Routledge
Taylor & Francis Group

Economic Research-Ekonomska Istraživanja

ISSN: 1331-677X (Print) 1848-9664 (Online) Journal homepage: https://www.tandfonline.com/loi/rero20

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To cite this article: Zheng-Zheng Li, Chi-Wei Su, Ran Tao & Lin-Na Hao (2019) Enhance or depress? The effect of trade on active females in the labour market, Economic Research-Ekonomska Istraživanja, 32:1, 2680-2698, DOI: 10.1080/1331677X.2019.1653785

To link to this article: https://doi.org/10.1080/1331677X.2019.1653785

Published online: 27 Aug 2019.

ECONOMIC RESEARCH-EKONOMSKA ISTRAŽIVANJA
2019, VOL. 32, NO. 1, 2680–2698
https://doi.org/10.1080/1331677X.2019.1653785

Enhance or depress? The effect of trade on active females in the labour market

Zheng-Zheng Li[a], Chi-Wei Su[b], Ran Tao[c] and Lin-Na Hao[d]

[a]Department of Finance, Ocean University of China, Shandong, China; [b]School of Economics, Qingdao University, Shandong, China; [c]Qingdao Municipal Centre for Disease Control & Prevention, Shandong, China; [d]School of Business, Liaocheng University, Liaocheng, China

ABSTRACT

The objective of this study is to provide evidence for the existence of threshold effects in trade openness, which affects the female labour force participation rate (FLFPR) in Asian countries. The authors employ the proportion of export, import and total trade volume to gross domestic product to denote export and import dependency and trade openness, respectively. The panel threshold regression results indicate that there exists an optimal value in the correlation between trade openness and FLFPR below which an increase in trade openness will enhance the FLFPR; an adverse relationship exists when trade openness exceeds the threshold value. This relationship is attributed to the trade-off between the cost reduction effect and the technology channel. Furthermore, the authors further categorise trade openness into export and import dependency. The findings reveal that export dependency also has a single threshold effect on FLFPR, while import dependency exerts a negative effect on FLFPR regardless of threshold effect. Therefore, the government could promote female participation in the labour force by regulating the export policy.

ARTICLE HISTORY
Received 16 December 2018
Accepted 25 July 2019

KEYWORDS
Trade openness; female labour force participation rate; exports dependency; imports dependency; panel threshold model

JEL CLASSIFICATIONS
C23; F16; J16

1. Introduction

The female labour force participation rate (FLFPR) can promote a nation's potential output and economic development, as it increases labour supply and, consequently, the country's production capability (Cooray, Dutta, & Mallick, 2017). Increasing trade openness may expand the traded-goods sector, including tourism, financial services and information technology. New employment opportunities will thereby be generated, especially for female participation in the labour market. However, due to women's low education level, coupled with trade openness will intensify competition, which is not conducive to female labor force. Generally, it is recognised that globalisation creates winners and losers in the process of creating trade openness due to

CONTACT Chi-Wei Su cwsu7137@gmail.com

the reallocation of resources. Compared with males, females are more vulnerable to competition due to gender inequalities in wage gap and job seeking (Fofana, Cockburn, & Decaluwe, 2005). Many Asian countries share considerable similarities in social cultural values. Conventional gender norms in these countries afford a husband more conjugal power and, therefore, career priority. Additionally, labour may be less organised and have less legal protection in these places compared with developed countries, and state intervention may be inadequate owing to the pressure of changing economic conditions (Cooke, 2010). Thus, we concentrate on the effect of trade openness on FLFPR to verify the interaction between these two variables in the developing countries of Asia.

Asia has experienced a remarkable and sustained economic growth. Trejos and Barboza (2015) point out that international trade is a driver of this quick economic growth. Rapid trade expansion has been the hallmark of Asia's rise in the global economy (Athukorala, 2012). With the acceleration of globalisation, developing countries in Asia have implemented a series of trade reforms in order to reduce trade barriers and costs. China, Indonesia, Korea, Malaysia, the Philippines and Thailand have been in the process of trade liberalisation since the mid-1980s. India and Vietnam introduced trade reforms in the early 1990s. With the support of multilateral liberalisation from the General Agreement on Trade and Tariffs (GATT) and the World Trade Organisation (WTO), trade liberalisation has been regarded as unilateral and non-discriminatory (Athukorala, 2012). These countries account for more than 50% of the global population and 25% of the world's traded goods. Trade volume in Asia has been rising quickly since the early 1970s, reaching 0.8 trillion dollars in 1980 and increasing to 14 trillion dollars in 2011. Specifically, the volume of exports from Asia has grown faster than the volume of imports (Nasreen & Anwar, 2014). Asia accounts for over a third of the world's total exports over this period. Given the substantial increase in multilateral trade volume, we intend to identify a sizeable impact of trade on labour markets.

Empirical studies suggest that the increase in international trade affects domestic labour markets and labour force participation, especially for women (Jonsson & Subramanian, 2001). However, the literature is mixed about the effect from trade on FLFPR. Most studies recognise a significant increase in FLFPR, which corresponds to the period of trade liberalisation in most developing and emerging countries (Crozet & Orefice, 2017; Fofana et al., 2005). Gaddis and Pieters (2012) comprehensively demonstrate that countries with a greater degree of trade liberalisation significantly promote FLFPR and employment. Moreover, they point out that employment flows across sectors (from agriculture and manufacturing to trade and other service industries), male unemployment and labour market insecurity contribute to the number of active women in the economy. Furthermore, Ouedraogo and Marlet (2018) innovatively elaborate that foreign direct investment (FDI) inflows improve FLFPR by affecting primarily women's health and education.

Contrary to positive opinions, much research suggests that trade openness leads to a decline in the FLFPR. Standing (1999) argues that trade liberalisation may reduce the bargaining power of female labourers, resulting in a pessimistic relationship. Yahmed (2010) further supports that idea, suggesting that import penetration

increases competition and profit margins and thus increases discriminatory behaviour. Seguino (2015) purports that both imports and exports have a negative effect on women's employment. Gaddis and Pieters (2017) find that trade liberalisation reduces FLFPR and tradable sector employment rates, particularly for low-skilled workers.

Furthermore, Nordas (2003) suggests that trade liberalisation has created jobs for women in the Philippines and Sri Lanka. He also finds that a higher proportion of women are employed in the export industry rather than competing import industries. Nowbutsing and Ancharaz (2011), furthermore, prove a strong positive nexus between female employment and export-oriented industries along with a negative link in import-competing industries. Cooray, Gaddis, and Wacker (2012) elaborate a study on the effects of globalisation on female economic activity in developing countries and find a negative effect of trade, especially exports, on female labour participation. Anyanwu (2016) finds that trade openness promotes gender equality, supporting the idea that globalisation could increase female employment in export sectors.

