Hiring Skilled Workers in Global Production Sharing: Evidence of Thai Manufacturing Plants

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Issues

- Hiring skilled workers plays a crucial role to the productivity enhancement and upgrading for firms. Governments in many countries put great effort to enlarge a pool of skilled workers. This is especially true for vocational trained workers whose skill are largely accumulated in production lines.

- This issue deserves special closer attention in twofold.

1. Role of demand-sides, firm's decision in hiring skilled workers

2. Effect of global production sharing (GPS)

1. Roles of Demand-side Factors

- Enlarging a pool of skilled workers must be done with care. In fact, it is based on the implicit assumption that demand for skilled workers continue to grow.

- A number of studies (e.g. Antonelli et al, 2009 &2010; Antonioli et al., 2011; Blatter et al., 2012; Blatter et al. ,2016; Bustos , 2011a and 2012b; Schneider, 2015; and Jongwanich and Kohpaiboon, 2015) raise concerns about overemphasising in supply-side factors as decision firms hire skilled workers is complicated.

- Better understanding about the demand-side factors is needed to ensure adequate demand for the enlarging skilled workforces.

2. Global Production Sharing (GPS)

- GPS is referred to a circumstance where the whole production processes are divided into separated stages and economically allocated in many locations according to competitiveness.

- On the one hand, given the fact that developed countries are relatively endowed by skilled labor as opposed to developing counterparts, activities outsourced to developing countries as a result of global production sharing would be unskilled-labor intensive.

- On the other hand, despite being regarded as unskilled-labor intensive in the context of developed countries, activities could be skilled-labor intensive in the developing countries. In other words, firms operating in developing and developed countries are facing different cones of production (Leamer and Levinsohn 1995; Feenstra 2004; Leamer et al. 2005; and Kiyota 2012).

- Despite immense policy relevant, empirical work to gain better understanding on such decision to hire workers is lopsided to the impact on developed countries.

- The effect on developing countries is both theoretically and empirically unknown.

- Against this backdrop, the paper examines hiring skilled workers at the plant level of Thai manufacturing with a view to gain better understanding its key determinants.

Thailand as a case study

- The country has been long engaged into GPS organized by multinational enterprises.

- Trade liberalization in Thailand remains important as its progress has been stalled since the new millennium. All progress was undertaken through free trade agreement (FTA) negotiations. Hence, whether FTA-led liberalization can partially substitute for unilateral ones in terms of promoting upgrading and hiring skilled workers remains open question.

About the Paper

- The paper examines hiring skilled workers at the plant level of Thai manufacturing with a view to gain better understanding its key determinants.

- The determinants include both firm- and industry-specific variables.

- Reduced form employment equation is estimated, using the Thai manufacturing censuses between 2006 and 2016.

