

Higher education reform and female labour force participation in Malaysia

Beatrice Lim (Universiti Malaysia Sabah)

Martin O'Brien, Peter Siminski, Celeste Rossetto

(University of Wollongong)

Introduction

- In 1996, Malaysia implemented a huge higher education reform with the introduction of the Private Higher Education Institutions Act of 1996.
- Driven by the ever-growing demand for public higher education in Malaysia that exerts pressure on the public institutions that operate within the constraints of limited allocations from the Government (Morshidi 2006).
- This reform provides an opportunity to estimate the causal effect of higher education reform on female labour force participation (FLFP).

- Education is predicted to have a positive impact on FLFP.
- The results cannot be interpreted as causal because education and labour force participation decisions can be jointly determined.
- Students who are more talented and have higher career aspirations usually seek more education.
- This selection creates biases in the OLS estimates of the effect of education.
- Omitted variables that are correlated to both education and FLFP may cause further biases in the estimates.
- One potential omitted factor is the number of education providers or institutions. The availability of more institutions increases the opportunities for students to pursue higher education.

Aim of Study

- 1. To what extent does the 1996 higher education reform affect the educational attainment of individuals?
- 2. What is the impact of the 1996 higher education reform on FLFP in Malaysia?
- 3. Using the higher education reform as an instrument, what is the causal effect of higher education on FLFP in Malaysia?

Literature review

- In theory, female education can increase the productivity of women both at home (Becker 1975) and at work (Schultz 1961).
- Education has a positive effect on FLFP (see for example Contreras, Puentes & Bravo 2005; Ntuli & Wittenberg 2013; Olowa & Adeoti 2014).
- In general, women with greater ability and a stronger preference for work are more likely to have higher education.
- Therefore, education and FLFP decisions could be jointly determined.
- Instrumenting the exogenous change in education can help eliminate the bias in estimation and thus provide a more accurate view of the impact of education on FLFP.

Literature review

- Recently, several studies examined the impact of higher education reform on various labour market outcomes with quasi-experimental identification strategies (Boccanfuso et al. 2015; Li & Xing 2010; Li, Whalley & Xing 2014).
- These studies scrutinise the impact of education on the employment and unemployment of university graduates.
- Due to data limitations, these studies examined the impact of education on labour market outcomes only in the short-term

Li & Xing, 2010

- In 1999, China's higher education experienced a major expansion (Li & Xing 2010). Following the expansion, individuals taking college exams before and after the expansion policy had different probabilities of being admitted to college. The expansion increased the probability of going to college tremendously.
- In the short term, labour force participation for individuals who had taken exams after the education expansion were found to be lower than for earlier cohorts. However, this could likely be due to both policy and age effects.
- There was a large share of individuals who were unemployed immediately after graduation which could be due to an excess supply of college graduates. However, these effects are regarded as short-term.

Boccanfuso et al, 2015

- A more recent study in Senegal exploited a variation in education - a large-scale education reform at the tertiary level in 2001 - to identify short-term effects of education on labour market outcomes of highly skilled workers (Boccanfuso, Larouche & Trandafir 2015).
- In a sample of highly skilled workers - male and female combined - the study found that improvements in the quality of higher education increased the employment rate of cohorts affected by the reform by 12 percentage points in the short term.
- Younger workers are better able to find jobs in the services sector and the public sector.

A natural experiment

- The 1996 higher education reform is exogenous to the educational attainment of individuals and the labour force participation decision of any individual.
- It can be treated as a natural experiment to evaluate the impact of the reform on both educational attainment and FLFP.

Institutional background

- In the mid-1990s, the Government enacted several education-related acts which spurred the reform of higher education in Malaysia including The Private Higher Educational Institutions Act 1996 (amended 2009).
- Laid the foundation to expand access to education, control public expenditure and regulate the quality of higher education in order to transform Malaysia into a regional hub for higher education (Morshidi 2006; Sivalingam 2006).
- After the East Asian financial crisis in 1997, the sharp devaluation of the Malaysian Ringgit increased the cost of foreign education. This accelerated the growth of the domestic education sector.