In the context of Asia, Korinek (2005) finds that trade creates jobs for women from middle-income developing countries. However, Chandra, Lontoh, and Margawati (2010) stress that women are often the major victims of economic openness. Poor women, in particular, remain vulnerable to economic policy changes that occur in the region. Fontana (2009) explains trade and female participation from the perspective of industries and suggests that trade liberalisation has led to feminisation in the manufacturing sector, especially for Asian economies. The greater the share of garments, textiles and electronics in export sectors, the greater the employment-creating impact of trade has been for women. This finding is confirmed by Verick (2018); he proposes that female workers' transition from agriculture to manufacturing is due to the improvement of export-oriented manufacturing in East and Southeast Asia. For different stages, Hyder and Behrman (2012) indicate that trade liberalisation raises female employment in the early phases of export-driven growth in East Asian and Southeast Asian economies; however, the process can be reversed in the later phases. This reversal can be explained by defeminisation, which specifies that export production is restructured and becomes technologically more sophisticated (Banerjee & Veeramani, 2015). Considering the heterogeneity of rural and urban areas, Schaner and Das (2016) find that younger women in urban areas have increased labour force participation in Indonesia largely through wage employment, while younger women in rural areas have reduced labour force participation largely by opting out of informal, unpaid employment.

Previous studies have not been able to present a consistent result regarding this issue. Additionally, several obvious drawbacks exist in the current literature. Specifically, most studies do not distinguish the different effects from exports and imports on FLFPR (Gaddis & Pieters, 2012; Sauré & Zoabi, 2009, 2014). This is important because these two variables contribute different shares of the total trade. In general, little research concentrates on the interaction between trade and FLFPR in emerging Asian countries. Furthermore, no matter if the relationship is positive or negative, the existing studies assume that the link is linear. This assumption ignores the time-varying character and external structural breaks in time series and may not be rigorous (Gaddis & Pieters, 2012; Wamboye & Seguino, 2015). It is reasonable to

investigate whether there is an optimal level of trade openness to capture the non-linearity characteristic as the previous results were ambiguous. Hence, depending on the panel threshold regression model, we can drive a more accurate conclusion and fill the gap in this field.

This study focuses on estimating the optimal level of trade openness in terms of affecting the FLFPR. The significance of our study lies in the following points. First, we distinguish the different contributions of exports, imports and total trade volume to FLFPR so that targeted policies can be applied to promote active women in the labour market. Furthermore, some previous literature argued that the relationship is either positive or negative; however, the link among these variables may be influenced by external factors and an endogeneity problem (Bloom, Canning, Fink, & Finlay, 2009; Gaddis & Pieters, 2012; Madanizadeh & Pilvar, 2017; Tam, 2011)). This paper expands the understanding of the nexus between trade openness and FLFPR based on the enormous development of trade and finds a non-linear correlation. Finally, we confirm that there is an optimal value in the correlation between trade openness and FLFPR by using the panel threshold regression method (Hansen, 1999). Specifically, when trade openness is below the threshold level, an increase in trade openness promotes FLFPR; when trade openness exceeds the threshold value, the opposite effect occurs. Furthermore, export dependency also has a single threshold effect on FLFPR partly in accordance with Becker's discrimination model (Becker, 1957). This means exports encourage female labourers up to a certain point. Therefore, proper export trade encourages FLFPR.

The remainder of this study is organised as follows. Section 2 presents a theoretical and empirical literature review and highlights the theoretical basis of the discrimination model. Section 3 explains the methodology of the panel threshold regression model. Data source is introduced in Section 4. Section 5 provides empirical findings and discussions. Section 6 summarises the conclusion.

2. Theory development

Trade openness may have an effect on the female labour market through a variety of channels. Theoretically, the Heckscher–Ohlin (H-O) model (1991) focuses on the effect of trade liberalisation on labour markets via relative factor prices between developing countries and developed countries. Galor and Weil (1996) illustrate that male and female labour may be an imperfect substitute in the production process, verifying the gender implications due to the sectorial reallocation of production and resources. Sauré and Zoabi (2009) distinguish women's relative advantage sector as brain-intensive and men's relative advantage sector as physical-intensive based on the intrinsic differences in labour endowments. Under these assumptions, male workers migrate to the expanding sector due to the expansion of trade, inducing the aggregate FLFPR to drop. Basically, these authors believe the countries' initial factor endowments and the properties of the production functions induce the effects of trade openness on male and female labour market outcomes.

Becker (1957) proposes the competition and discrimination model, that is, competition forces discriminatory firms from the market. According to discrimination

theory (Becker, 1957), trade openness increases competition in the local market and reduces the incentive of sectors to discriminate against women. Arrow (1973) further states that the share of the female workforce will vary across firms, with more discriminatory firms employing a lower proportion of women and vice versa. In addition, the more discriminatory firms will be less profitable than other firms since they have higher marginal costs of production. Therefore, in a competitive environment, capital flows to the more profitable or less discriminatory firms and the more discriminatory firms are forced to exit the market in the long run. Thus, this theory argues that competition reduces discrimination by a mechanism where only the most profitable (least discriminatory) firms survive. Therefore, firms that perceive a trade-off between profits and the female share of their workforce will respond to increased competition by hiring more women (Ederington, Minier, & Troske, 2009).

3. The panel threshold regression model

We apply the panel data by considering the existence of control variables based on Hansen's (1999) panel threshold regression model and construct the following single threshold model:

$$FLFPR_{it} = \begin{cases} \mu_i + \beta_1 Trade_{it} + \alpha' \boldsymbol{x}_{it} + \varepsilon_{it} & \text{if } Trade_{it} \le \gamma \\ \mu_i + \beta_2 Trade_{it} + \alpha' \boldsymbol{x}_{it} + \varepsilon_{it} & \text{if } Trade_{it} > \gamma \end{cases} \tag{1}$$

$$\alpha = (\alpha_1, \alpha_2, \alpha_3, \alpha_4)' \quad \boldsymbol{x}_{it} = (q_{it}, m_{it}, s_{it}, v_{it})$$

$$\{FLFPR_{it}, Trade_{it}, \boldsymbol{x}_{it} : 1 \le i \le n, 1 \le t \le T\}$$

where $Trade_{it}$ is the level of trade dependency (trade volume/GDP) as the threshold variable (Cooray et al., 2017; Neumayer & De Soysa, 2005); γ denotes the estimated threshold value; β_1 and β_2 are the estimated threshold coefficients of different threshold values; and $\boldsymbol{x}_{it}$ is the vector of 4×1, which comprises the control variables q_{it}, m_{it}, s_{it} and v_{it}. Specifically, q_{it} is the logarithm of gross domestic product (GDP) per capita, which is used to control the effect of business cycles on labour indicators and trade. The growth of GDP per capita in some developing countries has been generally high since the mid-1990s; this ordinarily demands a huge amount of labour and, as a result, women are pulled into the labour market (Klasen, 2017). Therefore, there exist some links between income and FLFPR. Thus, as income indicator, GDP per capita should be controlled to ensure there is no spurious correlation between dependent and independent variables. Second, m_{it} is referred to as the female fertility rate, which is also an important factor that affects the incidence of women's labour participation. Bloom et al. (2009) and Mishra and Smyth (2010) report a negative relationship between fertility and FLFPR in cross-country studies. Declining fertility frees women from the burdens of childcare and sharply reduces the time span in their life cycles (Jayachandran & Lleras-Muney, 2009; Miller, 2010). In addition, studies find that the interaction relationship has shifted from negative to positive since the mid-1980s (Yamaguchi, 2006), which implies that the substitution effect between having children