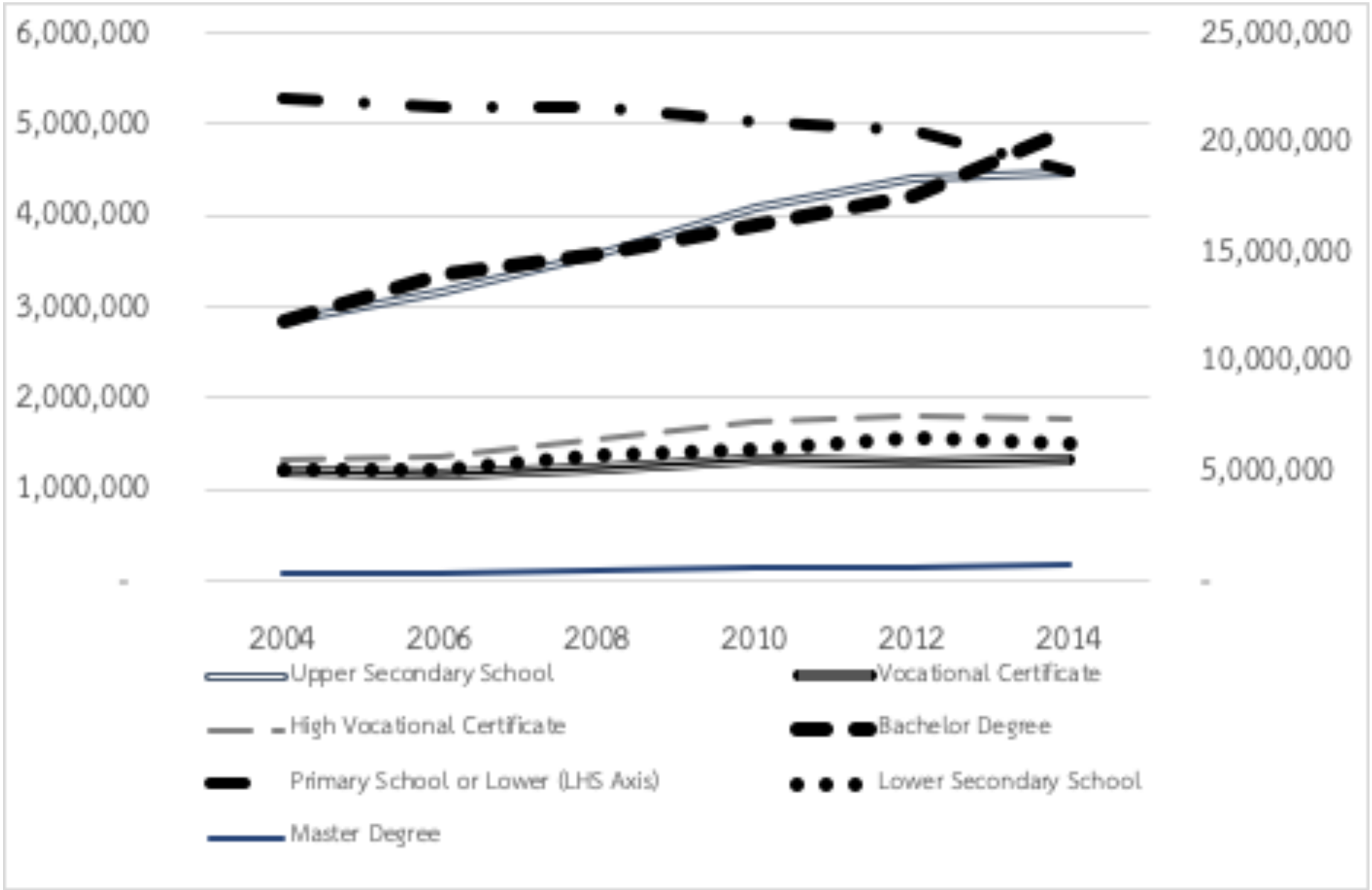
Current Situation of Skilled Workers in Thailand

- Labor shortage problem is not new for Thailand,firstly addressed in the late 1980s. (in the sixth national economic and social development plan).

- Note that labor shortage in this paper is referred to quantity shortage which is largely found in vocational training workers.

- Another important aspect in labor market is quality mismatching, i.e. workers' qualification that does not fit to the need by firms (either over or under qualified). It is more applicable for tertiary education. While both are equally important and policy relevant, quantity mismatching is emphasized in this study.

Figure 1
Hired Workers Classified by Education Background 2003-14



Source: Author's compilation from Table 3.4 from Report submitted to Office of the Education Council (2016).

