INSTITUTE OF DEVELOPING ECONOMIES

IDE Discussion Papers are preliminary materials circulated to stimulate discussions and critical comments

IDE DISCUSSION PAPER No. 862

Heterogenous Impacts of Trade Liberalization on Individual Wages: Evidence from Thailand

Sasatra SUDSAWASD and Kazunobu HAYAKAWA*

September 2022

Abstract: This study empirically examines how trade liberalization changes individuals' wages, with evidence from Thailand. We primarily focus on the effect of Thailand's tariff reduction under the ASEAN free trade regime. We use individual-level employment data for 2001, 2006, 2011, and 2016. We find that the reduction in AFTA tariffs in Thailand decreases the relative wages of the more educated and skilled workers. Thus, trade liberalization contributes to narrowing income inequality in terms of education and skills. Contrastingly, we do not find heterogeneous effects according to age, sex, marital status, location, or company size. Moreover, the results do not differ significantly between industries with or without international competitiveness.

Keywords: Household; Tariffs; Thailand

JEL Classification: F15; F53

* Senior Research Fellow, Bangkok Research Center, IDE (kazunobu_hayakawa @jetro.go.jp)

The Institute of Developing Economies (IDE) is a semigovernmental, nonpartisan, nonprofit research institute, founded in 1958. The Institute merged with the Japan External Trade Organization (JETRO) on July 1, 1998. The Institute conducts basic and comprehensive studies on economic and related affairs in all developing countries and regions, including Asia, the Middle East, Africa, Latin America, Oceania, and Eastern Europe.

INSTITUTE OF DEVELOPING ECONOMIES (IDE), JETRO
3-2-2, WAKABA, MIHAMA-KU, CHIBA-SHI
CHIBA 261-8545, JAPAN

Heterogenous Impacts of Trade Liberalization on Individual Wages: Evidence from Thailand[§]

Sasatra SUDSAWASD
School of Development Economics, National Institute of Development Administration, Thailand

Kazunobu HAYAKAWA[#]
Bangkok Research Center, Institute of Developing Economies, Thailand

Abstract: This study empirically examines how trade liberalization changes individuals' wages, with evidence from Thailand. We primarily focus on the effect of Thailand's tariff reduction under the ASEAN free trade regime. We use individual-level employment data for 2001, 2006, 2011, and 2016. We find that the reduction in AFTA tariffs in Thailand decreases the relative wages of the more educated and skilled workers. Thus, trade liberalization contributes to narrowing income inequality in terms of education and skills. Contrastingly, we do not find heterogeneous effects according to age, sex, marital status, location, or company size. Moreover, the results do not differ significantly between industries with or without international competitiveness.

Keywords: Household; Tariffs; Thailand
JEL Classification: F15; F53

1. Introduction

Since the 1990s, member countries of the Association of Southeast Asian Nations (ASEAN) have eliminated intra-regional tariffs to increase regional trade within ASEAN. The ASEAN Free Trade Area (AFTA) entered into force in 1993 among Brunei, Indonesia, Malaysia, the Philippines, Singapore, and Thailand. Vietnam joined in 1995, followed by Laos and Myanmar in 1997 and Cambodia in 1999. The AFTA contributed to reducing or eliminating tariff rates in intra-ASEAN trade by introducing a common effective preferential tariff. Furthermore, to pursue the goal of establishing a single market and production base with a free flow of goods, ASEAN member states (AMS) signed the ASEAN Trade in Goods Agreement (ATIGA) in 2009, which entered into force in 2010. Moreover, in 2010, the six forerunners eliminated their respective tariffs for almost all products. Additionally, in other

[§] We would like to thank Hiroshi Mukunoki, Shujiro Urata, Kiyoyasu Tanaka, Kyoji Fukao, Satoru Kumagai, Yoko Asuyama, Miki Hamada, and the seminar participants in the Institute of Developing Economies for their invaluable comments. All remaining errors are ours.
[#] Corresponding author: Kazunobu Hayakawa; Address: Bangkok Research Center, Japan External Trade Organization, 127 Gaysorn Tower, 29th Floor, Ratchadamri Road, Lumphini, Pathumwan, Bangkok 10330, Thailand; Tel: 66-2-253-6441; Fax: 66-2-254-1447; E-mail: kazunobu_hayakawa@ide-gsm.org.

countries, all scheduled tariff reductions or eliminations were completed in 2018.

