



SENIOR RESEARCH

**The Impact of Trade Liberalization on Wage Premium: Case Study on
Thailand's 10 S – Curve Industries**

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Abstract

This paper investigates the impact of trade liberalization on wage and skill premium of Thailand's 10 S-curve industries (New Engine of Growth). 10 S-curve industries are the targeted industries that the Ministry of Industry under government Prayuth Chan-Ocha has proposed under the framework that Thailand would push the economic growth (S-Curve) through five potential industries (First S-curve) and five future industries (New S-curve) to drive the economy into the next phase and to achieve high-income status within 20 years. The estimation is using average tariff rate from UNCTAD as a trade liberalize measure and using individual data from Thailand's Labor Force Survey. The result reveals that tariff reduction is associated with rising wages for overall S-curve industries and is benefit capital intensive more than labor intensive industries. Moreover, this study reveals that as tariff level declines, skill premium widens.

1. Introduction

For the past two decades, the world has changed very fast. We must agree that trade liberalization becomes a major role on the countries' growth and development. There is a surge in Regional Trade Agreements (RTAs) since the mid of 1990s. From about 50 in 1990, the number of RTAs notified to the World Trade Organization (WTO) has crossed 250 in 2003¹. And in 2017, the number of cumulative RTAs in force is over 430². However, the benefits of globalization especially trade liberalization has become a cliché³ as it has been blamed for rising inequality in rich and poor countries⁴. Recently, new evidence that shows how people in the country think they lost benefit from trade openness is the incidence of BREXIT, when majority of British people voted to leave the European Union (EU). The result of the vote shocked and surprised the world. According to the paper: "Trump, Brexit, and the rise of Populism: Economic have-nots and cultural backlash." (2016) of Inglehart, Ronald, and Pippa Norris. Their paper emphasizes the consequences for electoral behavior arising from profound changes transforming the workforce and society in postindustrial economies. Because of the rise in technological automation, and the collapse of global flows of goods and capital, there is overwhelming evidence of powerful trends toward greater income and wealth inequality. According to this incidence, it leads to low-waged unskilled workers, and the long term unemployed.

This study examines the effect of trade liberalization on wage and skill premium of 10 S-curve industries by extracting individual level data from the Labor Force Survey such as age, gender, marital status, and education using an ISIC panel to get specific data of the industries. For trade liberalization measure, I use average tariff rate by extracting HS code from UNCTAD of each.

There are many studies on this relationship, but most of them focus on how big developed countries would get or loss benefit overtime and most of the paper have done it across countries using macro level of data. The results are various among the papers as each country does not have the same resources. For example, Florence, Subirlal, and Papa (2013) finds a negative relationship that trade liberalization leads to lower income inequality, while financial liberalization leads to higher income inequality. Same as the study from Amity (2012), finds that with the evidence of globalization impact on Indonesian workers, trade liberalization raises wage for workers in every dimensions. On the other hand, the study from Goldberg, Koujianou, Parcnik (2007) finds that globalization leads to more demand of skilled labor even in developing countries and technological change may depress the demand for low-skilled workers. A study from Kusuna finds that globalization increases productivity and skill premium. She also found out that the decrease in tariff rate increases skill premium. A study from *Archanun* (2014) finds that globalization enlarges wage skill premiums. Cutting tariff induces greater demand for skilled labors and raise wage for them, on the other hand, it could have a negative impact on unskilled labor.

Unlike the other papers that focusing on big picture using macro level data, I use individual data from the Labor Force Survey so that I could control individual's characteristics that I want in the regression to get precise result. Moreover, this is the first study on the impact of trade liberalization on skill premium

¹ Parthapratim Pal: *Regional Trade Agreements in a Multilateral Trade Regime: An Overview*

² Source: WTO Secretariat

³ Stanford Institute for Economic Policy Research (SIEPR), *Globalization: Is It Good or Bad?*. December 2002

⁴ Globalization and Wage Inequality- Elhanan Helpman. Harvard University and CIFAR December 2, 2016

of Thailand's 10 S-curve industries. This paper will give an implication on the labor force preparation for the New Engine of Growth- 10 S-curve industries' policy to make labor management most effective and make the policy possible.

The paper is organized as follows. Section 2 presents trade liberalization policy in Thailand, and general information and the data of 10 S-curve industries. Section 3 details the methodology used in my empirical work, followed by empirical result in section 4. In the final section, I conclude the results I get and gives policy implication.

2. Data and Variable

2.1 Trade Liberalization in Thailand & 10 S-Curve Industries Tariffs

There are many indexes to measure trade liberalization. In this paper, I use average tariff rate as a trade liberalization index because it is the most obvious index to measure liberalization and is also the most available data that cover the period I study.

Thailand's high tariff structure remains a major market access impediment. Since 1990, Thailand had an outstanding economic performance with real GDP growth averaging almost 9 percent annually. This strong expansion was partly the outcome of market-oriented structural reforms, undertaken by successive governments during the 1980s, including reductions in barriers both to imports and exports, and the liberalization of the foreign investment regime. Unfortunately, Thailand faced severe economic recession in 1997. It was started when the commercial banks reported a huge increase in non-performing loans at the end of 1996, and export declined in 1997, indicating a possible fall in external competitiveness. In response to the crisis, the Thai authorities established a market-based exchange rate system, thereby abandoning the peg to a basket of currencies. Basically, the government tried to use several aspects of liberalization such as trade and foreign investment regime to speed up structural adjustment⁵.