- After the 1997 crisis, Malaysia was losing its comparative advantage in the production of labour-intensive goods and instead started to focus on producing more technology-intensive goods.
- The expansion of the higher education sector became crucial in the creation of a knowledge economy to support the production of these technology-intensive goods (Sivalingam 2006).

Source of data

- The 2000 and 2010 Population and Housing Census Surveys of Malaysia administered by the Department of Statistics Malaysia, 2% sample.
- Females between 25 and 39 years.
- No data on wages or income.

The experimental design

Figure 1: Age by census year and status of treatment

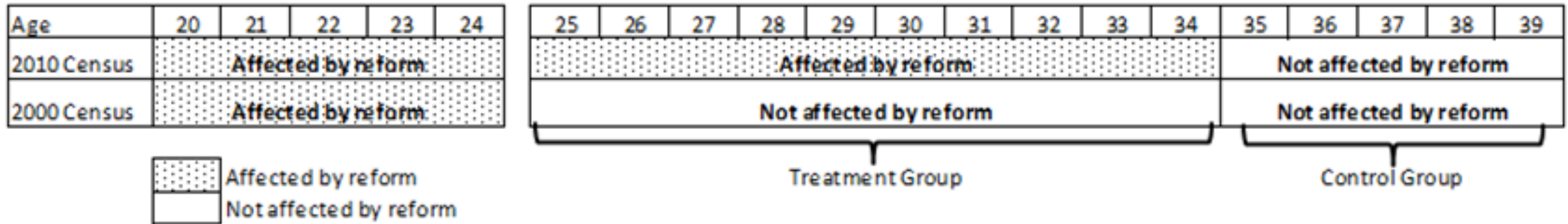


Table 1: Summary statistics of sample

	2000 Census (without reform)		2010 Census (with reform)	
	Treatment group	Control group	Treatment group	Control group
Age group	25-34	35-39	25-34	35-39
Age	29.36 (2.862)	36.94 (1.423)	29.17 (2.846)	36.95 (1.442)
Married	0.778 (0.416)	0.891 (0.311)	0.693 (0.461)	0.864 (0.343)
Urban	0.717 (0.450)	0.700 (0.458)	0.768 (0.422)	0.737 (0.440)
Rural	0.283 (0.450)	0.300 (0.458)	0.232 (0.422)	0.263 (0.440)
Developed	0.592 (0.491)	0.587 (0.492)	0.633 (0.482)	0.594 (0.491)
Less Developed	0.408 (0.491)	0.413 (0.492)	0.367 (0.482)	0.406 (0.491)
Malay Bumiputera	0.486 (0.500)	0.483 (0.500)	0.530 (0.499)	0.512 (0.500)
Other Bumiputera	0.108 (0.310)	0.097 (0.296)	0.109 (0.311)	0.117 (0.321)
Chinese	0.237 (0.425)	0.265 (0.442)	0.210 (0.405)	0.223 (0.416)
Indian	0.072 (0.259)	0.084 (0.277)	0.075 (0.263)	0.071 (0.257)
Others	0.097 (0.295)	0.072 (0.258)	0.080 (0.272)	0.077 (0.267)
Tertiary education	0.124 (0.329)	0.079 (0.270)	0.243 (0.429)	0.162 (0.368)
FLFP	0.522 (0.500)	0.444 (0.497)	0.641 (0.480)	0.519 (0.500)
Number of observations	33,073	15,652	34,560	14,691

Note: Standard deviations are in parentheses.