With Thailand as our focus, we empirically examine how trade liberalization changed individuals' wages. We primarily look at the effect of trade liberalization in the country itself, rather than in partner countries. This makes the market in Thailand tougher, due to the increase in imports from other AMS. Specifically, the effects on wages depend on the types of workers intensively inputted in the liberalized industries. For example, skilled workers face greater negative effects on wages if they are intensively employed in said industries. Furthermore, the effects may differ between industries with and without international competitiveness. Competitive industries may not suffer from negative effects because of higher quality products that are different from imported ones. However, in the case of trade liberalization in partner countries, the rise in wages is greater for workers who are intensively employed in export-competitive industries.

We use individual-level data on employment for four years: 2001, 2006, 2011, and 2016. As mentioned previously, Thailand reduced preferential tariffs against other AMS in this period. These are survey data collected by the Thai government. Although the data cannot be panelized over time at the individual level, they are representative of the Thai population. We link the ATIGA preferential tariffs to individuals' wages according to their employment industry. We then investigate to what extent the reduction of tariffs in an industry changes the wages of those individuals who work in that industry. In particular, we explore how the effects of trade liberalization on wages differ according to individual-level characteristics. Our data enabled us to identify various individual attributes such as age, sex, marital status, company size, education level, occupation, and location. Thus, we uncover the heterogeneous effects of trade liberalization on individual wages in Thailand.

Our findings can be summarized as follows. The reduction in AFTA tariffs in Thailand leads to a decrease in the relative wages of more educated and skilled workers. By contrast, we do not find heterogeneous effects according to age, sex, marital status, location, or company size. The former result indicates that trade liberalization in Thailand contributed to narrowing income inequality across education and skill levels. Fierce competition with imported goods exerted downward pressure on the wages of workers with relatively high wages, i.e., the more educated, or more skilled, workers. However, due to the continuous increase in consumer prices, minimum wages have increased over time. Therefore, workers with relatively low wages (i.e., less-educated workers or less-skilled workers) did not experience a significant degree of wage reduction. In short, trade liberalization based on the AFTA/ATIGA had a pro-poor effect in Thailand.

Our study contributes to the literature on the effects of trade liberalization on wages at the individual level. Several studies have been conducted in this subfield. For instance, Fukase (2013) examines the effects of the United States (U.S.)–Vietnam bilateral trade agreement on wages in Vietnam by individuals' skills, showing that provinces more exposed to the increase in exports experienced a relatively larger wage growth for unskilled

workers. Autor et al. (2014) explored the effects of import penetration from China on wages in the U.S. by age and firm tenure. They found that earnings losses are larger for individuals with low initial wages, low initial tenure, and low attachment to the labor force. Hummels et al. (2014) examined the effects of offshoring and exporting on wages in Denmark based on individuals' skills, suggesting that while offshoring increases (decreases) high-skilled (low-skilled) wages, exporting increases wages for all skill types. Hakobyan and McLaren (2016) investigated the effects of NAFTA tariffs on wages in the U.S., according to individuals' educational attainment. They found that NAFTA tariff reductions were associated with substantially reduced wage growth for married blue-collar women. Utar (2018) examined the effects of China's accession to the WTO on wages in Denmark according to education and occupation, and found that the negative impact increases with lower education. Kovak and Morrow (2022) explored the effects of Canada-U.S. free trade agreement tariffs in both Canada and the U.S. on wages in Canada, by company size, showing significant earnings losses at low-attachment workers' initial firms in response to Canadian tariff cuts.

Further aggregated analyses have also been performed. For example, Topalova (2010) developed an analytical concept of regional tariffs, which indicates each region's exposure to trade liberalization and is computed by taking a weighted average of industry-level tariffs using the share of employment in each region as weights. Topalova examined the effect of India's trade liberalization in 1991 on poverty and found that rural districts in which production sectors were more exposed to liberalization experienced both a slower decline in poverty and lower consumption growth. Using regional tariff measures, several studies have investigated the effect of trade liberalization on poverty at the regional level (Edmonds et al., 2010; McCaig, 2011; Law, 2019). There are also several studies that have examined the effect of globalization on income inequality indicators, such as the Gini coefficient, defined at the country or regional level. A meta-analysis of these studies by Heimberger (2020) showed that, on average, globalization has an inequality-increasing effect and does not reduce income inequality in developing countries.