Before the crisis, the tariff rate was in downwards trend even though it was quite fluctuated. From figure 1, in 2000 Thailand's tariff rate (most favored nation, weighted mean, all products (percent)) was at 9.48 percent then it was aggressively declined to 5.84 percent in 2004. As Thailand is an original member of the Association of South-East Asian Nations (ASEAN); it participates in the ASEAN Free-Trade Area (AFTA) and provides preferential tariffs on imports from ASEAN countries⁶. Under the Common Effective Preferential Tariff (CEPT) to a maximum 5 percent by end 2002, or by end 2003 on a few products⁷.

Looking at the 10 S-curve industry's tariffs to see if they had changed much after 2003. In figure 2, a year right after 2003, most of the industries' tariff rates steeply dropped down. Even though some of them

⁵ WTO- Secretariat Report PRESS RELEASE PRESS/TPRB/122 10 December 1999

⁶ WTO- Trade Policy Review Thailand 2003

⁷ CEPT was to be achieved initially by 2008, but this was accelerated to 2003 for original members and then to 2002 for most products following the financial crisis. Longer transitional periods apply to new ASEAN members: 2006 for Viet Nam, 2008 for Laos and Myanmar, and 2010 for Cambodia.

had increased the tariff rate again in 2005, but overall, the average of industries' tariff rate after the reform is lower than what they were. However, the average tariff rates of S-curve industries were much higher than the average tariff rate of most favored nation, indicating that there is a high level of protection on labor market especially on the focused industries.

As mention above about Thailand's tariff reformation in 2003, I select the period from 2001-2014 to see how trade openness affects wages of S-curve industries overtime. For Next-Generation Automotive, Smart Electronics, Agriculture and Biotechnology, Food for the Future, Robotics, Aviation and Logistics, Biofuels and Biochemical, Digital, and Medical Hub, I collect the data from UNCTAD by selecting simple average tariff rate based in industries' definitions and ISIC-HS Code concordance⁸. Since Tourism is a service good, so it does not have an actual tariff rate. Even though there are some studies on the equivalent tariff of tourism sector, but data provided in a few periods of time which is not enough in this study. So, with the data limitation, I decided to drop Tourism. Otherwise, the number of total observation would be very small. For some industries, I collect more than one HS Code of simple average tariff rate as one HS Code does not cover the whole definition of an industry. For industries that I collect more than one HS Code tariff rate, I average them to get one tariff rate for an industry.

Industry	HS Code
Next-Generation Automotive	8707, 8708, 8711, 8714
Smart Electronics	85
Agriculture and Biotechnology	01, 803, 1005, 1006, 1209, 1211, 1212
Food for the Future	16
Robotics	84795
Aviation and Logistics	88, 89
Biofuels and Biochemical	2710
Digital	8417
Medical Hub	9018, 9022, 9402
Wellness Tourism	-

2.2 Data: Overall Thailand Labor Market

In this section, I will describe the general information of Thailand's labor market.

Labor force in Thailand has increased at a faster pace than the population⁹. From 2001 – 2014, the number of labor force increase 10.52 percent while the number of population grows only at 0.5 percent.

Out of 100 persons, labor force has increased from 56 persons in 2001 to 59 persons in 2014.

Unemployment rate was 2.6 percent and dropped to 0.84 percent.

Education For workers having education lower secondary or lower, the share of employment decreased from 91.27 percent in 2001 to 82.39 percent while labor share with education upper secondary or

⁸ I will call following industries for the rest of this paper- Next-Generation Automotive: Vehicle, Smart Electronics: Electronics, Agriculture and Biotechnology: Agriculture, Food for the Future: Food, Robotics: Robotics, Aviation and Logistics: Logistics, Biofuels and Biochemical: Biofuels, Digital: Digital, Medical Hub: Medical Hub, and Wellness Tourism: Tourism.

⁹ Labor Force Structure Change and Thai Labor Market, 1990-2008 Chairat Aemkulwat Chulalongkorn University

higher went up from 7.12 percent in 2001 to 14.45 percent in 2015, and labor with university went up from 1.61 percent to 3.23 percent.

Industry In 2001, agriculture sector had the largest share of employment among three sectors (agriculture, service, and manufacturing.) Overtime, workers migrated from agriculture sector to the manufacturing and service sectors. Agricultural share of employment decreased from 46.02 percent in 2001 to 35.18 percent in 2014. Manufacturing share increased from 18.82 percent to 22.74 percent. Service turned to have the largest employment share with the increase from 35.11 percent to 41.87 percent within 14 periods (2001-2014).

Wage Over 2001-2014, average real wage of grew at of 8.38 percent annually. In 2012, it grew the highest at 31.72 percent since the government Yingluck had proposed new minimum wage policy at 300 baht per day and this policy was adapted in every provinces. Real wage of 10 S-curve industries was at 7341.18 baht in 2001, and increased to 21207.5 baht in 2014.

Productivity According to World Bank Group Report: Thailand: Systematic Country Diagnostic, April 2017, Thailand has a large productivity gaps across sectors compared to the other countries such as China Vietnam Turkey and Malaysia. Figure 3 shows the ratio of labor productivity in agriculture to labor productivity in industry and services. In Thailand, industrial workers and service workers are 6.5 and 4.7 respectively more productive than farmers. In figure 4 shows value added per full-time equivalent worker (in 2002 constant prices), people who work in manufacturing sector had about 10 times value added more than those one who work in agricultural sector in 2000, and about 8 times in 2013.