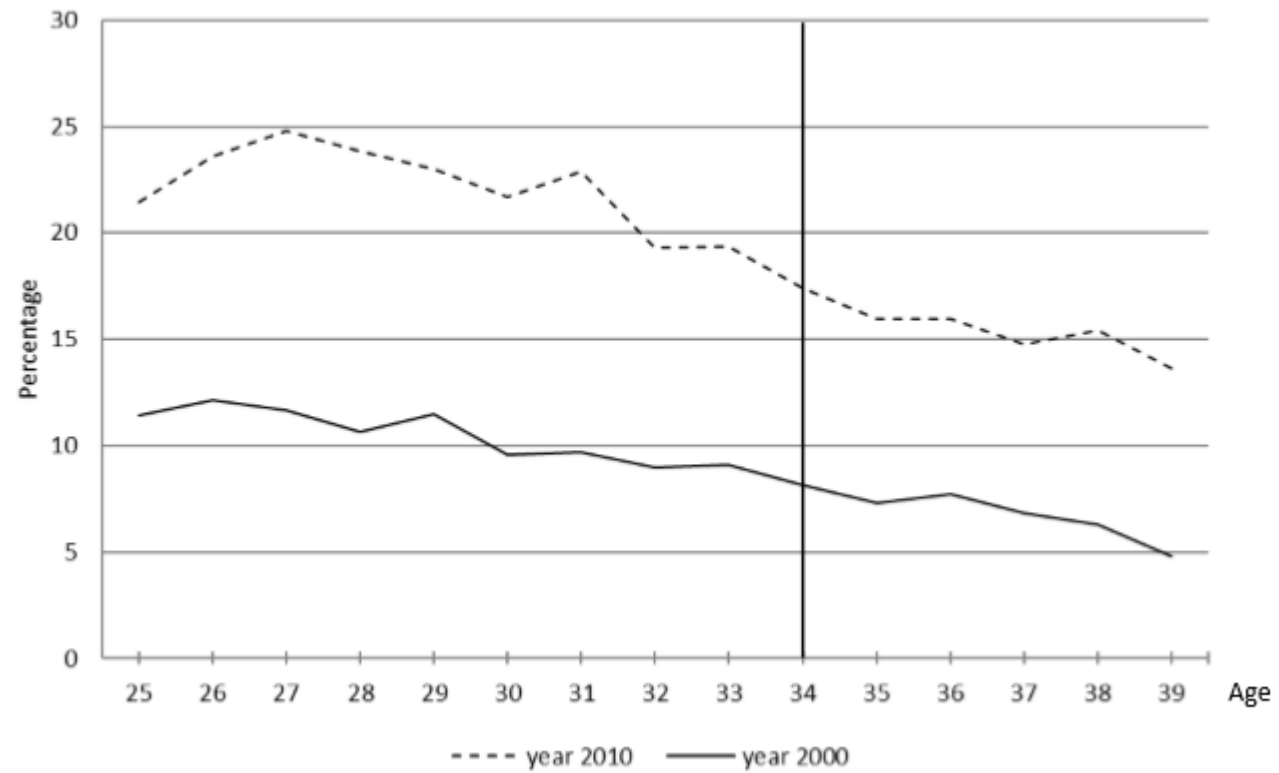
Empirical strategy

- Differences-in-differences (DID)

To evaluate the effect of the 1996 education reform on educational attainment and female labour force participation.