In sum, previous studies have demonstrated the heterogeneous effects of trade liberalization on wages. In particular, the effects of trade liberalization on wage inequality are mixed and inconclusive. Our study differs from the extant literature in some respects. Existing studies have examined the impacts on wages in developed countries, or those of trade liberalization among developed countries, or between developed and developing countries. Contrastingly, this study focuses on the impact of trade liberalization among developing countries, namely AFTA and ATIGA. Since developing countries tend to have a comparative advantage in labor-intensive industries, the wage effects of trade liberalization among developing countries might not be as simple as those of trade liberalization among developed countries or between developed and developing countries. Furthermore, although previous studies have found heterogeneity in the effects of tariff reduction, we

examined these effects across multiple new dimensions and found that heterogeneity in the effects of trade liberalization is more significant across individual characteristics (e.g., skill levels) than across industry characteristics (e.g., international competitiveness).

The remainder of this paper is organized as follows. The next section reviews the existing empirical literature on the economic effects of the AFTA on Thailand. After explaining the empirical framework used to study the effects of AFTA on individual wages in Section 3, we report the estimation results in Section 4. Section 5 concludes the paper.

2. Economic Effects of AFTA on Thailand

This section reviews the existing empirical literature on the economic effects of the AFTA on Thailand. Hapsari and Maugunsong (2006) analyzed the determinants of AFTA members' trade flows and the potential for trade diversion using a gravity model of trade. They showed that the reduction in AFTA tariffs would have a significant effect on increasing bilateral exports of AMS. However, a reduction may create trade diversion by shifting trade from non-AMS to possibly less efficient AMS because of their tariff advantages. Subsequent work by Pholphirul (2010) examined the trade patterns between Thailand and other AMS by referring to the following: the export similarity index, revealed comparative advantage (RCA) rank correlation, and intra-industry trade index. A high degree of similarity was found in the trade structure between Thailand and other AMS. His findings suggest that there will be fewer trade-creation benefits from the AFTA and a greater likelihood of trade diversion once the AFTA scheme is fully implemented.

On the contrary, Sudsawasd and Mongsawad (2007) employed a gravity model and a computable general equilibrium (CGE) model to show that Thailand, as well as other AMS, would achieve more benefits from the so-called ASEAN+1 FTAs (i.e., regional trade agreements between ASEAN and non-AMS) if they fully liberalize intra-ASEAN trade, partly due to less trade diversion, better resource allocation, and improvements in the terms-of-trade. Their findings emphasized the importance of ASEAN regional cooperation, such as the AFTA. Okabe and Urata (2013) also applied a gravity model and found that AFTA has been effective in promoting intra-ASEAN trade as they detect the positive and significant trade creation effects of AFTA for a wide range of products, for both imports and exports. The trade creation effects are relatively large, especially for the original six AFTA member countries (Brunei, Indonesia, Malaysia, the Philippines, Singapore, and Thailand).

Although there are several studies on the economic effects of the AFTA on ASEAN countries, most studies have focused on trade aspects at the macro level; only few have focused on the effects of AFTA at the micro-level, i.e., the individual and household levels. Understanding the effects of increasing openness on wage structures has been widely acknowledged as a complex task in the extant literature, and experiences in developing

countries have been quite varied (Arbache et al., 2004). Moreover, some empirical studies (e.g., Robbins and Gindling, 1999) have shown that trade liberalization in developing countries is disequalizing and does not necessarily support standard international trade theorems, which typically argue that trade should increase the demand for unskilled labor, a developing country's abundant factor, resulting in an increase in unskilled wages or returns to a lower level of education.