Workforces Classified According to their Education Background and Job Market Participation in 2017 and 2018

Education background	2017	2018	Participation rate (% to total graduate)
Lower Secondary	697,837	725,660	9.6
Upper Secondary	397,997	413,469	5.0
Vocational Certificates	183,233	246,426	19.4
High Vocational Certificates	161,924	161,924	59.0
Bachelorof Arts	377,003	447,454	89.5

Table 2
(%) of Labor Shortage Classified by Education Background

	Whole Country		Bangkok		Vicinity		Central		North		Northeast		South	
	2008	2013	2008	2013	2008	2013	2008	2013	2008	2013	2008	2013	2008	2013
Lower secondary school or lower	64.9	31.6	48	28.1	81.1	36	71.7	34.5	72.4	30.6	69.8	39	44.5	29.2
Vocational Certificates	11.1	17.3	19.1	16	6.6	18	11.7	18.9	6.4	17.8	6.7	9.2	11.2	24
High Vocational Certificates	5.2	8.7	11.4	9.9	2.9	8.7	2.9	6.3	5.8	8.9	2.8	5.5	4.8	9.7
Bachelor Degree or higher	11.9	15.2	19.4	25.4	6	12.8	8	5	6.5	7.9	8.7	5.1	22.7	8.7
Others	1.2	1.2	1	0.2	0.1	0	0.1	2.8	1	0	5.7	9.9	0.7	0
Unidentified	5.7	26	1.1	20.4	3.3	24.5	5.6	32.5	7.9	34.8	6.3	31.3	16.1	28.4
Total Sample (1,000)	250	182	54	74	52	29	62	26	18	18	33	15	32	20
% to Total Sample	100	100	21.5	40.7	20.7	15.9	24.9	14.2	7.0	10.0	13.3	8.1	12.6	11.1

Source: Enterprises Survey by National Statistics Office (Table 19 for 2008 survey and Table 7 for 2013 survey)

- Decision for continuing study would be derived from the relatively low compensation to vocational-graduated workers as opposed to university-graduated ones. This is worsened by the recent populists pursued.

- The clear example was the election campaign (the starting 15,000-baht salary for university graduates) and then implemented in Yingluck Shinawatra Administration (Bangkok Post, 2011; Tana, 2016). To a large extent, the similar populist was found in many political parties in the 2019 election including the government-coalition leading party, Palang Pracharath Party.

- Nonetheless, such a promise is associated with the starting 18,000-baht salary for vocational education graduates) (Bangkok Post, 2019).

- As argued in Pukpong and Suppanut (2013), universities are more likely to receive financial support from the government as opposed to vocational schools. This is especially true for budget on tools and equipment. This would entice vocational schools transform themselves to universities.

Skill Development Promotion

- Department of Skill Development (DSD), Ministry of Labor is the agency in charge. This is done in addition to the effort of formal education reform under the responsibility of Ministry of Education.

- DSD's responsibility is under Skill Development Promotion Act BE 2545 (2002) and then amended in 2014.

- Two main activities

    1. Training programs of skill formation by DSD.

    2. Granting financial support to firms undertaking in-house training and promoting skill formation.

Skill Development Promotion:
DSD Training programs

- A number of trainees in DSD programs have been less than 500,000 workers with declining trend.

- most of training attendants are those in the labor markets

- skill trained in the DSD training programs is rather wide, covering construction, industrial, mechanics, electricians, technician, industrial agriculture, and services. It seems that the true purpose of the training program is to offer alternative skill for workers as an insurance policy.

- For example, electrician skill offered is to add new skill to trainees to fix electrical appliances. Another example, one type of service skill offered in the training program is to train massage therapists.

Skill Development Promotion: Loan Programs

	Number of Establishments (1)	Number of Workers involved (2)	Workers per establishments (3)= (2)/(1)	Training Expense (Mil Baht) (4)	Expense per workers (Bath/ worker) (5) = (4)/
2009	22,983	4,372,985	190	n.a.	n.a.
2010	22,656	3,938,212	174	n.a.	n.a.
2011	25,388	4,048,332	159	3.4	848
2012	22,241	2,491,127	112	1,377	553
2013	32,110	4,627,225	144	1,805	390

Data set and Econometric Procedures

- The data set used in this research is Thailand's industrial census, conducted by the National Statistical Office. So far, four censuses are available (i.e. 1996, 2006, 2011, and 2016). A fraction of observation can be matched and conduct a panel-data analysis amongst the three latest censuses (2006, 2011, and 2016), i.e. 9,211 observations. In this paper, the panel data of 9,912 observations over the three latest censuses are used.