and working is offset by the income effect. In other words, higher FLFPR allows households to afford more children. This reflects changes in social norms towards working women and public policies that reduce the trade-offs between childcare and female employment (Kinoshita & Guo, 2015). s_{it} indicates the unemployment rate for women. Zoabi and Saure (2010) highlight that the control variables should include an unemployment rate for women. This is because the impact of unemployment is proven to be discouraging on FLFPR (Mincer, 1962; Tansel, 2002). Additionally, trade openness may affect the agents' incentives to enter or to exit the labour market, and this will lead to changes in the unemployment rate as well (Madanizadeh & Pilvar, 2017). v_{it} represents educational attainment. Higher education is regarded to be positively related to FLFPR. As female education expands, women's qualifications for the labour market rise accordingly. Eckstein and Lifshitz (2011) confirm that the growth in education levels contributes to one-third of the increase in female labour participation. Steinberg and Nakane (2012) also report that education has a positive effect on the increase in FLFPR. Kinoshita and Guo (2015) point out that FLFPR remains low despite the significant increase in women's educational attainment levels in Japan and Korea, which provides evidence of the underutilisation of highly educated female labour in the workforce. $\alpha_1, \alpha_2,\ \alpha_3$ and α_4 are the estimated coefficients corresponding to the control variables $q_{it},\ m_{it}, s_{it}$ and v_{it}; μ_i is a fixed effect representing the heterogeneity of countries under different levels of trade dependency. The error term, ε_{it}, is a white noise process, which is subject to $iid(0,\ \sigma^2)$; i represents the different countries in the analysis, and t refers to a specific period.

The advanced threshold regression Equation (1) can also be rewritten as:

$$FLFPR_{it} = \mu_i + \beta_1 Trade_{it} \mathrm{I}(Trade_{it} \leq \gamma) + \beta_2 Trade_{it} \mathrm{I}(Trade_{it} > \gamma) + \ \alpha' x_{it} + \varepsilon_{it} \qquad (2)$$

Equation (2) represents a single threshold regression model; however, there may be numerous thresholds in empirical applications. Therefore, the formula for the double threshold regression model can be organised as follows:

$$FLFPR_{i,t} = \begin{cases} \mu_i + \beta_1' \ Trade_{it}(\gamma) + \alpha_i' \boldsymbol{x}_{it} + \varepsilon_{it} & \text{if } Trade_{it} \leq \gamma_1 \\ \mu_i + \beta_1' \ Trade_{it}(\gamma) + \alpha_i' \boldsymbol{x}_{it} + \varepsilon_{it} & \text{if } \gamma_1 < Trade_{it} \leq \gamma_2 \\ \mu_i + \beta_1' \ Trade_{it}(\gamma) + \alpha_i' \boldsymbol{x}_{it} + \varepsilon_{it} & \text{if } Trade_{it} > \gamma_2 \end{cases} \qquad (3)$$

Equation (3) can also be simplified as:

$$\begin{aligned} FLFPR_{it} = {} & \mu_i + \beta_1' \ Trade_{it} \mathrm{I}(Trade_{it} \leq \gamma_1) + \beta_2' Trade_{it} \mathrm{I}(\gamma_1 < Trade_{it} \leq \gamma_2) \\ & + \beta_3' Trade_{it} \mathrm{I}(Trade_{it} > \gamma_2) + \alpha' \boldsymbol{x}_{it} + \varepsilon_{it} \end{aligned} \qquad (4)$$

where the threshold value is $\gamma_1 < \gamma_2$. Accordingly, this can be extended to the multiple threshold model.

Regarding the previous research on the relationship between trade openness and FLFPR, it is reasonable to believe that when trade openness is below the threshold value, a lower percentage of trade volume promotes the growth of FLFPR; this appears as a positive interrelation. However, when the trade openness is higher than

the threshold value, the nexus between these two variables will deviate from the original correlation.

4. Data

In this paper, we apply panel data annually from several developing Asian countries (including China, India, Indonesia, Malaysia, Nepal, Pakistan, the Philippines, Thailand and Vietnam) from 1990 to 2016. The dependent variable is FLFPR, and the threshold variable of the extent of trade openness is measured as the ratio of the sum of exports and imports to GDP, while exports volume to GDP means exports dependency,[1] which is similar to imports dependency (Cooray et al., 2017; Neumayer & De Soysa, 2005). Control variables can isolate the effects of other factors that have a significant influence on FLFPR. We employ four control variables in our study: GDP per capita, fertility rate, female unemployment rate and school enrolment tertiary rate, which is referred to as educational attainment (Zoabi & Saure, 2010). All the data were collected from the World Bank database.

Asian countries have experienced a wave of awakening of women's consciousness with the sharply rising FLFPR since the 1990s. Meanwhile, trade has grown at a rapid pace driven by trade liberalisation policies and increasing export capacities (Crozet & Orece, 2017). In this process, rapid economic growth and structural change in developing Asian countries have been underpinned by a remarkable reduction in barriers to international trade. Specifically, China has become a large participant in the global market since the economic reforms in the 1970s and 1980s, prior to which China's economy was a small, agriculturally based economy (Mirza, Narayanan, & Leeuwen, 2014). The significant growth in output is attributed to a market-oriented strategy and trade liberalisation. China has become a leading exporter of manufacturing goods, and has impressively removed the tariff barriers, benefiting from entry to the WTO (Chen, Ma, & Xu, 2014). India changed from trade and foreign exchange controls to liberalisation reforms in 1990–1991. Since then, the Indian authorities have experienced a sustained drive towards liberalisation, including the elimination of quantitative restrictions on imports and the adoption of a market-determined exchange rate regime (Vashisht, 2016). Malaysia was one of the most active countries in liberalising its investment regime during the 1990s through outward-oriented strategies. This policy offered many incentives, such as expanded investment tax allowances for expansion projects, tax deductions for export promotions, the establishment of free trade zones (FTZs) and other types of incentive to attract FDI, and so on (Chandran, 2009). Nepal's imports and exports have increased significantly since liberalisation. The nominal tariff protection for the majority of commodities has declined 48% since the mid-1980s (Fofana et al., 2005).

As for controlling variables, although Asian countries accounted for 19% of the global economy in 1950, by 2010 this share had increased to 28%. The Asia Development Bank predicts that Asia could generate 52% of the global economy; the average GDP per capita is targeted to reach 40,800 dollars by 2050. The high-growth GDP per capita in Asia is driven by an export-oriented trade policy and heavy investment in education (Hutchinson & Das, 2016). Some countries, including Japan,

Table 1. Descriptive statistics.

	Mean	Max.	Min.	Std dev.	Skewness	Kurtosis	Jarque–Bera
Exports dependency	0.333	1.195	0.051	0.262	1.080	2.949	47.261***
Imports dependency	0.344	1.160	0.063	0.218	1.037	3.497	46.054***
Trade openness	0.677	2.255	0.125	0.473	1.068	3.090	46.269***
FLFPR	53.751	82.752	12.504	19.249	0.383	2.186	12.646***
Per capita GDP	2521.765	11028.19	357.206	2365.704	1.584	4.942	13.767***
Education attainment	22.870	60.029	0.889	15.268	0.509	2.416	8.603**
Fertility rate	2.851	6.024	1.494	1.051	0.704	2.884	20.221***
Unemployment rate	4.377	11.850	0.580	2.380	0.968	3.575	41.266***

**and ***indicate significance at the 5% and 1% level, respectively.

Korea and Singapore, have entered post-massification as their tertiary enrolment rates are more than 50%. In addition, higher education in Malaysia, Thailand, Indonesia and the Philippines has been improving rapidly, which can be regarded as a result of economic growth. Governments in countries with developed higher education systems perceive education as a social system to train technicians and professionals for their industrial development and to produce knowledge and technology for their economy (Shin, Postiglione, & Huang, 2016). Higher quality education not only has a positive impact on a country's economic development but also lowers unemployment and fertility rates (Varshney & Lata, 2014). In Asian countries such as India, Thailand, Indonesia and China, governments have implemented nationwide family planning programmes to solve poverty problems. Rapid economic growth and social change has led to a continuing decline in fertility; by 2013, fertility rates had dropped below the replacement level,[2] and evidence indicates that the decline will continue (Booth, 2016).