To examine the AFTA-wages nexus, most studies have used a CGE model and have shown that the impact on wages and income distribution generally varies according to the patterns of a country's production and trade. Kyophilavong et al. (2016) employed a CGE model and microsimulations to assess the impact of AFTA on Laos. They found that the impacts of AFTA are heterogeneous across regions and depend on various factors, including household characteristics. They also showed that AFTA contributes to increasing wages for both skilled and unskilled labor. Rural households (unskilled labor) earn more wage income than urban households. They conclude that AFTA does not expand income inequality in Laos.

In contrast, Plummer et al. (2014) used a CGE model together with labor force survey data for six ASEAN countries to decompose the impact of regional cooperation at the occupational and gender levels. Simulation results showed that the impact of AFTA on wages and other factor returns varies across broad factors (labor, capital, and land), labor skill levels, and gender. In Thailand, labor enjoys a greater gain than capital, but land does not. In addition, the increase in wages of men exceeded that of women. With respect to the distribution of wage gains, assuming that the wages of unskilled workers are fixed, both skilled and semi-skilled workers gain more, and the gains are greater for the former.

As discussed previously, most of the findings in the existing literature were primarily based on the CGE model, which provided an ex-ante estimation of the likely effects of AFTA prior to its implementation. One might ask the question of what the actual effects would be, which could differ from the model predictions, especially when the data are available. Therefore, this study tries to fill this gap in the literature by providing ex-post assessments of such effects on wages using actual data from Thailand before and after tariff elimination in 2010.

3. Empirical Framework

This section explains our empirical framework for examining the effect of tariff reductions on wages at the individual level. According to the standard trade model, such as the Heckscher–Ohlin theorem, tariff reductions increase the import of goods in disadvantaged industries. Thus, wages for workers intensively inputted in these industries are expected to decline. As of 2015, Thailand was the fourth-highest country in ASEAN in

terms of GDP per capita. Its GDP per capita was lower than Singapore, Brunei, and Malaysia, but higher than the rest of the ASEAN countries, including Indonesia and the Philippines. Thus, among AMS, Thailand is positioned as middle-high class. If import competition becomes stronger with upper-class countries such as Singapore or Malaysia, industries with higher degrees of technological concentration may suffer from greater negative effects in Thailand. In contrast, tougher import competition with lower-class countries, such as Indonesia and Vietnam, decreases the production of industries with relatively low degrees of technological concentration. In short, the shrunken industries determine what type of worker is affected to what degree from tariff reductions.

Our baseline specification for individual *i* in year *t*, who works in industry *s* and lives in province *p*, is as follows:

$$\ln Wage_{it} = \alpha \times \ln(1 + AFTA_{st}) + \beta \times \ln(1 + AMS\ tariffs_{st}) + \mathbf{X}'\boldsymbol{\gamma} + \mathrm{u}_p + \mathrm{u}_s + \mathrm{u}_t + \epsilon_{it} \quad (1)$$

$Wage_{it}$ refers to the monthly income of individual *i* in year *t*. $AFTA_{st}$ is Thailand's AFTA tariff rate in industry *s* in year *t*. We also control for the weighted average of other AMS tariffs for Thailand (*AMS tariffs*), which are computed using exports from Thailand to each AMS in 2001 as weights. A vector of **X** includes various individual attributes, such as age, sex, marital status, company size, education level, occupation, industry, and provinces. Except for age, we introduce dummy variables for each of these attributes; for example, a male or female dummy for sex. We also introduce three types of fixed effects, as explained below. ϵ_{it} is a disturbance term. We estimate this model using the ordinary least squares (OLS) method.

Our set of fixed effects are as follows: The first is the province fixed effect (u_p), which controls for time-invariant location-specific elements, such as the distance to the national border. Second, we introduce the industry fixed effect (u_s), which controls for time-invariant industry characteristics such as factor intensity. In addition, since most favored nation (MFN) tariffs have hardly changed in Thailand, the effect of MFN tariffs is captured by industry fixed effects. Furthermore, Thailand eliminated tariffs under the AFTA regime for almost all its products in 2010. AFTA tariffs decreased gradually to zero. Thus, the cross-industry variation in AFTA tariffs comes primarily from the base rates (i.e., MFN tariff rates) in the pre-liberalization period, which are controlled by industry fixed effects. Moreover, a significant part of the tariff reduction schedule was determined in the 1990s (i.e., the pre-study period). Depending on the base rates, the basic timeframe for reducing or eliminating tariffs was specified for each product. As a result, the time-series change of AFTA tariffs was determined based on the industry characteristics of the pre-study period, which are time-invariant in our study and controlled by industry fixed effects. This framework thus reduces the risk of an endogeneity bias.