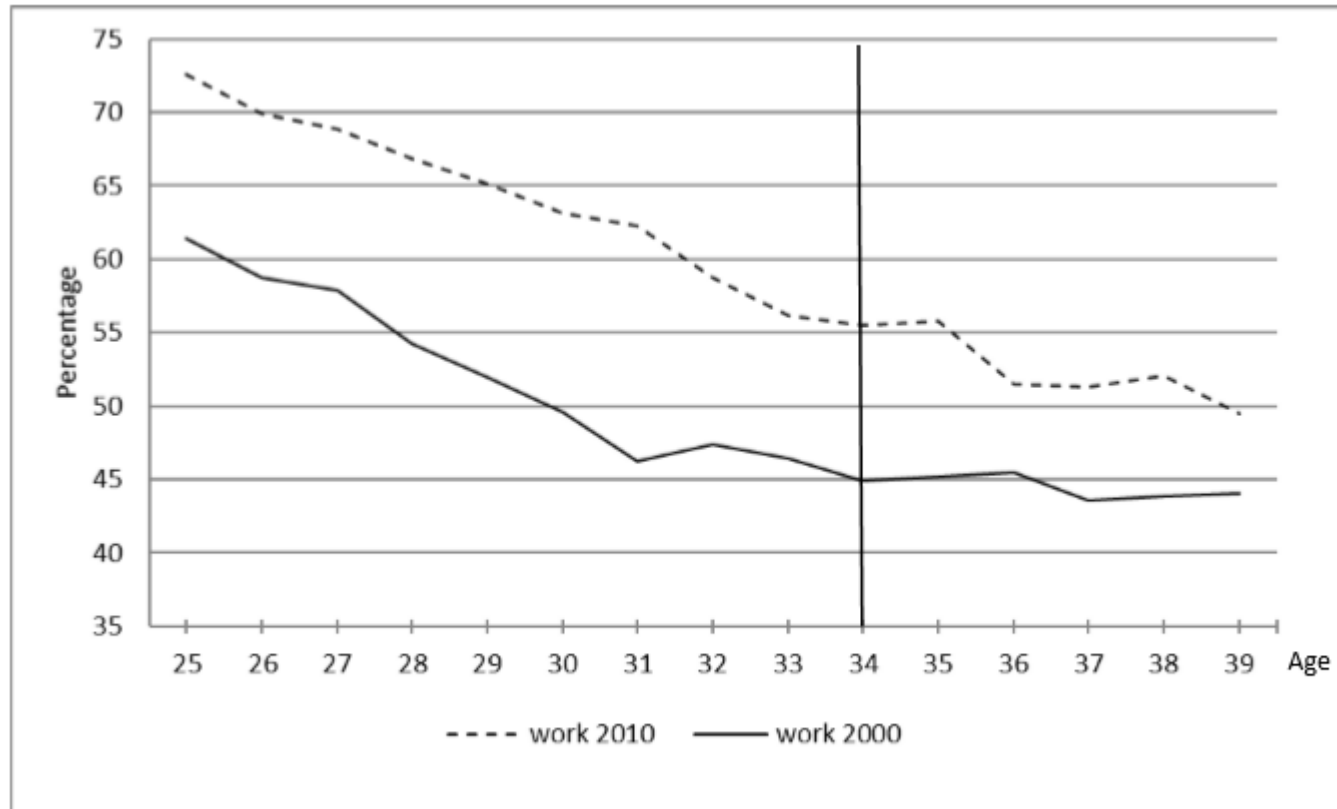
Compare the difference in mean outcomes before and after the reform for groups affected by the reform (the treatment group) to groups not affected by the reform (the control group).

Figure 2: Tertiary education by age, 2000 and 2010.



Source: Population and Housing Census of Malaysia, 2000 and 2010.

Figure 3: Female labour force participation by age, 2000 and 2010.



Source: Population and Housing Census of Malaysia, 2000 and 2010.

- The variation in the treatment impact of the 1996 education reform on the outcome of interest can be estimated as follows:

$$Y_{1ip} = \rho_0 + \rho_1 Treated25_34_i + \rho_2 Year2010 + \rho_3 (Treated25_34_i * Year2010) + \delta_1 M_{1ip} + \eta_{1ip} \quad (6.1)$$

where Y_{1ip} is the binary outcome (tertiary education and female labour force participation) for individual i and p denotes period (binary for years prior to 1996, before the higher education reform, or 1996 and later, after the reform).

$Treated25_34_i$ is a dummy variable for individuals aged 25 to 34. For the 2010 observations $Treated25_34_i=1$ were affected by the education reform. This is the treatment group.

The dummy variable $Year2010$ is a binary variable which equals 1 for observations from the 2010 sample (period 1) or equals 0 for observations from the 2000 sample (period 0).

The dummy variable $Year2010$ switches on for observations obtained in the year 2010.

The variable $Treated25_34_i * Year2010$ is the differential effect for the treated group affected by the reform.

- The coefficient ρ_3 captures the effect of the higher education reform on the outcome of interest examined in the equation.
- The age difference and time difference are captured by coefficients ρ_1 and ρ_2 , respectively whilst ρ_0 is the constant.
- The term M_{1i} is a vector of socio-economic characteristics including marital status, living strata, state of residence and ethnicity; η_{1ip} is the error term.
- The reform is not targeted to any specific demographic group. However, controlling for socio-economic characteristics of individuals can improve the explanatory power of the estimation.

Table 2: The effect of the 1996 higher education reform on tertiary education and female labour force participation.