Table 1 presents descriptive statistics of the variables. It shows that the maximum of export dependency is larger than that of import, while the minimum of export dependency is smaller than that of import. Specifically, the standard deviation of export dependency is larger than import dependency, meaning that the export is more volatile. Furthermore, we find that all the variables are non-normally distributed according to the Jarque–Bera tests; they are also all skewed to the right.

5. Empirical results

We employ a panel threshold regression model to reveal the interaction relationship between trade openness and FLFPR. To avoid the spurious regression problem, all variables in the model should be stationary. Therefore, we proceed with unit root tests before the panel threshold regression model. This approach is used because the single-equation augmented Dickey–Fuller (ADF) test presents limited power when the data are generated by a near-unit root but stationary process. To enhance the reliability of results, we adopt a two panel unit root test proposed by Levin, Lin, and Chu (2002) and Im, Pesaran, and Shin (2003). Table 2 shows that the null hypothesis of unit roots is rejected within the 1% significance level. This implies all the variables in our analysis are stationary, which is the premise of the following panel threshold regression. Additionally, we investigate the potential endogeneity problem by introducing an instrumental variable. The results show that there are no endogenous

Table 2. Panel unit root tests.

	Panel augmented Dickey–Fuller test			
	Levin et al. (2002)		Im et al. (2003)	
Variables	*t*-Statistic	*p*-Value	*t*-Statistic	*p*-Value
Exports dependency	−12.529***	0.000	−11.320***	0.000
Imports dependency	−12.354***	0.000	−10.926***	0.000
Trade openness	−13.080***	0.000	−11.366***	0.000
FLFPR	−4.380***	0.000	−5.996***	0.000
Δ Per capita GDP	−3.83471***	0.000	−4.185***	0.000
Education attainment	−5.934***	0.000	−3.426***	0.000
Fertility rate	−4.053***	0.000	−4.351***	0.000
Unemployment rate	−3.320***	0.000	−3.946***	0.000

***Indicates significance at the 1% level.
Note: Δ Per capita GDP denotes the first difference of per capita GDP.

Table 3a. Tests for threshold effects between trade openness and FLFPR.

	Threshold value	*F*-statistics	*p*-Value
Trade openness			
Single threshold effect test	0.617	75.622*	0.080
Double threshold effect test	0.617	33.254	0.130
	1.386		

Note: The critical values of the *F*-statistics for the single threshold effect are 60.650, 86.751 and 112.658 at the respective 10%, 5% and 1% levels; the critical values for the double threshold effect are 35.205, 44.433 and 62.996 at the respective 10%, 5% and 1% levels.
*Indicates significance at the 10% level.

Table 3b. Estimated coefficients of trade openness.

	Estimated value	OLS se	t_{OLS}	White se	t_{White}
$\hat{\beta}_1$	15.301	1.602	9.551***	1.861	8.222***
$\hat{\beta}_2$	−5.566	0.810	−6.872***	0.945	−5.890***

Notes: OLS se (White se) refers to homogeneous (heterogeneous) standard deviations.
$\hat{\beta}_1$ ($\hat{\beta}_2$) indicates that the coefficient estimates are smaller (larger) than the threshold value.
***Indicates significance at the 1% level.

Table 3c. Estimated coefficients of the control variables.

	Estimated value	OLS se	t_{OLS}	White se	t_{White}
$\hat{\alpha}_1$	1.838E-05	0.000201	0.0914	0.000225	0.0817
$\hat{\alpha}_2$	−1.618	0.293	−5.522***	0.308	−5.253***
$\hat{\alpha}_3$	−0.222	0.061	−3.639***	0.072	−3.083**
$\hat{\alpha}_4$	0.146	0.038	3.842***	0.035	4.171***

** and ***indicate significance at the 5% and 1% levels, respectively. E-05 denotes 10^{-5}.

explanatory variables across our models. The detailed contents are shown in the Appendix.

The results of the panel threshold regression are listed in Tables 3a–3c, with a 10,000 repetition of bootstrapping of the sample. Table 3a presents the long-term relationship between trade openness and FLFPR. The threshold value for the single threshold model is 0.617 under the 10% significance level, exhibiting an asymmetric non-linear relationship. The test for the double threshold effects reveals an *F*-statistic of 33.254 and a *p*-value of 0.130, showing this model does not have a double threshold.

Table 4a. Tests for threshold effects between exports dependency and FLFPR.

	Threshold value	*F*-statistics	*p*-Value
Trade openness			
Single threshold effect test	0.153	67.655*	0.070
Double threshold effect test	0.153	20.333	0.350
	0.303		

Notes: The critical values of the *F*-statistics for the single threshold effect are 57.484, 73.080 and 97.639 at the respective 10%, 5% and 1% levels; the critical values for the double threshold effect are 39.321, 42.591 and 56.116 at the respective 10%, 5% and 1% levels.
*Indicates significance at the 10% level.

As shown in Table 4, when trade openness is lower than the threshold value ($Trade_{it} \leq 0.617$) in the first segment, the coefficient $\hat{\beta}_1$ is 15.301. At this point, when trade openness is lower than 61.7%, continued trade openness promotes the FLFPR. Developing countries in Asia are abundantly endowed with unskilled labour; what determines the comparative advantage of industries is intensively using unskilled labour. Therefore, it may be expected that trade liberalisation would stimulate faster growth of unskilled labour-intensive industries. In addition, because the service industry and garments and light manufacturing are motivated by trade openness, this leads to a significant demand for female workers (Sauré & Zoabi, 2014). In the second segment, when trade openness is higher than the threshold value ($Trade_{it} > 0.617$), the coefficient $\hat{\beta}_2$ is −5.566. That is, when trade openness is above 61.7%, an increase in trade openness leads to a reduction in FLFPR. The reasons can be summarised as follows: international trade will accelerate capital accumulation, which is reflected by the continuous increase in per capita GDP in these developing Asian countries (Sauré and Zoabi, 2009). Following this, the income effect[3] discourages female participation. Additionally, trade openness can reduce the bargaining power of female workers if they are employed in low-wage sectors (Oostendorp, 2009). That is, trade openness leads to an increase in the demand for skilled relative to low-skilled labour, which can result in a disadvantage to women in job acquisition (Wood, 1998). Furthermore, economic openness exposes domestic firms to foreign competition, forcing them to become more efficient, resulting in advanced technology and improved productivity (Seguino, 2000). Repetitive and routine work such as administration, media and manufacturing will be significantly reduced. Unfortunately, women are the main force in these industries. With an update in technology, a large number of women who were employed to do basic work with strong substitutability will become unemployed (vom Lehn, 2019). In consequence, FLFPR tends to decrease.