Next, to investigate the heterogeneous effects of tariff reductions on wages, we extend the model above as follows:

$$\ln Wage_{it} = \alpha \times \ln(1 + AFTA_{st}) + \ln(1 + AFTA_{st})\,\mathbf{X}'\boldsymbol{\delta} + \beta \times \ln(1 + AMS\ tariffs_{st}) + \mathbf{X}'\boldsymbol{\gamma} + \mathrm{u}_p + \mathrm{u}_s + \mathrm{u}_t + \epsilon_{it} \quad (2)$$

We introduce the interaction terms of AFTA tariffs in Thailand with individual characteristics, that is, **X**. By investigating the coefficients of these interaction terms, we examine how the effects of AFTA tariffs on wages differ by individual characteristics. Furthermore, due to the existence of friction in labor mobility across industries, the effects on wages may differ across industries depending on their international competitiveness, even if workers have similar attributes. Thus, we estimate the aforementioned models separately for industries with high and low international competitiveness. Specifically, those with high international competitiveness are defined as those in which the RCA in 2011 is greater than the sample median among all industries.

Our sources of data are the Labor Force Surveys conducted in 2001, 2006, 2011, and 2016, and collected by the National Statistical Office of Thailand. Since 2001, the survey has been conducted on a monthly basis, and the population surveyed has included all people aged 15 and older who are classified as either in the labor force or not, according to the activity in which each person was engaged during the survey reference week.[1] Note that we cannot panelize the individuals across years. We restrict the study to nonservice workers aged 25-60. We also exclude individuals with wages in the top or bottom 5% as outliers. Industry codes are available at the four-digit level, according to the International Standard Industrial Classification. Data on tariffs were obtained from World Integrated Trade Solution (WITS). We take a simple average of tariffs at the tariff-line level (i.e., a harmonized system eight-digit level) by industry.

Before reporting our estimation results, we provide a brief overview of Thailand's trade and tariffs. Figure 1 depicts the shares of Thailand's trade values with major partners, which were the top four economies in terms of value in 2016. These major trading partners are the same for both imports and exports; ASEAN, China, Japan, and the U.S. Trade data for this figure were obtained from the ASEAN Stats Data Portal[2]. The largest export destination is AMS. The share of exports to ASEAN rose slightly, from 21% in 2003 to 25% in 2016. While the shares of exports to the U.S. and Japan show declining trends, the share of exports to China has gradually increased. However, the shares of imports from both

[1] The survey was based on stratified two-stage sampling. Provinces were constituted strata. Each stratum was divided into two types of local administration, municipal areas and non-municipal areas. The primary and secondary sampling units were blocks for municipal areas and villages for non-municipal areas, and private households/persons in special households (which include persons living in a group), respectively. Data collection was carried out through the interviewing method.

[2] https://data.aseanstats.org/trade-annually

ASEAN and China were around 20% in 2016, due to the dramatic rise in the latter's share from 8% in 2003 to 22% in 2016. By contrast, the share of imports from Japan showed a remarkable decline from 24% in 2003 to 16% in 2016.

=== Figure 1 ===

Next, we focus on Thailand's intra-ASEAN trade. Figure 2 shows the share of Thailand's exports to or imports from each ASM. Owing to its small values, the figures for Brunei are not shown. Singapore and Malaysia were outstanding export destinations for Thailand in the 2000s. However, the share of exports to these countries has gradually decreased. Meanwhile, the shares of exports to Vietnam and Indonesia are increasing. The share of imports from Malaysia has been the largest, although it has decreased gradually. The second largest share constitutes imports from Singapore, which also exhibits a declining trend. The share of imports from Indonesia has been relatively stable, whereas imports from Vietnam have been growing.