- Data cleaning in our study starts with examining the possibility of duplicated observations, i.e. samples with different plants' identification numbers report the same value of key variables.

- As our dependent variable (a number of skill workers) is censored to zero, i.e. it cannot be negative value and there are a number of zero observations, Poisson Pseudo Maximum Likelihood (PPML) model is our preferred choice.

Empirical Model

$$Skill_{ij,t} = \beta_0 + \beta_1 \pi + \beta_2 size^2_{ij,t} + \beta_3 \left(\frac{K}{L}\right)_{ij,t} + \beta_4 \exp_{ij,t} + \beta_5 imp_{ij,t} + \beta_6 own_{ij,t} + \beta_7 RDS_{ij,t} \quad (8)$$
$$\alpha_1 HHI_{j,t} + \alpha_2 ERP_{j,t} + \alpha_3 HHI_{j,t} * ERP_{j,t} + \alpha_4 Network_{j,t} + \varepsilon_{ij,t}$$

Dependent variable

$Skill_{ij}$ = A number of skill workers of establishment *i* in industry *j* at time *t, alternatively measured by*

(1) $skill\_1_{ij,t}$ = a number of skill production workers and

(2) $skill\_2_{ij,t}$ = a number of skill production workers plus white collar workers.

Explanatory variables

$size_{ij,t}$ (?) = Size of establishment *i* in industry *j* at time *t,* proxied by (real) sale value.

$\left(\frac{K}{L}\right)_{ij,t}$ (?) = Capital-labor ratio of establishment *i* in industry *j* at time *t.*

$\exp_{ij,t}$ (+) = Export-output ratio of establishment *i* in industry *j* at time *t*

$imp_{ij,t}$ (+) = Ratio of imported to total raw materials and intermediates of establishment *i* in industry *j* at time *t*

$own_{ij,t}$ (+) = Foreign ownership of establishment *i* in industry *j* at time *t*

$RDS_{ij,t}$ (+) = ratio of R&D expense to total sales of establishment *i* in industry *j* at time *t*

$HHI_{j,t}$ (-) = Industrial concentration of industry *j* at time *t* , proxied by Hirschman-Herfindahl (see the formula in Equation 5).

$ERP_{j,t}$ (-) = Trade protection of industry *j* at time *t ,* measured by effective rate of protection (see the formula in Equation 6)

$Network_{j,t}$ (?) = GPS participation of industry *j* at time *t ,* proxied by the ratio of parts and components to total trade (see the formula in Equation 7).

ε_{ij} = Disturbance term

(Expected signs are expressed in the parenthesis)

Table 6
PPML Estimation Results (Dependent Variable = a number of skilled workers)

	(a) $skill\_1_{ij,t}$		(b) $skill\_2_{ij,t}$		(c) $skill\_1_{ij,t}$		(d) $skill\_2_{ij,t}$	
	Coeff	Z-stat	Coeff	Z-stat	Coeff	Z-stat	Coeff	Z-stat
$\left(\frac{K}{L}\right)_{ij,t}$	-0.175***	-199.52	-0.182***	-171.94				
$own_{ij,t}$	0.398***	58.08	0.256***	30.07	0.290***	42.61	0.103***	12.25
$size_{ij,t}$	0.182***	15.65	-0.068***	-4.9	0.143***	12.5	-0.06***	-4.51
$size^2_{ij,t}$	0.002***	5.47	0.009***	24.4	0.001***	2.43	0.006***	18.02
$\exp_{ij,t}$	0.329***	55.51	0.123***	16.84	0.298***	50.32	0.108***	14.91
$imp_{ij,t}$	0.341***	49.17	0.057***	6.66	0.332***	47.97	0.054***	6.3
$RDS_{ij,t}$	0.050***	24.52	0.005*	1.99	0.038***	18.98	-0.006**	-2.33
$ERP_{j,t}$	-0.016***	-164.08	0.000**	-2.54	-0.015***	-157.15	0.000	1.14
$HHI_{j,t}$	-0.447***	-19	0.030	1.04	-0.506***	-21.37	0.018	0.65
$HHI_{j,t} * ERP_{j,t}$	-0.002**	-2.4	-0.026***	-21.9	-0.010***	-11.56	-0.04***	-29.14
$Network_{j,t}$	0.012***	24.27	0.010***	16.9	0.006***	13.15	0.006***	10.32
$\left(\frac{K}{L}\right)_{j,t}$					-0.157	-96.14	-0.10***	-51.09
# of obs	6,717		6,717		6,717		6,717	
Wald Test	118321.54***		52501.93***		91630.03***		26912.58***	