The parameter estimates of the control variables, including GDP per capita, fertility rate, unemployment rate and educational attainment, are summarised in Table 3c, which shows that the estimated coefficients are $\hat{\alpha_1} = 1.838\text{E}{-}05$, $\hat{\alpha_2} = -1.618$, $\hat{\alpha_3} = -0.222$ and $\hat{\alpha_4} = 0.146$. In the homogeneous and heterogeneous standard deviations results, $\hat{\alpha_2}$, $\hat{\alpha_3}$ and $\hat{\alpha_4}$ are significant, thereby indicating that the fertility rate and unemployment rate are negatively correlated with FLFPR. This implies that reducing female fertility could free women from childcare time, thereby encouraging the FLFPR (Klasen, 2017). Additionally, enthusiasm to enter the labour market will rise because of the drop in the female unemployment rate (Tansel, 2002). We can further find that educational attainment is

Table 4b. Estimated coefficients of exports dependency.

	Estimated value	OLS se	t_{OLS}	White se	t_{White}
$\hat{\beta}_1$	41.992	6.157	6.820***	7.578	5.541***
$\hat{\beta}_2$	−3.878	1.529	−2.536**	1.603	−2.419**

**and ***indicate significance at the 5% and 1% levels, respectively.

Table 4c. Estimated coefficients of the control variables.

	Estimated value	OLS se	t_{OLS}	White se	t_{White}
$\hat{\alpha}_1$	−0.000260	0.000201	−1.294	0.000262	−0.992
$\hat{\alpha}_2$	−1.239	0.292	−4.243***	0.381	−3.252**
$\hat{\alpha}_3$	−0.194	0.121	−1.603	0.083	−2.337**
$\hat{\alpha}_4$	0.173	0.039	4.436***	0.040	4.325***

**and ***indicate significance at the 5% and 1% levels, respectively.

Table 5a. Tests for threshold effects between imports dependency and FLFPR.

	Threshold value	*F*-statistics	*p*-Value
Trade openness			
Single threshold effect test	0.608	48.191	0.120

Note: The critical values of the *F*-statistics for the single threshold effect are 52.127, 63.624 and 83.256 at the respective 10%, 5% and 1% levels.

Table 5b. Estimated coefficients of imports dependency.

	Estimated value	OLS se	t_{OLS}	White se	t_{White}
$\hat{\beta}_1$	−17.695	2.179	8.121***	2.058	8.598***
$\hat{\beta}_2$	−10.052	1.613	−6.232***	1.619	−6.209***

***Indicates significance at the 1% level.

Table 5c. Estimated coefficients of the control variables.

	Estimated value	OLS se	t_{OLS}	White se	t_{White}
$\hat{\alpha}_1$	0.000881	0.000192	4.588***	0.000213	4.136***
$\hat{\alpha}_2$	−2.102	0.319	−6.589***	0.308	−6.825***
$\hat{\alpha}_3$	0.210	0.124	1.693	0.093	2.258**
$\hat{\alpha}_4$	0.178	0.114	1.561	0.152	1.174

**and ***indicate significance at the 5% and 1% levels, respectively.

positively linked with FLFPR, which can be explained by improvements in education levels enhancing competitiveness and pushing women into newly created jobs owing to trade openness (Tansel, 2002; Thevenon & Ali, 2012). As economic activity shifts from 'brawn-based' to 'brain-based' work, such as in the services sector, female labourers gain a comparative advantage (Pitt, Rosenzweig, & Hassan, 2012).

We have revealed, however, the relationship between trade openness (exports plus imports relative to GDP) and FLFPR. We do not find that exports or imports lead to the threshold effects exactly. As we have discussed above, export orientation seems to be positively correlated with FLFPR by providing more job opportunities (Başlevent & Onaran, 2004), and while imports can promote an increase of equipment investment, they will exert pressure on FLFPR (Ozler, 2007). Then, we examine the long-term links between export/import dependency and FLFPR; the results are presented in Tables 4a–4c and Tables 5a–5c.

Table 4a points out that the single threshold effect exists in the export dependency effect on FLFPR within the 10% significance level. Combined with Table 4b, when export dependency is lower than the threshold value of 0.153, the coefficient $\hat{\beta}_1$ is 41.992. In this period, exports and FLFPR have a positive and significant correlation, signifying that exports will boost FLFPR. The Asian economies had highly protective trade regimes before they embarked on their export-oriented trade strategies, and afterwards they achieved gains through realising their comparative advantage (Krueger, 1990). Since the adoption of the export-oriented industrialisation strategy, export processing zones (EPZs) have developed rapidly in almost all Asian countries (Paul-Majumder & Begum, 2000). Additionally, governments in these economies exert their active roles in guiding the development and extensive use of subsidised credit, tax privileges, and protectionism for export sectors. These export-stimulating strategies also expand market size and lead to the scale effect of economy (Seguino, 2000). To some extent, export sections encourage female employment as a result of intensified labour market competition, which raises the cost of gender discrimination (Chen, Ge, Lai, & Wan, 2013). This additional cost pushes employers to hire more women rather than forcing them out of the market (Ederington et al., 2009). Meanwhile, female Asian labourers are regarded as comparatively cheap. They are employed in the export industry mainly due to their comparative advantages, which include the low cost of their labour, lower bargaining power, and docility (Paul-Majumder & Begum, 2000). When exports' share is higher than 15.3%, the coefficient $\hat{\beta}_2$ is -3.878, implying that an increase in exports results in a reduction in FLFPR. These Asian countries not only successfully industrialised using export-oriented industrialisation strategies but also upgraded their manufacturing sectors into higher value added activities using exports as a driver (Tejani & Milberg, 2016). In the meantime, with the rise in education and skills, the comparative advantages of women have disappeared, and employers have changed their preference for female workers, leading to the trend downwards. Table 4c indicates the parameter estimates of control variables. From the homogeneous or heterogeneous standard deviations results, $\hat{\alpha_2}$, $\hat{\alpha_3}$ and $\hat{\alpha_4}$ are significant. In particular, fertility rate and unemployment rate play a negative role on FLFPR, which confirms our conjecture. Similarly, educational attainment is positively correlated with FLFPR.

We further perform the regression on import dependency and FLFPR; however, a single threshold effect is not significant at even the 10% significance level (see Table 5a). Regardless of the threshold effect, we can infer that increased imports dependency would hinder FLFPR, combined with Table 5b (Chudik, Mohaddes, Pesaran, & Raissi, 2017). This bias could arise because of new technology, as imports would introduce technological change, in particular the improvement of computerised production processes, mainly designed in the skill-abundant industrialised economy. Major changes occur within Asian countries, including a remarkable increase in the importance of machinery and electronic products in intraregional trade (Ng & Yeats, 2003). This exhibits capital–skill complementarities in production, which have lowered the need for physically demanding skills and therefore depress women's participation in the labour market (Juhn, Ujhelyi, & Villegas-Sanchez, 2014).