=== Figure 2 ===

Figure 3 shows the average AFTA tariffs in Thailand and other AMS in addition to GDP per capita in Thailand. The AFTA tariffs in Thailand decreased from approximately 5% in 2001 to almost 0% in 2011. AFTA tariffs in other AMS, which are the weighted average of AFTA tariffs in other AMS using product-level exports from Thailand to each country in 2001 as a weight, declined as well. The tariffs were still near 2% in 2016 because the ASEAN latecomers (Cambodia, Laos, Myanmar, and Vietnam) completed their tariff reduction/elimination in 2018. We also see a gradual rise in GDP per capita. During the period of study, personal income increased by more than double. In 2016, it reached 200 thousand Thai Baht (approximately seven thousand USD). Thus, the period in question is one of high economic growth for Thailand.

=== Figure 3 ===

4. Empirical Results

This section presents the results of our estimation. Table 1 presents the basic statistics for these variables. We clustered standard errors by industry in all estimations. The estimation results of Equation (1) for all industries are reported in the column "All" in Table 2, which does not report standard errors to save space. The results show that, like other AMS tariffs, AFTA tariffs do not have a significant effect on wages. Thus, on average, we do not

find significant effects of AFTA tariffs in Thailand, or other AMS, on individual wages. The results for individual attributes show that wages are higher for the elderly, men, married persons, persons working in larger-sized companies, those with higher education, more skilled workers (occupation), and persons living in urban areas. These results do not change even when regressing for high and low RCA industries separately, as shown in the columns "Low" and "High," respectively.

=== Tables 1 & 2 ===

Next, we estimate Equation (2) to investigate the heterogeneous effects of tariff reductions on wages. Table 3 lists the estimation results. To save space, we do not report the estimation results for non-interacting individual attributes in the analyses below. Several interaction terms have significant coefficients, indicating that the reduction in AFTA tariffs in Thailand significantly decreases wages for more educated workers relative to those for less-educated workers. However, this effect is weak in high RCA industries. In addition, it decreases the relative wages of skilled workers in both the low and high RCA industries. Thus, heterogeneous effects according to skills exist not only in less competitive industries but in more competitive ones as well. By contrast, in both low and high RCA industries, we find no significant differences in the effects of tariff reduction according to age, sex, marital status, location, or company size. Thus, except for education level, we find no notable differences in the effects between the low and high RCA industries.

=== Table 3 ===

We conducted various robustness checks on the results above. First, if Thailand did not import a concerned product from other AMS, the reduction of AFTA tariffs in Thailand would have only a trivial effect on the domestic economy and wages. Therefore, we focus on industries in which significant imports from other AMS were observed during the study period. Specifically, we restrict the industries under consideration to those in which the share of total imports that was imported from AMS in 2015 was greater than the sample median. Although it may be better to select industries based on import penetration from other AMS (i.e., the share of imports from AMS out of total domestic consumption), we use their share of total imports due to limited data on the consumption of domestic goods. Note that in both cases, this restriction yields a sample selection bias. The results are reported in Table 4, and are qualitatively similar to those in Table 3. Heterogeneous effects according to educational level can also be found in highly competitive industries.

=== Table 4 ===

Second, when separating industries based on international competitiveness, we use the RCA index computed using data on Thailand's exports. However, due to our focus on AFTA tariffs, that is, tariffs against AMS, their effect may be sensitive to the degree of competitiveness against AMS rather than against the world in general. Therefore, in Table 5, we divide industries based on RCA computed using intra-ASEAN trade. However, we obtained results that were similar to those presented in Table 3. Except for the level of education, clear differences do not exist in the effects between low and high RCA industries. As mentioned in Section 1, the AFTA is a trade agreement primarily among developing countries. Based on higher income inequality, individual characteristics (e.g., skills or education level) would be more diversified in developing countries than in developed countries. Thus, heterogeneity in the effects of trade liberalization may be more significant across individual characteristics than across industry characteristics.