	Dependent variable=Tertiary education (Yes=1 / No=0)		Dependent variable=Female labour force participation (Yes=1 / No=0)	
	(1)	(2)	(3)	(4)
	No controls	With controls	No controls	With controls
Treat25_34*Year2010	0.0371*** (0.0047)	0.0273*** (0.0047)	0.0445*** (0.0069)	0.0185** (0.0065)
Treat25_34	0.0444*** (0.0028)	-0.0083 (0.0053)	0.0771*** (0.0048)	-0.0103 (0.0079)
Year2010	0.0821*** (0.0037)	0.0763*** (0.0037)	0.0747*** (0.0057)	0.0616*** (0.0055)

Notes: The total number of observations is 97,976. Sample is females aged 25 to 39 years old. The treatment group consists of females aged 25 to 34 years. The control group consists of females aged 35 to 39 years. Robust standard errors are in parentheses. Statistically significantly different from zero at the *0.1 level, **0.05 level and ***0.01 level.

Falsification test

- The sample selected for the placebo test is females aged between 40 and 49 years from both the 2000 and 2010 censuses.
- The treated group is women aged 40 to 44 while the control group consists of women aged 45 to 49 years.
- In the year of the higher education reform (1996), individuals who were 40 in 2000 and 2010 were 36 and 26, respectively.
- It therefore is assumed that these individuals in both censuses were not affected by the reform since they should have completed their tertiary education by 1996.

Table 3: The effect of a placebo reform on tertiary education and female labour force participation.

	Dependent variable=Tertiary educational attainment (Yes=1 / No=0)		Dependent variable=Female labour force participation (Yes=1 / No=0)	
	(1) No controls	(2) With controls	(3) No controls	(4) With controls
Treated40_44*Year2010	0.0065 (0.0046)	0.0052 (0.0046)	0.0177** (0.0088)	0.0128 (0.0086)
Treated40_44	0.0198*** (0.0028)	0.0065 (0.0050)	0.0425*** (0.0063)	-0.0244** (0.0097)
Year2010	0.0461*** (0.0032)	0.0436*** (0.0031)	0.0428*** (0.0064)	0.0389*** (0.0063)

Notes: The total number of observations is 50,333. Sample is females aged 40 to 49 years old. The treatment group consists of females aged 40 to 44 years. The control group consists of females aged 45 to 49 years. Robust standard errors are in parentheses. Statistically significantly different from zero at the *0.1 level, **0.05 level and ***0.01 level.

Alternative treatment groups

- The results is further examined using different definitions of age cohorts, where the age of the treated group varied from 25 to 30 to 36 years.
- The effects of the 1996 higher education reform on tertiary education decreases with the size of the treated group indicating that there is an increasing degree of contamination between the treated and the control groups.
- A wider age group includes both individuals affected by the reform as well as older individuals who might have completed their education before the reform.
- The preferred treatment group is shown in Panel A.

Table 4: The effect of the 1996 higher education reform on tertiary education and female labour force participation using alternative treatment groups.

	Dependent variable=Tertiary education (Yes=1 / No=0)		Dependent variable=Female labour force participation (Yes=1 / No=0)	
	(1) No controls	(2) With controls	(3) No controls	(4) With controls
A. Treatment group				
25 to 34 years	0.0371*** (0.0047)	0.0273*** (0.0047)	0.0445*** (0.0069)	0.0185*** (0.0065)
B. Alternative treatment group				
25 to 36 years	0.0300*** (0.0054)	0.2100*** (0.0054)	0.0457*** (0.0083)	0.0245*** (0.0079)
25 to 35 years	0.0331*** (0.0050)	0.0233*** (0.0050)	0.0522*** (0.0074)	0.0272*** (0.0071)
25 to 33 years	0.0392*** (0.0046)	0.0303*** (0.0046)	0.0395*** (0.0065)	0.0155** (0.0062)
25 to 32 years	0.0391*** (0.0046)	0.0298*** (0.0045)	0.0395*** (0.0063)	0.0152** (0.006)
25 to 31 years	0.0367*** (0.0047)	0.0271*** (0.0046)	0.0361*** (0.0063)	0.0120** (0.0059)
25 to 30 years	0.0301*** (0.0048)	0.0212*** (0.0047)	0.0232*** (0.0063)	0.0021 (0.0059)

Notes: Robust standard errors are in parentheses. Statistically significantly different from zero at the *0.1 level, **0.05 level and ***0.01 level. Sample is women aged 25 to 39 years old. In the alternative treatment group models, the remaining women from this sample formed the control group.