In general, the empirical results demonstrate that the relationship between trade openness and FLFPR is non-linear by the panel threshold regression method. However, the major shortcoming of traditional studies is that they assume a linear relationship between the two variables. We provide more convincing evidence that there is an optimal level of trade openness that encourages the FLFPR. That is, when trade openness is below the optimal threshold value, a positive correlation exists between the increase in trade and FLFPR, which is consistent with Becker's (1957) discrimination model. Trade openness can intensify competition in the local market then reduce the incentive of sectors to discriminate against female workers. However, when trade openness exceeds the threshold value, excessive trade openness crowds out women in the labour market. Furthermore, these threshold effects are primarily favoured by exports rather than imports. Rapid export growth in developing Asia has been underpinned by the manufacturing sectors, which encourage female labourers because of their comparative advantages of low cost and lower bargaining power. With the rise of educational attainment and advanced technology, these comparative advantages have disappeared, leading to a negative interaction relationship. Clearly, import dependency has an adverse influence on FLFPR in the long term, which is in line with Bell and Cattaneo (1997) and Edwards (2004). It can be explained as trade liberalisation, which creates more jobs in exporting sectors and destroys jobs in sectors producing import substitutes (Fontana & Wood, 2000). Corresponding implications consist of the fact that appropriate export dependency can promote women's willingness to participate in labour markets; however, to a certain extent, increased imports would crowd out female workers.

6. Conclusion

This study applies the panel threshold regression (Hansen, 1999) and examines whether trade openness is subject to threshold effects; the results confirm the asymmetric single threshold effect in developing Asian countries. Specifically, on both sides of threshold value, an increase in trade openness will enhance and then depress the FLFPR. In addition, by reducing the fertility and unemployment rates for women and promoting their education, FLFPR can be encouraged. Furthermore, the export dependency also has a similar single threshold effect on FLFPR; this finding is basically in line with Becker's (1957) theory of discrimination. That is, trade openness, and especially exports as a channel for increased competition, decreases the discrimination against women and thus enhances their participation rate. Consequently, trade openness enhances or depresses FLFPR depending on the balance of these opposing channels. The heighted competitive pressure and competitive advantages for female labourers result in the cost reduction effect, contributing to greater FLFPR; the technology channel works in the opposite direction. On the other hand, regardless of threshold effect, imports dependency exerts a negative effect on FLFPR in the long term. Although trade liberalisation creates more jobs in exporting sectors, it also destroys jobs in sectors producing import substitutes. It can be seen that the threshold effect of trade openness is attributed to exports. Therefore, export dependency is an important explanatory variable when considering the FLFPR. Governments can

adjust the scale of export volume to encourage women's active participation in the labour market.

In terms of policy implications, increasing exports is definitely not always better, and it tends to harm FLFPR after a point. The optimal level of trade openness, especially regarding exports, is a key concern for policy-makers attempting to foster female labour participation. It is also worth considering the channel efficiency and whether exports could intensify competition and then reduce discrimination or would crowd out female workers. Policy-makers can focus less on increasing the scale of exports and more on improving export structure. However, measures to strengthen quality and fairness need to be undertaken rather than simply aiming to promote higher export volume. As mentioned by World Bank documents, trade globalisation requires a series of public policies to promote women's fundamental participation (Assaf, 2018). Governments need to eliminate the unequal treatment of men and women in the labour market. Specifically, improving the education level of female workers, strengthening skills training and highlighting child security programmes are conducive to enhancing women's competitiveness and the ability to resist crisis. These factors would reduce female unemployment and, thus, enhance women's enthusiasm for participating in the labour market.

Notes

1. Exports are widely referred as preferable to total trade (or imports) as the numerator in calculating this ratio because the restrictiveness of a given country's policy regime is presumably better captured by export performance (Athukorala, 2012).
2. Below the replacement level is referred to as fertility rate less than 2.1 (Hirschman et al., 1994).
3. The income effect arises from the change in labour supply because of a change in household income.

Disclosure statement

No potential conflict of interest was reported by the authors.

Funding

This research is supported by the Social Sciences and Humanities Youth Foundation of Ministry of Education [Grant Number 19YJC630049].

References

Anyanwu, J. C. (2016). Analysis of gender equality in youth employment in Africa. *African Development Review*, *28* (4), 397–415. doi:10.1111/1467-8268.12220

Arrow, K. J. (1973). The theory of discrimination. In Ashenfelter, O. and Rees, A. (Eds.), *Discrimination in labor markets*. Princeton: Princeton University Press.

Assaf, A. A. (2018). Evaluating the impact of trade openness on women's job opportunities: An analysis for Middle East countries. *Global Journal of Economic and Business*, *4*(1), 99–110. doi:10.12816/0048157

Athukorala, P. C. (2012). Asian trade flows: Trends, patterns and prospects. *Japan and the World Economy*, *24*(2), 150–162. doi:10.1016/j.japwor.2012.01.003

Banerjee, P., & Veeramani, C. (2015). *Trade liberalisation and women's employment intensity: Analysis of India's manufacturing industries* (Working Paper No. 018). Mumbai: Indira Gandhi Institute.

Başlevent, C., & Onaran, Ö. (2004). The effect of export-oriented growth on female labor market outcomes in Turkey. *World Development*, *32*(8), 1375–1393. doi:10.1016/j.worlddev.2004.02.008

Becker, G. S. (1957). *The economics of discrimination*. Chicago: University of Chicago Press.

Bell, T., & Cattaneo, N. (1997). Foreign trade and employment in South African Manufacturing Industry. Occasional Report No. 4. Geneva, Switzerland: Employment and Training Department, International Labour Office.

Bloom, D. E., Canning, D., Fink, G., & Finlay, J. E. (2009). Fertility, female labor force participation, and the demographic dividend. *Journal of Economic Growth*, *14*(2), 79–101. doi:10.1007/s10887-009-9039-9

Booth, A. (2016). Women, work and the family: Is Southeast Asia different? *Economic History of Developing Regions*, *31*(1), 167–197. doi:10.1080/20780389.2015.1132624

Chandra, A., Lontoh, L., & Margawati, A. (2010). *The gender implications of trade liberalization in Southeast Asia*. Winnipeg: International Institute for Sustainable Development.

Chandran, V. G. R. (2009). Trade openness and manufacturing growth in Malaysia. *Journal of Policy Modeling*, *31*(5), 637–647.

Chen, B., Ma, H., & Xu, Y. (2014). Measuring China's trade liberalization: A generalized measure of trade restrictiveness index. *Journal of Comparative Economics*, *42*(4), 994–1006. doi:10.1016/j.jce.2014.03.003

Chen, Z., Ge, Y., Lai, H., & Wan, C. (2013). Globalization and gender wage inequality in China. *World Development*, *44*, 256–266. doi:10.1016/j.worlddev.2012.11.007

Chudik, A., Mohaddes, K., Pesaran, M. H., & Raissi, M. (2017). Is there a debt-threshold effect on output growth? *Review of Economics and Statistics*, *99*(1), 135–150. doi:10.1162/REST_a_00593

Cooke, F. L. (2010). Women's participation in employment in Asia: A comparative analysis of China, India, Japan and South Korea. *The International Journal of Human Resource Management*, *21*(12), 2249–2270. doi:10.1080/09585192.2010.509627

Cooray, A., Dutta, N., & Mallick, S. (2017). Trade openness and labor force participation in Africa: The role of political institutions. *Industrial Relations: A Journal of Economy and Society*, *56*(2), 319–350. doi:10.1111/irel.12175

Cooray, A., Gaddis, I., & Wacker, K. M. (2012). *Globalization and female labor force participation in developing countries*. Göttingen: University of Göttingen

Crozet, M., G. & Orefice, G. (2017). Trade and labor market: What do we know?. CEPII Policy Brief No. 15.