=== Table 5 ===

Finally, although we investigated the interaction terms with AFTA tariffs in Thailand, we also examined those with other types of tariffs. In this examination, we used the RCA index computed using data on Thailand's exports to the world. One type, for instance, is AFTA tariffs in other AMS. The results are presented in Table 6. The table shows that the effects of tariff reductions in other AMS are similar to those of the AFTA tariffs in Thailand. The reduction of other AMS' AFTA tariffs increases the relative wages of less-educated workers and the relative wages of unskilled workers. Such heterogeneous effects are found in low-RCA industries but not in high-RCA ones. In the latter, wages increase significantly for workers in large companies. Nevertheless, note that compared to the measure of AFTA tariffs in the country, the measure of AFTA tariffs in trade partner countries is not necessarily precise, because we need to aggregate tariff rates in multiple countries.

=== Table 6 ===

The other type is ASEAN-China free trade area (ACFTA) tariffs in Thailand. As shown in Figure 1, imports to Thailand from China experienced a dramatic increase during the period of study. Thus, the reduction in ACFTA tariffs may have more significant effects on wages in Thailand. The results are presented in Table 7. Compared with the results for AFTA tariffs in Thailand and other AMS, the interaction terms with dummy variables on education level tend to have insignificant coefficients. Nevertheless, those with the occupation dummy variables show similar results. In other words, the reduction in the ACFTA tariffs in Thailand decreases the relative wages of more skilled workers. The other interaction terms had insignificant coefficients.

=== Table 7 ===

In summary, we found that the reduction in AFTA tariffs in Thailand decreased the relative wages of more educated workers and skilled workers. By contrast, we did not find heterogeneous effects according to age, sex, marital status, location, or company size. The former results imply that a larger increase in imports due to tariff reductions occurs in more educated- or skilled labor-intensive industries. Examples of such industries include resource extraction, chemical, and machinery industries.[3] Thus, fierce competition for imported goods in these industries may result in a decrease in the relative wages of more educated or skilled workers. In short, the evidence strongly substantiates the fact that tariff reductions under the ATIGA had a pro-poor effect in Thailand.

One possible reason for this pro-poverty effect might be the rapid rise in minimum wages in Thailand. After the completion of tariff reduction/elimination under the AFTA regime in 2010, Thailand adopted new minimum wage policies between 2012 and 2013, which increased minimum daily wage rates to 300 Baht for the whole kingdom (a 71 percentage increase from the simple average rate of all provinces at 176 Baht in 2011). The new wage rate was applied to the seven pilot provinces (Bangkok and five provinces in its vicinity, plus Phuket) in 2012 and to all other provinces in 2013. Due to this dramatic and forced rise in wages, particularly for less-educated and unskilled workers, the rise in wages for more-educated and skilled workers may have been minimized.[4]

5. Concluding Remarks

This study empirically examined how the reduction in AFTA/ATIGA tariff rates in Thailand changed individuals' wages in Thailand. We found that it decreased the relative wages of more educated or skilled workers, while no significant heterogeneous effects were detected according to age, sex, marital status, location, or company size. These results indicate that trade liberalization in Thailand has contributed to narrowing income inequality in terms of education and skills. However, the relative decline in the wages of more educated or skilled workers may decrease their labor supply and, consequently, the research and development activities that require intensive use. Such a decrease leads to a

[3] We identify these industries by using the average shares of more educated or skilled workers out of all workers in each industry in our dataset.

[4] Our estimation results do not change even if we control for province-year fixed effects, which include the level of minimum wages. However, this type of fixed effects does not absorb the heterogenous effect of ATIGA tariffs across provinces. In addition, we estimate our model for observations that exclude those with wages in the first quartile, which include workers who are potentially affected by minimum wages. However, we obtain similar results to those in Table 3. Note that this estimation also does not control for the pressure on wages for workers who earn wages higher than the minimum wages.

reduction in the long-run economic growth. Therefore, it is important to strike a balance between a minimum wage policy and achieving appropriate wages for high-quality workers.

References

Arbache, Jorge Saba, Andy Dickerson and Francis Green, 2004, Trade Liberalisation and Wages in Developing Countries, *Economic Journal*, 114(293): F73-F96.

Autor, David H., David Dorn, Gordon H. Hanson, and Jae Song, 2014, Trade Adjustment: Worker-Level Evidence, *Quarterly Journal of Economics*, 129(4): 1799-1860.