10 S-Curve Industries Over time, the average employment rate of 10 S-curve industries increased at the rate 14.82 percent, higher than rate of labor force growth. Electronics has the highest growth rate of employment at 79.08 percent during 2001-2014. Follow by Vehicle 65.09 percent and Biofuels 64.18 percent. Table 1 shows summary statistic which includes the share of employment for 10 S-curve industries, agriculture remains the biggest portion even though it started to decrease over time. Figure 5 shows average real wage of 10 S-Curve industries which grew at of 3.32 percent annually. In 2012, it grew the highest at 17.14 because of minimum wage policy. It was adapted to every province again in the next year which leads to 9.45 percent higher in average real wage. Real wage of 10 S-curve industries was at 9297.4 baht in 2001, and increased to 14896.98 baht in 2014.

2.2.1) 10 S-Curve Industry

Background of 10 S-curve Industries: Thailand's Economy Struggling

Thailand used to be the targeted country to invest. The economy of Thailand grew at an average annual rate of 7.7 percent for nearly four decades (see figure 6) and its export grew at a very impressive annual rate of 15 percent from 1986- 1996. In the same period, private investments averaged more than 30 percent of GDP (see figure 7). Thailand is a country of vast potential but recent growth has been slowing; it has also lost the competitive edge once enjoyed over other countries in the region. During 2001-2005, investment dropped to 9 percent¹⁰. In figure 8, FDI has also in a low level compared with those of the ASEAN countries. Growth has slowed sharply to 3.3 percent over the last decade. At this rate of growth is not enough to drive the economy into the next phase and it will take Thailand more

¹⁰ During the period of 2001-2003, 1 percent investment increased 0.7 percent GDP, while 2006-2014, it only increased 0.3 percent of GDP

than 20 years to achieve high-income status. And that means Thailand need to have 10 percent of investment by average and 6 percent GDP continuously for the next 17 years.

Therefore, to accomplish the goal, on November 2015, the Ministry of Industry has proposed “10 Targeted Industries”: New Engine of Growth under the framework that Thailand would push the economic growth (S-Curve) through two categories: five potential industries (First S-curve) and five future industries (New S-curve). The aim of these targeted S-curve industries is to attract leading firms to invest in Thailand in order to develop workers’ skills and to improve technology. Hence, the competitiveness of the country will be increased by developing from manufacturing and asset based industry into knowledge based industry.

What are 10 S-curve Industries

As I mentioned in the introduction part that most of the papers have done the studies in big picture using macro data level, in this paper, I will use individual data of Thailand’s Labor Force Survey from NSO (National Statistic Office) to extract out variables that I want and put in the regression to find how trade liberalization affect wage of each industry.

Noting that this is the first paper on 10 S-curve industries, so no one has ever categorized them into an official ISIC Code before. To extract the data of individuals who work in 10 S-curve industries from the Labor Force Survey, I look up for each industry’s definition that the ministry of industry provides and categorize them to an ISIC Code.

So, I collect the data from period 2001-2014 using LFS data quarter 3 as it is the most stable period that people tend to be more settle to their jobs.

For the employment rate of 10 S-curve industries, they are fluctuated over time as people shift their job to different industries. In 2011, the employment rate swung the most as the Labor Force Survey changed industry’s ISIC code from ISIC 3 to ISIC 4¹¹.

According to the definition provided, agriculture is the biggest share of employment for the S-curve industries; therefore I cannot really separate out which sub categories are high-tech industries from the big group.

The 10 S-curve : definition and ISIC Code

First S-curve

1. Next-Generation Automotive: manufacture of electric vehicle including the bodies, parts, and accessories. (ISIC 3: 34 , ISIC4: 29)
2. Smart Electronics : manufacture of electronic component and boards, circuits, smart appliances, and microelectronics (ISIC 3: 31 , ISIC4:)
3. Affluent, Medical and Wellness Tourism : eco-tourism (ISIC 3: 63, ISIC4: 79)
4. Agriculture and Biotechnology : agriculture using high technology (ISIC 3: 01, ISIC4: 01)
5. Food for the Future : manufacture of processing food (ISIC 3: 15, ISIC4: 10)

¹¹ 2001-2011 : ISIC3, 2012-2015: ISIC 4

New S-curve

1. Robotics : manufacture of industrial robots (ISIC 3: 29, ISIC4: 28)
2. Aviation and Logistics : logistics, manufacture of aircraft and building ships (ISIC 3: 35 , ISIC4: 30)
3. Biofuels and Biochemical : manufacture of biofuels(ISIC 3: 2320, ISIC4: 1920)
4. Digital : manufacture of software (ISIC 3: 72 , ISIC4: 62)
5. Medical Hub : manufacture of medical and dental instruments and supplies (ISIC 3: 3311, ISIC4: 3250)

3. Methodology

I will divide into three steps: first step, I will find the relationship of trade liberalization on wage of overall S-curve industries to see if trade liberalization really benefit people in the S-curve. Second step, I will find the relationship separately on each of the industry. Third step, I will find the impact of trade liberalization on wage differential between skilled and unskilled workers.