Eckstein, Z., & Lifshitz, O. (2011). Dynamic female labor supply. *Econometrica*, *79*(6), 1675–1726.

Ederington, J., Minier, J., & Troske, K. R. (2009). *Where the girls are: Trade and labor market segregation in Colombia* (IZA Discussion Paper No. 4131). Germany: Institute of Labor Economics.

Edwards, L. (2004). A firm level analysis of trade, technology and employment in South Africa. *Journal of International Development*, *16*(1), 45–61.

Edwards, L. (2005). Globalisation and the Occupational Structure of Employment in South Africa. *South African Journal of Economics*, *69*(1), 40–71. doi:10.1111/j.1813-6982.2001.tb00002.x

Fofana, I., Cockburn, J., & Decaluwe, B. (2005). *Developing country superwomen: Impacts of trade liberalisation on female market and domestic work*. Canada: PEP Network Training Material, University Laval.

Fontana, M. (2009). The gender effects of trade liberalization in developing countries: A review of the literature. *Rafael E. de Hoyosy Maurizio Bussolo. Gender aspects of the trade and poverty Nexus. A macro-micro approach*, (pp. 25–50).

Fontana, M., & Wood, A. (2000). Modeling the effects of trade on women, at work and at home. *World Development*, *28*(7), 1173–1190. doi:10.1016/S0305-750X(00)00033-4

Gaddis, I., & Pieters, J. (2012). *Trade liberalization and female labor force participation: Evidence from Brazil* (IZA Discussion Paper No. 6809). Germany: IZA.

Gaddis, I., & Pieters, J. (2017). The gendered labor market impacts of trade liberalization evidence from Brazil. *Journal of Human Resources*, *52*(2), 457–490.
Galor, O., & Weil, D. N. (1996). The gender gap, fertility and growth. *American Economic Review*, *86*(3), 374–387.
Hansen, B. E. (1999). Threshold effects in non-dynamic panels: Estimation, testing, and inference. *Journal of econometrics*, *93*(2), 345–368.
Hirschman, C., Tan, J. E., Chamratrithirong, A., & Guest, P. (1994). The path to below replacement-level fertility in Thailand. *International Family Planning Perspectives*, *20*(3), 82–107. doi:10.2307/2133509
Hutchinson, F. E., & Das, S. B. (Eds.). (2016). *Asia and the middle-income trap*. London: Routledge.
Hyder, A., & Behrman, J. R. (2012). International trade openness and gender gaps in Pakistani labor force participation rates over 57 years. *Journal of the Asia Pacific Economy*, *17*(3), 367–382. doi:10.1080/13547860.2012.694684
Im, K. S., Pesaran, M. H., & Shin, Y. (2003). Testing for unit roots in heterogeneous panels. *Journal of Econometrics*, *115*(1), 53–74. doi:10.1016/S0304-4076(03)00092-7
Jayachandran, S., & Lleras-Muney, A. (2009). Life expectancy and human capital investments: Evidence from maternal mortality declines. *Quarterly Journal of Economics*, *124*(1), 349–397. doi:10.1162/qjec.2009.124.1.349
Jonsson, G., & Subramanian, A. (2001). Dynamic gains from trade: Evidence from South Africa. *IMF Working Papers*, *48*(1), 197–224. doi:10.5089/9781451846461.001
Juhn, C., Ujhelyi, G., & Villegas-Sanchez, C. (2014). Men, women, and machines: How trade impacts gender inequality. *Journal of Development Economics*, *106*, 179–193. doi:10.1016/j.jdeveco.2013.09.009
Kinoshita, Y., & Guo, F. (2015). *What can boost female labor force participation in Asia?* (International Monetary Fund Working Paper No. 15-56). Washington, DC: International Monetary Fund. doi:10.5089/9781498329750.001
Klasen, S. (2017). What explains uneven female labor force participation levels and trends in developing countries? Retrieved from http://conference.iza.org/conference_files/GLMLICNetwork_2017/klasen_s146.pdf.
Korinek, J. (2005). *Trade and gender: Issues and interactions* (OECD trade policy Working Paper No. 24). Paris: OECD.
Krueger, A. O. (1990). Asian trade and growth lessons. *The American Economic Review*, *80*(2), 108–112.
Lechman, E., & Kaur, H. (2015). Economic growth and female labor force participation – verifying the U-feminization hypothesis. New evidence for 162 countries over the period 1990–2012. *Economics and Sociology*, *8*(1), 246–257.
Levin, A., Lin, C. F., & Chu, J. (2002). Unit root in panel data: Asymptotic and finite-sample properties. *Journal of Econometrics*, *108*(1), 1–24. doi:10.1016/S0304-4076(01)00098-7
Madanizadeh, S. A., & Pilvar, H. (2017). The impact of trade openness on labor force participation rate. Retrieved from http://gsme.sharif.edu/~madanizadeh/Files/The%20Impact%20of%20Trade%20Openness%20on%20Labor%20Force%20Participation.pdf.
Miller, G. (2010). Contraception as development? New evidence from family planning in Colombia. *The Economic Journal*, *120*(545), 709–736. doi:10.1111/j.1468-0297.2009.02306.x
Mincer, J. (1962). Labor force participation of married women: A study of labor supply. In Lewis, H. Greg (Ed.). *Aspects of labor economics* (pp. 63–105). Princeton: Princeton University Press.
Mirza, T., Narayanan, B., & Leeuwen, N. V. (2014). Impact of Chinese growth and trade on labor in developed countries. *Economic Modelling*, *38*, 522–532. doi:10.1016/j.econmod.2014.01.029
Mishra, V., & Smyth, R. (2010). Female labor force participation and total fertility rates in the OECD: New evidence from panel cointegration and Granger causality testing. *Journal of Economics and Business*, *62*(1), 48–64. doi:10.1016/j.jeconbus.2009.07.006
Nasreen, S., & Anwar, S. (2014). Causal relationship between trade openness, economic growth and energy consumption: A panel data analysis of Asian countries. *Energy Policy*, *69*, 82–91. doi:10.1016/j.enpol.2014.02.009

Neumayer, E., & De Soysa, I. (2005). Trade openness, foreign direct investment and child labor. *World Development*, *33*(1), 43–63. doi:10.1016/j.worlddev.2004.06.014

Ng, F., & Yeats, A. J. (2003). *Major trade trends in East Asia: What are their implications for regional cooperation and growth?* (Policy Research Working Paper No. 3084). Geneva: The World Bank.

Nordas, H. K. (2003). *Is trade liberalization a window of opportunity for women?* (Staff Working Paper No. ERSD-2003-03). Geneva: WTO.

Nowbutsing, B. M., & Ancharaz, V. (2011). *Trade, employment and gender: Case Study of Mauritius*.