Note: ***,**, and * indicate statistical significance at 1 5 and 10 per cent; In our estimation, an intercept is included together with industry dummies. We do not report them here for space limitation.
Source: Author's Estimation

Table 7
Tobit Estimation Results (Dependent Variable = a ratio of skilled to total workers)

	(a) $skill\_1_{ij,t}$		(b) $skill\_2_{ij,t}$	
	Coeff	Z-stat	Coeff	Z-stat
$\left(\frac{K}{L}\right)_{ij,t}$	0.006***	3.02	-0.0041	-1.0100
$own_{ij,t}$	-0.013	-0.7	-0.0007	-0.0200
$size_{ij,t}$	0.000	0.42	-0.0003	-0.3300
$size^2_{ij,t}$	0.051**	2.69	0.1106***	3.0900
$\exp_{ij,t}$	-0.039**	-2.53	0.0621**	2.1200
$imp_{ij,t}$	0.026*	1.48	0.1084***	3.2000
$RDS_{ij,t}$	0.006	0.9	0.0339**	2.5500
$ERP_{j,t}$	-0.001***	-4.76	-0.0072***	-14.6900
$HHI_{j,t}$	-0.027	-0.41	-0.0412	-0.3000
$HHI_{j,t} * ERP_{j,t}$	-0.005*	-1.69	-0.0121*	-1.8200
$Network_{j,t}$	0.000	-0.16	0.0100	3.0700
จำนวนตัวอย่าง	6,717		6,689	
Wald Test	301.64***		1024.32***	

Note: ***,**, and * indicate statistical significance at 1 5 and 10 per cent; In our estimation, an intercept is included together with industry dummies. We do not report them here for space limitation.
Source: Author's Estimation

Conclusion

- The paper examines hiring skilled workers at the plant level of Thai manufacturing with a view to gain better understanding its key determinants. Three censuses of Thai manufacturing between 2006 and 2016 are used to perform the panel econometrics.

- Labour shortage is not new but long recognized in policy circle of Thailand but effective policy measure so far has been enlarging a pool of skilled workforces through a formal education. This seems to be risky and could worsen the existing quality mismatching problem.

- Our econometric analysis suggests that demand-side factors matters. Conducive environment (exposing to global trade, ensuring presence of competitive pressures and participating in GPS) must go hand in hand with enlarging a pool of skilled workforces.

- Installed physical capital so far is labor saving technology so that demand for workers will be less. The lowered labor demand effect seems to be stronger for unskilled workers.

- Unskilled and skilled workers are complement in Thai manufacturing. This would have immense implication on managing unskilled foreign workers from neighbouring countries.

Policy Inferences

1. It is crucial to take the role of demand sides into policy consideration when reviewing policies to promote skill formation. Solely enlarging skilled workforces while ignoring them could not mitigate labour shortage but worsen quality mismatching.

2. Evidence from Thai manufacturing provides support for developing countries to open up to international trade and participate in global production sharing. Mutual benefit from participating in the global production network remains to be shared between developed and developing countries.

3. The relative importance of competitive pressure urges for further trade liberalization which was overlooked after FTA proliferation. In fact, trade liberalization through FTAs are far from perfect to substitute for unilateral tariff liberalization.