

The Republic of the Union of Myanmar (2014). *Myanmar Population and Housing Census, Policy brief on Labor Force.*

The Republic of the Union of Myanmar (2014). *Myanmar Population and Housing Census, Policy brief on Migration and Urbanization.*

The Republic of the Union of Myanmar (2014). *Myanmar Population and Housing Census, Policy brief on Population Dynamics.*

UNDP (1996-2015). *Human Resource Development Reports*.

Appendix

For Male

```
. reg metpr rp up tne tng

      Source |       SS       df       MS              Number of obs =      20
-------------+------------------------------           F(  4,    15) =   56.61
       Model |  9.72522911     4  2.43130728            Prob > F      =  0.0000
    Residual |  .644280974    15  .042952065           R-squared     =  0.9379
-------------+------------------------------           Adj R-squared =  0.9213
       Total |  10.3695101    19  .545763689           Root MSE      =  .20725

------------------------------------------------------------------------------
      metpr |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         rp |   .9287048   .1521959     6.10   0.000     .6043069    1.253103
         up |   .1210606   .0442815     2.73   0.015     .0266769    .2154443
        tne |  -.001782    .000584    -3.05   0.008    -.0030268   -.0005372
        tng |   .0030508   .0009404     3.24   0.005     .0010463    .0050553
      _cons |   47.22684   4.657244    10.14   0.000     37.30016    57.15352
------------------------------------------------------------------------------

. estat vif

    Variable |       VIF       1/VIF
-------------+----------------------
         tne |      5.76    0.173662
          rp |      3.97    0.251702
         tng |      3.97    0.251806
          up |      3.57    0.279916
-------------+----------------------
    Mean VIF |      4.32

. test rp= up= tne= tng=0

 ( 1)  rp - up = 0
 ( 2)  rp - tne = 0
 ( 3)  rp - tng = 0
 ( 4)  rp = 0

       F(  4,    15) =   56.61
            Prob > F =    0.0000

. estat hettest

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of metpr

         chi2(1)      =     0.42
         Prob > chi2  =   0.5165
```

For Female

```
. reg fetpr rp up tne tng

      Source |       SS       df       MS              Number of obs =      20
-------------+------------------------------           F(  4,    15) =   34.01
       Model |  8.75974442     4  2.18993611            Prob > F      =  0.0000
    Residual |  .965747018    15  .064383135           R-squared     =  0.9007
-------------+------------------------------           Adj R-squared =  0.8742
       Total |  9.72549144    19  .511867971           Root MSE      =  .25374

------------------------------------------------------------------------------
      fetpr |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         rp |   1.195002   .1863361     6.41   0.000     .7978356    1.592168
         up |   .0088092   .0542146     0.16   0.873    -.1067464    .1243649
        tne |  -.0017483    .000715    -2.45   0.027    -.0032723   -.0002243
        tng |   .0030312   .0011514     2.63   0.019     .0005771    .0054854
      _cons |   34.10381   5.701945     5.98   0.000      21.9504    46.25722
------------------------------------------------------------------------------

. estat vif

    Variable |       VIF       1/VIF
-------------+----------------------
         tne |      5.76    0.173662
          rp |      3.97    0.251702
         tng |      3.97    0.251806
          up |      3.57    0.279916
-------------+----------------------
    Mean VIF |      4.32

. test rp= tne= tng=0

 ( 1)  rp - tne = 0
 ( 2)  rp - tng = 0
 ( 3)  rp = 0

       F(  3,    15) =   14.43
            Prob > F =    0.0001

. estat hettest

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of fetpr

         chi2(1)      =     1.26
         Prob > chi2  =   0.2611
```

For Male

```
. reg mse rp up tne tng

      Source |       SS       df       MS              Number of obs =      20
-------------+------------------------------           F(  4,    15) =  772.34
       Model |  3302.63425     4  825.658563            Prob > F      =  0.0000
    Residual |  16.0354854    15  1.06903236            R-squared     =  0.9952
-------------+------------------------------           Adj R-squared =  0.9939
       Total |  3318.66974    19  174.666828            Root MSE      =  1.0339

------------------------------------------------------------------------------
         mse |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          rp |    5.670829   .7592877     7.47   0.000     4.052445    7.289212
          up |   -7.923665   .2209151   -35.87   0.000    -8.394534   -7.452795
         tne |    .0109567   .0029135     3.76   0.002     .0047467    .0171667
         tng |   -.0187856   .0046917    -4.00   0.001    -.0287858   -.0087853
       _cons |    .3406394   23.23445     0.01   0.988    -49.18242    49.8637
------------------------------------------------------------------------------

. estat vif

    Variable |       VIF       1/VIF
-------------+----------------------
         tne |      5.76    0.173662
          rp |      3.97    0.251702
         tng |      3.97    0.251806
          up |      3.57    0.279916
-------------+----------------------
    Mean VIF |      4.32

. test rp= up= tne= tng=0

 ( 1)  rp - up = 0
 ( 2)  rp - tne = 0
 ( 3)  rp - tng = 0
 ( 4)  rp = 0

       F(  4,    15) =  772.34
            Prob > F =    0.0000

. estat hettest

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of mse

         chi2(1)      =     0.55
         Prob > chi2  =   0.4583
```

For Female

```
. reg fse rp up tne tng

      Source |       SS       df       MS              Number of obs =      20
-------------+------------------------------           F(  4,    15) =  614.68
       Model |  2694.24846     4  673.562115            Prob > F      =  0.0000
    Residual |  16.4369034    15  1.09579356            R-squared     =  0.9939
-------------+------------------------------           Adj R-squared =  0.9923
       Total |  2710.68536    19  142.667651            Root MSE      =  1.0468

------------------------------------------------------------------------------
         fse |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          rp |    3.757674   .7687326     4.89   0.000     2.119159    5.396188
          up |   -6.904196   .2236631   -30.87   0.000    -7.380923    -6.42747
         tne |    .0112905   .0029498     3.83   0.002     .0050033    .0175778
         tng |   -.0185414   .0047501    -3.90   0.001    -.028666   -.0084167
       _cons |    49.96688   23.52347     2.12   0.051    -.1722029    100.106
------------------------------------------------------------------------------

. estat vif

    Variable |       VIF       1/VIF
-------------+----------------------
         tne |      5.76    0.173662
          rp |      3.97    0.251702
         tng |      3.97    0.251806
          up |      3.57    0.279916
-------------+----------------------
    Mean VIF |      4.32

. test rp= up= tne= tng=0

 ( 1)  rp - up = 0
 ( 2)  rp - tne = 0
 ( 3)  rp - tng = 0
 ( 4)  rp = 0

       F(  4,    15) =  614.68
            Prob > F =    0.0000

. estat hettest

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of fse

         chi2(1)      =     0.13
         Prob > chi2  =   0.7194
```