Oostendorp, R. H. (2009). Globalization and the gender wage gap. *The World Bank Economic Review*, *23* (1), 141–161. doi:10.1093/wber/lhn022

Ouedraogo, R., & Marlet, E. (2018). *Foreign direct investment and women empowerment: New evidence on developing countries* (Working Paper No. WP/18/25). USA: International Monetary Fund. doi:10.5089/9781484339732.001

Ozler, S. (2007). Export-led industrialization and gender differences in job creation and destruction. In Van Staveren, I., Elson, D., Grown, C., and Cagatay, N. (Eds.). *The feminist economics of trade*, (pp. 164–184). Abingdon: Routledge.

Paul-Majumder, P., & Begum, A. (2000). *The gender imbalances in the export oriented garment industry in Bangladesh*. Washington, DC: World Bank, Development Research Group/ Poverty Reduction and Economic Management Network.

Pitt, M. M., Rosenzweig, M. R., & Hassan, M. N. (2012). Human capital investment and the gender division of labor in a brawn-based economy. *American Economic Review*, *102*(7), 3531–3560. doi:10.1257/aer.102.7.3531

Sauré, P. U., & Zoabi, H. (2009). *Effects of trade on female labor force participation* (Working Paper No. 9). Cambridge: SSRN.

Sauré, P., & Zoabi, H. (2014). International trade, the gender wage gap and female labor force participation. *Journal of Development Economics*, *111*, 17–33. doi:10.1016/j.jdeveco.2014.07.003

Schaner, S., & Das, S. (2016). *Female labor force participation in Asia: Indonesia country study* (ADB Economics Working Paper Series No. 474). Manila: Asian Development Bank.

Seguino, S. (2000). Accounting for gender in Asian economic growth. *Feminist Economics*, *6*(3), 27–58.

Seguino, S. (2015). Gender effects of trade openness in sub-Saharan Africa. *Feminist Economics*, *21*(3), 1–32. doi:10.1080/13545701.2014.927583

Shin, J. C., Postiglione, G. A., & Huang, F. (2016). *Mass higher education development in East Asia*. Berlin: Springer International Pu.

Standing, G. (1999). Global feminization through flexible labor: A theme revisited|. *World Development*, *27*(3), 583–602. doi:10.1016/S0305-750X(98)00151-X

Steinberg, C., & Nakane, M. M. (2012). *Can women save Japan?* (Working Paper No. 12-248). USA: International Monetary Fund. doi:10.5089/9781475512922.001

Su, C. W., Li, Z. Z., Tao, R., & Lobonț, O. R. (2018). Can economic development boost the active female labor force?. *Quality & Quantity*, 1–16.

Tam, H. (2011). U-shaped female labor participation with economic development: Some panel data evidence. *Economics Letters*, *110*(2), 140–142. doi:10.1016/j.econlet.2010.11.003

Tansel, A. (2002). *Economic development and female labor force participation in Turkey: Time series evidence and cross-province estimates* (Working Paper in Economics No. 01/05). Turkey: Economic Research Center ERC.

Tejani, S., & Milberg, W. (2016). Global defeminization? Industrial upgrading and manufacturing employment in developing countries. *Feminist Economics*, *22*(2), 24–54. doi:10.1080/13545701.2015.1120880

Thevenon, O., & Ali, N. (2012). *Effects of reducing gender gaps in education and labor force participation on economic growth in the OECD* (Working Paper No. 138). Paris: OECD Social, Employment and Migration.

Trejos, S., & Barboza, G. (2015). Dynamic estimation of the relationship between trade openness and output growth in Asia. *Journal of Asian Economics*, *36*, 110–125. doi:10.1016/j.asieco.2014.10.001

Varshney, D., & Lata, S. (2014). Female migration, education and occupational development: A geospatial analysis of Asian countries. *Environment and Urbanization Asia*, *5*(1), 185–215. doi:10.1177/0975425314521549

Vashisht, P. (2016). Creating manufacturing jobs in India: Has openness to trade really helped?. *Journal of Asian Economics*, *42*, 53–64. doi:10.1016/j.asieco.2016.01.002

Verick, S. (2018). *Female labor force participation and development*. Germany: IZA World of Labor. doi:10.15185/izawol.87.v2

Vom Lehn, C. (2019). Labor market polarization, the decline of routine work, and technological change: A quantitative analysis. *Journal of Monetary Economics*.

Wamboye, E. F., & Seguino, S. (2015). Gender effects of trade openness in sub-Saharan Africa. *Feminist Economics*, *21*(3), 82–113.

Wood, A. (1998). Globalisation and the rise of labour market inequalities. *The Economic Journal*, *108*(450), 1463–1482. doi:10.1111/1468-0297.00354

Yahmed, S. B. (2010). *Gender wage discrimination and trade openness*. France: GREQAM and Université de la Méditerranée.

Yamaguchi, K. (2006). On the true relationship between female labor force participation and fertility rate: An analysis of OECD countries and its policy implications. *MEITI Journal*, *4*, 58–61.

Zoabi, H., & Saure, P. (2010). *Effects of trade on female labor force participation* (DEGIT Conference Papers No. c015_015). Denmark: DEGIT.

Appendix

In light of the potential endogeneity problem and based on previous suggestions, we conduct an instrumental variable (IV) regression to reconsider the endogeneity issue. We anticipate that there exists mutual causality between GDP per capita and FLFPR (Lechman & Kaur, 2015; Su et al., 2018), that is, inducing to endogeneity. We then use the one-period lag GDP per capita (e.g., GDP_{t-1}) as an instrumental variable. Table A1 presents the regression results by fixed-effect (FE) and two-stage least squares (2SLS) methods.

Table A1. The effect of trade on FLFPR.

	FE	2SLS	FE	2SLS	FE	2SLS
Trade openness	−0.156	0.145				
	(1.251)	(3.99)				
Export dependency			0.299	0.115		
			(1.542)	(10.240)		
Import dependency					−0.228	−0.126
					(2.353)	(8.555)
GDP per capita	0.00428	0.00434	0.00292*	0.014***	0.0039	0.0044
	(0.0073)	(0.0051)	(0.0015)	(0.001)	(0.0076)	(0.0051)
GDP_{t-1}		1.028***		1.027***		1.028***
		(0.0045)		(0.0089)		(0.0046)
Fertility	−1.217***	−8.042***	−0.956**	−8.465***	−1.259***	−7.301***
	(0.429)	(2.088)	(0.447)	(2.044)	(0.432)	(2.072)
Unemployment	−0.119	−1.468**	−0.178	−1.497***	−0.117	−1.180*
	(0.160)	(0.602)	(0.162)	(0.567)	(0.161)	(0.600)
Education	0.083***	0.089**	0.123***	0.079	0.089***	0.168
	(0.032)	(0.122)	(0.027)	(0.104)	(0.031)	(0.117)
F-statistics	4.32***	49.82***	4.82***	51.61***	4.17***	52.82***

Notes: Standard errors adjusted for heteroscedasticity are reported in parentheses.
The dependent variable is GDP per capita in the first-stage coefficients GDP_{t-1} of 2SLS regression.
* , ** and ***indicate significance at the 10%, 5% and 1% level, respectively.

From Table A1, we can see that the main explanatory variables (trade openness, export and import dependency) are not significant. Thereby, it can be inferred that there may exist nonlinear relationships between trade openness and FLFPR. Furthermore, the coefficients of control variables for these two methods are basically consistent. Thus, we can conclude the endogeneity problem will not exert a significant effect on regression results.