3.1 Trade Liberalization Impact on Overall S-curve Industries

For the first step, I will find the relationship of trade liberalization on wage of overall S-curve industries by using linear regression to get coefficient of each variable with industry fixed effects and year fixed effects and putting individual's characteristics such as age¹², gender, marital status, and education level in the equation as follow. Of particular interest to this study is the coefficient of tariff and worker characteristics to see how tariff reduction benefit which characteristic groups of the worker the most.

$$\begin{aligned} \ln(Wage)_{i,j,t} = & \alpha + \beta_1 AGE_{i,j,t} + \beta_2 AGE^2_{i,j,t} + \beta_3 GENDER_{i,j,t} + \beta_4 MARITAL STATUS_{i,j,t} \\ & + \beta_5 EDUCATION LEVEL_{i,j,t} + \beta_6 TARIFF_{j,t} + \beta_7 INDUSTRY DUMMY_j + \beta_8 Year_t \\ & + \beta_9 MALEXTARIFF + \beta_{10} MARRIEDXTARIFF + \beta_{11} UNIVERSITYXTARIFF \\ & + \beta_{12} SECONDARYXTARIFF + e_{i,j,t} \end{aligned}$$

Where, *i*= individual, *j*= industry, *t*= year, (*t* = 2001, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2013, 2014) *AGE*= age of an individual, *GENDER*= gender dummy, *MARITAL STATUS*= marital status dummy, *EDUCATION LEVEL*= education level dummy which are Secondary, for education at upper secondary level and University, for education level at university level. *TARIFF*= industrial tariffs, *INDUSTRY DUMMY*= industry fixed effect which are Agriculture, Medical Hub, Biofuel, Food, Electronics, Robotics, Logistic, Vehicle and Digital. *Year*= year fixed effect for 14 periods (2001-2014). *MALEXTARIFF*= the effect of trade liberalization on gender. *MARRIEDXTARIFF*= the differential effect of trade liberalization on marital status. *UNIVERSITYXTARIFF*= the differential effect of trade liberalization on people who attain university level of education. *SECONDARYXTARIFF*= the differential effect of trade liberalization on people who attain secondary level of education. And *e* is the error term.

¹² I put both age and age square to prevent linear collinearity problem.

3.2 Trade Liberalization Impact on Each S-curve Industry

Once I get the result from the first step whether tariff reduction benefit overall S-curve industries or not. Next, I will find the relationship separately on each of the industry to see how trade reduction affect wages of industries differently. For this step, I cut off year and industry fixed effect.

$$\begin{aligned} \ln(Wage)_{i,t} = & \alpha + \beta_1 AGE_{i,t} + \beta_2 AGE^2_{i,t} + \beta_3 GENDER_{i,t} + \beta_4 MARITAL STATUS_{i,t} \\ & + \beta_5 EDUCATION LEVEL_{i,t} + \beta_6 TARIFF_t + \beta_7 MALEXTARIFF \\ & + \beta_8 MARRIEDXTARIFF + \beta_9 UNIVERSITYXTARIFF + \beta_{10} SECONDARYXTARIFF \\ & + e_{i,t} \end{aligned}$$

3.3 Trade Liberalization Impact on Skill Premium

Lastly, I want to find the effect of tariff reduction on skill premium¹³ of S-curve workers whether trade liberalization would increase or decrease the wage gap. So, I set wage differential as a dependent variable as follows. Actually, there are many factors that would affect the wage premium, however, with time and data limitation, I only put tariff rate as an independent variable.

$$WP_{j,t} = \beta_0 + \beta_1(TARIFF_{j,t}) e_{j,t}$$

Where **WP** = wage premium between skilled and unskilled labor of industry *i* in year *t* (*t* = 2001, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2013, 2014) and **TARIFF** = average tariff rate. According to Avalos and Savvides (2006), trade openness is expected to increase the demand for unskilled labor and may narrow the wage gap.

4. Result

4.1 Trade Liberalization Impact on Overall S-curve Industries

Table 2 shows the result of equation 1, observing the relationship of workers' characteristics and the effect of trade liberalization on wage of overall S-curve industries,

Characteristics For the characteristics of an individual, the result reveals that age are significantly important on wage rising, the higher the age, the higher the wage. For gender, male workers earn higher wage relative to female workers by 19.2 percent. Moreover, married workers earn more wage than the single counterparts by 8.21 percent.

¹³ Skill premium is the wage differential between skilled and unskilled workers. I categorize them based on education requirement according to their occupation using Occupation Code of LFS's Data Dictionary. Skilled workers :01-04, and unskilled worker : 05-09

Education, as I put lower secondary and below as base category, the result shows that people who have upper secondary education¹⁴ will get 33.2 percent higher in wage than those who do not. And people who have university level of education¹⁵ will get 100.07 percent higher wage than people who have below secondary education.

Tariff the relationship of wage and trade liberalization or tariff reduction is associated with the expectation. The result reveals that tariff reduction leads to rising in wage of overall S-curve industry. 1 percent tariff reduction will lead to 46.3 percent increase in wage of overall S-curve industries. Other than that, it is significantly significant that the reduction in tariff benefit people who have upper secondary as they earn more by 12.6 percent. In additional, female workers benefit more than male workers as tariff reduction leads to 7.44 percent higher in wage.

4.2 Trade Liberalization Impact on Each S-curve Industry

From first step, the results in table 2 shown that trade openness is associated with wage rising in overall S-curve industries. The purpose of this section is to find the impact of trade liberalization directly on each of the industry.

Even though first step has revealed that tariff reduction leads to wage rising in S-curve industries, but looking separately at each of the industry finds that not all industry that trade openness is associated with wage increasing. In table 3, for Electronics and Robotics industry, the result shows that they have negative relationship at 99 per cent confidential, indicating that reduction in tariff level have significant influence on wage rising, while Agriculture and Food have positive relationship, indicating that lowering in tariff level have significant influence on wage reduction. All in all, it could be interpreted that trade liberalization benefit capital intensive more than labor intensive industries, which in turn makes workers working in capital intensive industries better off relative to worker working in labor intensive industries from wage rising.