Two-stage least squares (2SLS) estimates

- The source of exogenous variation in female educational attainment is the 1996 higher education reform.
- The identification strategy rests on the assumption that the reform affects FLFP only through educational attainment.
- A 2SLS model can be used to examine the causal effect of tertiary education on FLFP.
- The empirical model is estimated using the following equations:

$$FLFP_i = \beta_0 + \beta_1 EDUHIGH_i + \beta_2 Treat25_34_i + \beta_3 Year2010_i + \beta_2 X_i + \varepsilon_i$$

(6.2)

Table 5: The effect of higher education on female labour force participation, OLS and 2SLS estimates.

	Dependent variable: Female labour force participation	
	(1) OLS	(2) 2SLS
Tertiary education	0.2927*** (0.0036)	0.6763*** (0.2379)
Number of observations	97,976	97,976
F-statistic of excluded instrument	-	34.17

Notes: Robust standard errors are in parentheses. Statistically significantly different from zero at the *0.1 level, **0.05 level and ***0.01 level. Covariates in the models are treatment group dummy, treatment year dummy, age, age-squared, marital status, urban, developed, Malay, Other Bumiputera, Chinese and Indian.

Limitation

- The 2SLS estimates could be larger than the OLS estimates because the 2SLS is estimating the local average treatment effect.
- On the other hand, the OLS is estimating the average treatment effect over the entire population.
- It is possible that the instrument shifts the behaviour of a subgroup of individuals whose female labour force participation status is larger than average.
- This results in the 2SLS estimates being larger than the OLS estimates due to the heterogeneity in the population studied.
- There is a possibility that the effect of the education reform is confounded by cohort effects as the treatment and control group is defined based on an individual's birth.

Future study

- One possible solution to this issue is to examine the difference in program exposure by region or the intensity of the program similar to Duflo (2001) and Osili and Long (2008).
- In Indonesia, the school construction program varied by region of birth and date of birth (Duflo 2001). The variation in program intensity is due to the allocation of more schools to regions where initial enrolment was low. The results indicate that the average educational attainment has increased over time as a result of the policy reform, especially in regions that received more schools (Duflo 2001, p. 798).

Future study

- Osili and Long (2008, p. 60) examine the variation in a primary school reform in Nigeria on years of schooling. The intensity of the program varied according to the levels of federal capital funds received.
- Similar to Duflo (2001) high-intensity states are states that had relatively lower primary school enrolment rates prior to the reform.
- The results indicate that the reform results in a significant increase in years of schooling for individuals in high-intensity states and affected by the reform (Osili and Long 2008, p. 67).
- Both studies captured the variation in program intensity according to the level of education resources allocated to regions or states with lower educational attainment prior to the reform.

- Assuming that there is plausibly exogenous variation in program intensity across states in the case of this present study, the impacts on the treatment and control groups as a result of the reform can be identified.
- However, there is limited data on program intensity such as fund disbursement and resource allocation among private higher education providers in Malaysia.
- When such data is available in the future, it may be worthwhile to examine the impact of the higher education reform using the approach similar to Duflo (2001) and Osili and Long (2008).

- In the second part of the analysis, the OLS results indicate that there is a positive effect of education on FLFP as evidenced in the literature (Contreras, Puentes & Bravo 2005; Evans & Kelley 2008; Ntuli & Wittenberg 2013; Olowa & Adeoti 2014; Vlasblom & Schippers 2004).
- The 2SLS estimates show that higher education would increase the probability of FLFP by 67.6 percentage points.

Conclusion

- The 1996 higher education reform initiated by the Malaysian Government aimed to meet the needs and demands of the domestic market.
- While the reform was not targeted to a specific population group, female students have clearly benefitted from the reform as evidenced by their increased enrolment in higher education institutions, surpassing their male counterparts.
- The findings in this present study imply that Malaysian women with higher educational attainment have a greater probability of working.