4.3 Trade Liberalization Impact on Skill Premium

In long run, when factors of production are mobile across industries, Heckscher-Ohlin's theory would predict that factor prices will be equalized across industries followed by Stolper-Samuelson theorem which suggests that labor abundant countries should experiences skill premium declines. However the result of this study agrees with the paper of Goldberg, Koujianou, Parcnik (2007), Kusuna, and Archanun (2014) that the tariff reduction has negative influence on wage premium of skilled and unskilled labor as shown in table 4, without controlling any other factors condition in this paper, indicating that as tariff rates decline, gap of skilled and unskilled wage widens. This is contrary to the initial theories that wage premium would fall as protection declines. The study reveals that even though globalization goes backward, skilled premium still increases even in labor abundant country like Thailand. This could be interpreted that trade openness increases the demand for skilled labors relative to unskilled labors because of technology and international fragmentation. Therefore, the government should have policies to reduce this skill differential and to support the labor supply for the S-curve industries which require more skilled labor to work in those industries.

¹⁴ Upper Secondary level education including Post-secondary education

¹⁵ Bachelor, master, and doctoral degree level

5. Conclusion

This study analyzes the impact of trade liberalization on wage premium of skilled and unskilled labor on S-curve industries, a “New Engine of Growth” policy that the ministry of industry has proposed in order to drive Thailand’s growth sustainability in long term. Since Thailand had tariff transformation in 2003, therefore, I chose the period 2001-2014 to study the wage before and after the transformation and the effect of trade openness until recent year. Estimation results showed that trade liberalization makes people in capital intensive better off since tariff level reduction is the significant factor that make their wages rise, while that of labor intensive workers are lower. Therefore, I can conclude that trade liberalization widens wage premium of skilled and unskilled labor.

The fact that agriculture employment share is still a dominant of Thailand’s labor force and that it has the lowest productivity and value added compared to the other sectors. Combined with the result from this paper that trade liberalization would make them worse off, therefore, I would like to suggest policy implication to create incentive for workers in agriculture sector to move into a more productive industries so that the S-curve policy would be running smoothly with sufficient labor supply.

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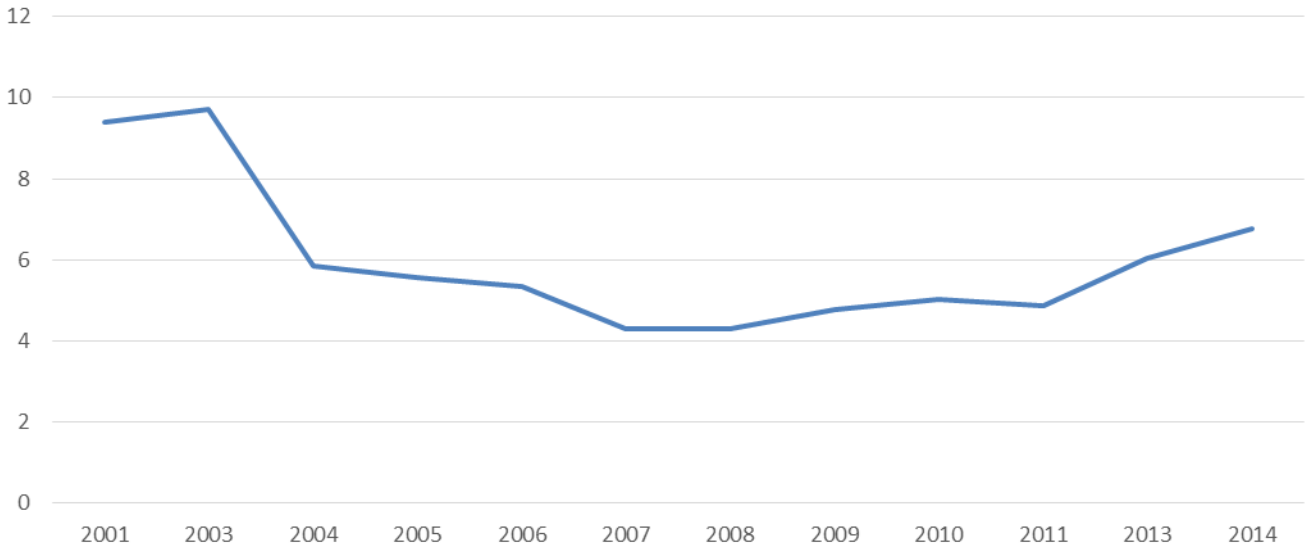
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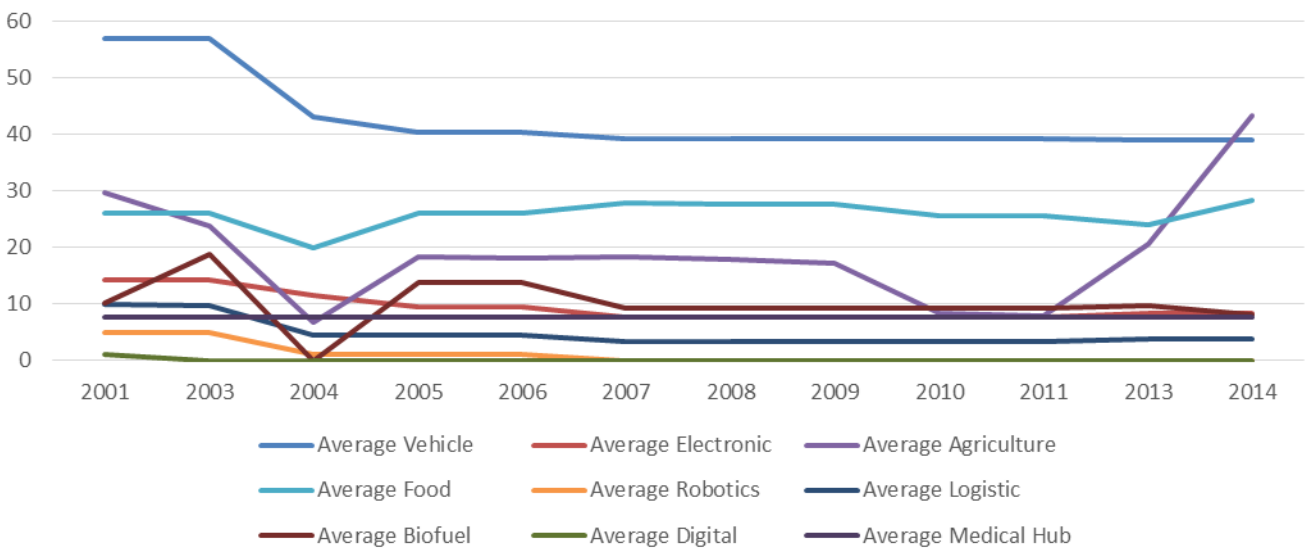
Appendix

Figure 1: Tariff rate, most favored nation, weighted mean, all products (%)



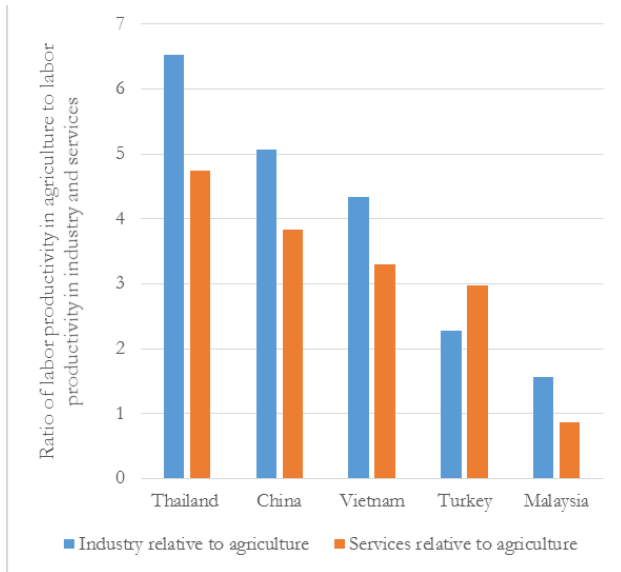
Source: World Development Indicators

Figure 2: Average Tariff Rate of 10 S-Curve Industries (%)



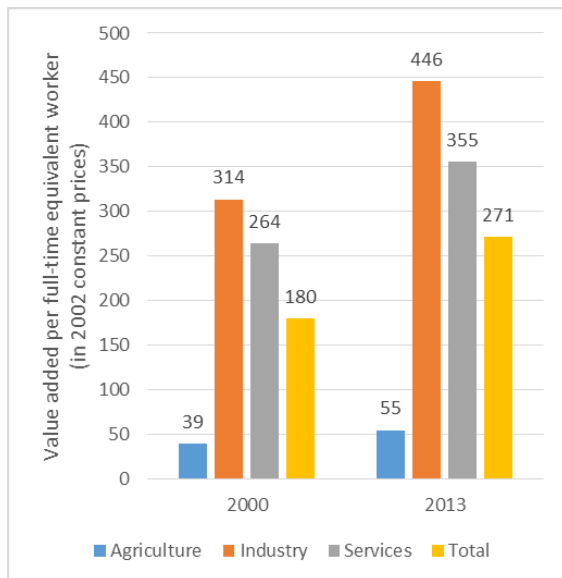
Source: UNCTAD - Trade Analysis Information System

Figure 3: Ratio of Labor Productivity in Agriculture to Labor Productivity in Industry and Services



Source: APO Productivity Database 2015.

Figure 4: Value added per full-time equivalent worker (in 2002 constant prices)



Source: World Bank Group Report April 2017 –Thailand: Systematic Country Diagnostic based on labor force survey (for employment data) and NESDB (for value-added)

Figure 5: Average Real Wage of 10 S-curve Industries

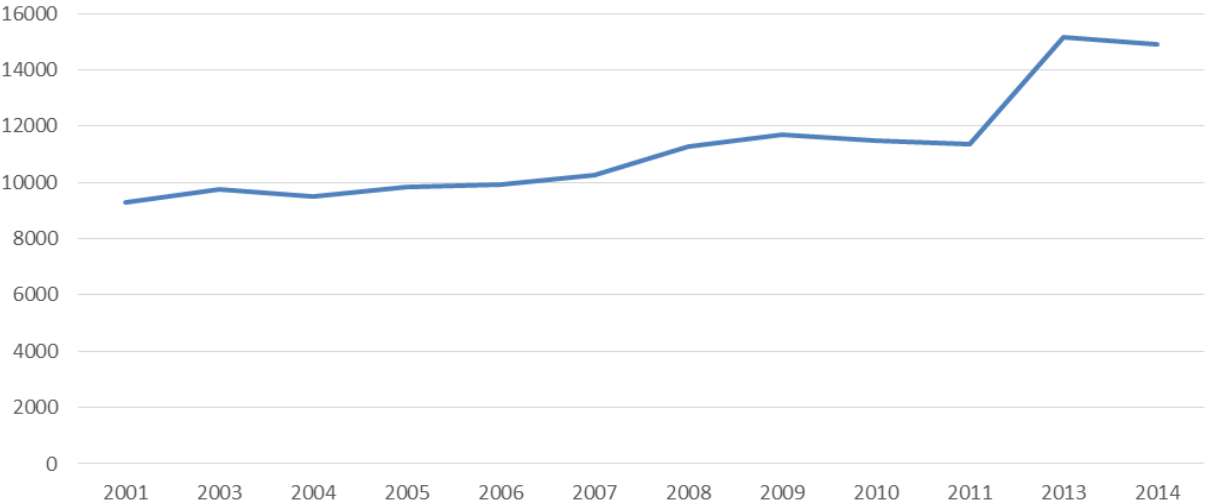
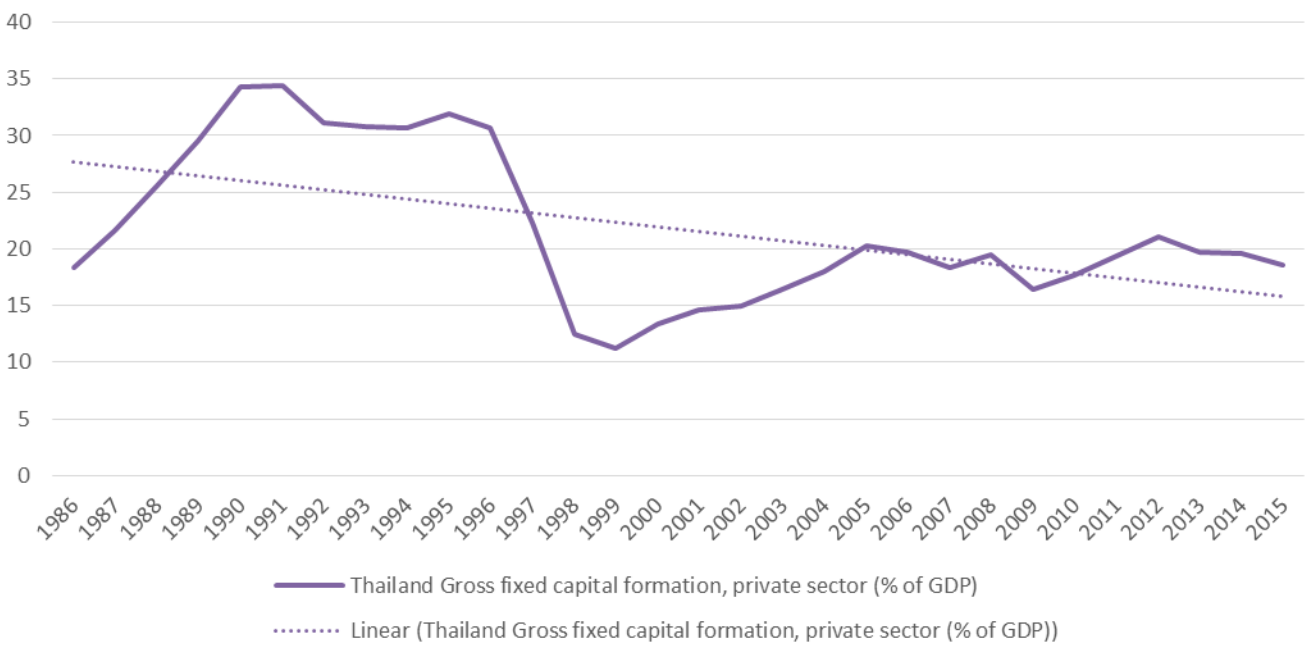


Figure 6: GDP per capita growth (annual %)



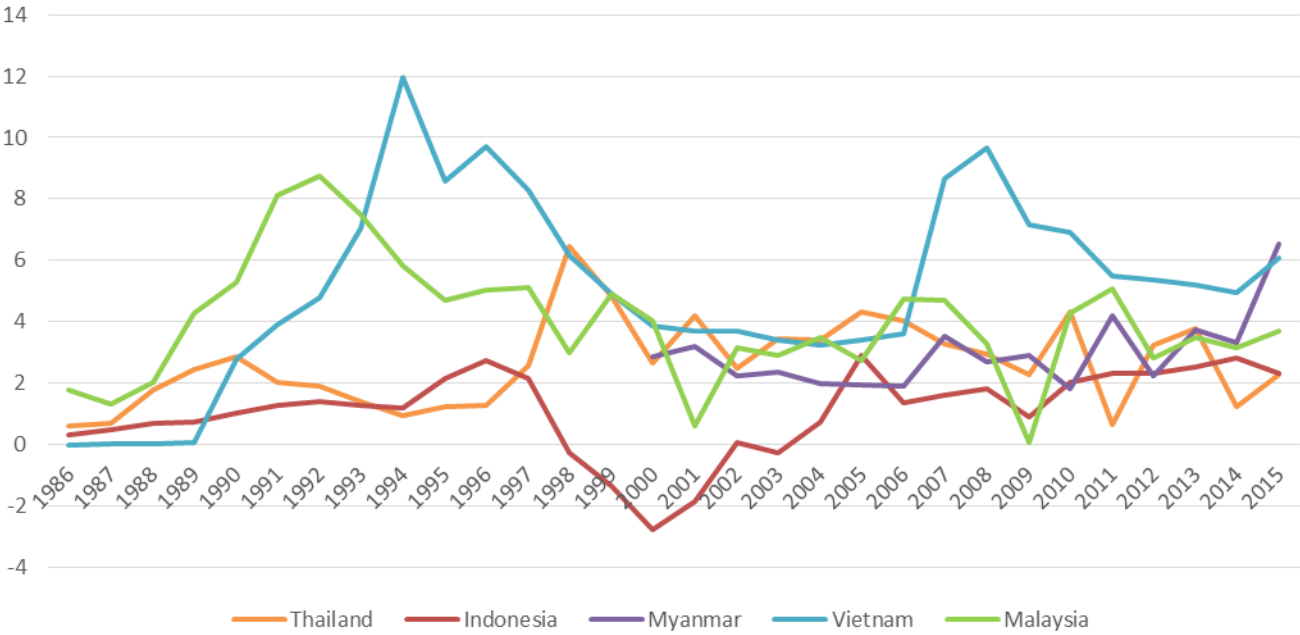
Source: World Development Indicators

Figure 7: Gross fixed capital formation, private sector (% of GDP)



Source: World Development Indicators

Figure 8: Foreign direct investment, net inflows (% of GDP)



Source: World Development Indicators

Table 1: Descriptive Statistics

VARIABLES	N	mean
<i>Worker Characteristics</i>		
AGE	400,804	40.41
% of Male	400,804	51.68
% of Married	400,804	77.29
% of Skilled	44,595	11.13
Working Hour	404,381	42.96
Secondary	46,259	11.4
University	12,319	3.03
% in Agriculture		83.76
% in Medical Hub		0.13
% in Biofuel		0.13
% in Electronics		1.42
% in Robotics		1.41
% in Vehicle		1.46
% in Food		9.97
% in Logistic		1.37
% in Digital		0.35
<i>Trade Liberalization</i>		
Tariff	397,982	0.21

Table 2: Estimate Trade Liberalization Impact on Overall S-curve Industries

AGE	0.0308***
	-0.00115
AGE_2	-0.000369***
	-1.51E-05
Male	0.191***
	-0.00781
Married	0.0835***
	-0.00842
Secondary	0.334***
	-0.0102
University	1.075***
	-0.0154
Tariff	-0.461***
	-0.0533
MalexTariff	0.0713**
	-0.0353
MarriedxTariff	-0.0589
	-0.0373
UniversityxTariff	-0.0967
	-0.067
SecondaryxTariff	-0.128***
	-0.0448
Constant	7.131***
	-0.0244
Observations	103,864
R-squared	0.439

Standard errors in parentheses
 *** p<0.01, ** p<0.05, * p<0.1

Table 3: Estimate Trade Liberalization Impact on Each S-curve Industry

VARIABLES	Agriculture	Electronics	Food	Logistic	Medical Hub	Robotics	Vehicle	Biofuel	Digital
AGE	0.0239***	0.0356***	0.0394***	0.0436***	0.0725***	0.0556***	0.0426***	0.0459**	0.0946***
	-0.00165	-0.00605	-0.0019	-0.00752	-0.0217	-0.00529	-0.00599	-0.0233	-0.0237
AGE_2	0.000316***	0.000231***	0.000470***	0.000432***	0.000754**	0.000425***	0.000217**	-0.00019	0.000847**
	-2.08E-05	-8.76E-05	-2.55E-05	-9.95E-05	-0.000311	-7.47E-05	-8.59E-05	-0.0003	-0.000336
Male	0.156***	0.162*	0.205***	0.185**	-0.869	0.0871***	0.0118	-0.0336	0.026
	-0.0133	-0.089	-0.0327	-0.0799	-2.204	-0.0156	-0.188	-0.209	-0.054
Married	0.0607***	-0.0348	0.0601*	0.12	0.346	0.0264	0.21	-0.0493	0.0687
	-0.015	-0.0886	-0.0342	-0.0747	-2.301	-0.0168	-0.184	-0.189	-0.0625
Secondary	0.731***	-0.0053	0.294***	0.380***	-0.798	0.282***	0.662***	0.585***	0.373***
	-0.0226	-0.091	-0.0428	-0.0763	-2.55	-0.0167	-0.184	-0.215	-0.11
University	1.691***	0.741***	1.044***	1.317***	3.212	0.956***	0.787***	1.356***	1.277***
	-0.0484	-0.158	-0.0684	-0.204	-3.072	-0.0255	-0.279	-0.211	-0.102
Tariff	0.807***	-5.303***	1.526***	6.733***	-1.426	-4.615***	0.808	-2.918	-
	-0.0737	-1.041	-0.129	-2.449	-36.36	-1.075	-0.584	-2.659	
MalexTariff	0.133**	-0.214	0.0333	0.54	14.92	-1.285	0.291	1.551	-
	-0.0652	-1.025	-0.13	-2.218	-28.67	-0.922	-0.482	-2.024	
MarriedxTariff	0.0323	0.589	-0.0323	-2.381	-2.834	0.677	-0.516	0.589	-
	-0.0725	-1.019	-0.136	-2.058	-29.95	-0.963	-0.47	-1.812	
UniversityxTariff	-1.663***	0.996	-0.148	-5.489	-31.18	-0.917	0.461	0.41	-
	-0.276	-1.854	-0.27	-5.467	-39.97	-1.493	-0.715	-2.038	
SecondaryxTariff	-1.125***	2.485**	0.0713	-4.268**	12.55	0.936	-1.078**	0.842	-
	-0.115	-1.045	-0.17	-2.107	-33.21	-0.989	-0.473	-2.045	
Constant	7.366***	8.360***	7.230***	7.371***	7.253**	7.395***	7.326***	7.801***	6.530***
	-0.033	-0.137	-0.0453	-0.157	-2.837	-0.0894	-0.246	-0.491	-0.397
Observations	56,227	5,318	29,281	1,839	397	4,628	5,447	476	595
R-squared	0.14	0.294	0.246	0.29	0.383	0.416	0.363	0.472	0.466

Table 4: Estimate Trade Liberalization Impact on Skill Premium

VARIABLES	OLS
Tariff	-1.769*
	-1.051
Constant	1.248***
	-0.197
Observations	98
R-squared	0.029

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1