Edmonds, Eric V., Nina Pavcnik, and Petia Topalova, 2010, Trade Adjustment and Human Capital Investments: Evidence from Indian Tariff Reform, *American Economic Journal: Applied Economics*, 2 (4): 42-75.

Fukase, Emiko, 2013, Export Liberalization, Job Creation, and the Skill Premium: Evidence from the U.S.–Vietnam Bilateral Trade Agreement (BTA), *World Development*, 41: 317-337.

Hakobyan, Shushanik and John McLaren, 2016, Looking for Local Labor Market Effects of NAFTA, *Review of Economics and Statistics*, 98(4): 728-741.

Hapsari, Indira M. and Carlos Mangunsong, 2006, Determinants of AFTA Members' Trade Flows and Potential for Trade Diversion, Asia-Pacific Research and Training Network on Trade Working Paper Series, No. 21.

Heimberger, Philipp, 2020, Does Economic Globalisation Affect Income Inequality? A Meta-Analysis, *The World Economy*, 43(11): 2960-2982.

Hummels, David, Rasmus Jorgensen, Jakob Munch, and Chong Xiang, 2014, The Wage Effects of Offshoring: Evidence from Danish Matched Worker-Firm Data, *American Economic Review*, 104(6): 1597-1629.

Kovak, Brian K. and Peter Morrow, 2022, The Long-Run Labour Market Effects of the Canada-U.S. Free Trade Agreement, NBER Working Papers 29793, National Bureau of Economic Research, Inc.

Kyophilavong, Phouphet, Richard Record, Shinya Takamatsu, Konesawang Nghardsaysone, and Inpaeng Sayvaya, 2016, Effects of AFTA on Poverty : Evidence from Laos, *Journal of Economic Integration*, 31(2): 353-376.

Lathapipat, Dilaka and Cecilia Poggi, 2016, From Many to One: Minimum Wage Effects in Thailand, PIER Discussion Paper No. 41.

Law, Cherry, 2019, Unintended Consequence of Trade on Regional Dietary Patterns in Rural India, *World Development*, 113(C): 277-293.

McCaig, Brian, 2011, Exporting out of Poverty: Provincial Poverty in Vietnam and U.S. Market Access, *Journal of International Economics*, 85(1): 102-113.

Okabe, Misa and Shujiro Urata, 2013, The Impact of AFTA on Intra-AFTA Trade, ERIA Discussion Paper Series, ERIA-DP-2013-05.

Pholphirul, Piriya, 2010, Does AFTA Create More Trade for Thailand? An Investigation of Some Key Trade Indicators, *Journal of Current Southeast Asian Affairs*, 29(1): 51-78.

Plummer, Michael G., Peter A. Petri, Fan Zhai, 2014, Assessing the Impact of ASEAN Economic Integration on Labour Markets, ILO Asia- Pacific Working Paper Series, ILO Regional Office for Asia and the Pacific, Bangkok: ILO.

Robbins, Donald and, T. H. Gindling, 1999, Trade Liberalization and the Relative Wages for More-Skilled Workers in Costa Rica, *Review of Development Economics*, 3(2): 140-154.

Sudsawasd, Sasatra and Prasopchoke Mongsawad, 2007, Go with the Gang, ASEAN!, *ASEAN Economic Bulletin*, 24(3): 339-56.

Utar, Hale, 2018, Workers beneath the Floodgates: Low-Wage Import Competition and Workers' Adjustment, *Review of Economics and Statistics*, 100(4): 631-647.

Table 1. Basic Statistics

	Obs	Mean	Std. Dev.	Min	Max
ln Wage	157,096	8.564	0.647	6.908	10.127
ln (1 + AFTA)	157,096	0.028	0.029	0	0.152
ln (1 + AMS tariffs)	157,096	0.037	0.040	0	0.493
ln Age	157,096	3.593	0.231	3.219	4.094
Male	157,096	0.507	0.500	0	1
Married	157,096	0.729	0.444	0	1
Education: None or Unknown (Base)					
Less than elementary	157,096	0.281	0.449	0	1
Elementary	157,096	0.245	0.430	0	1
Lower secondary	157,096	0.163	0.369	0	1
Upper Secondary	157,096	0.154	0.361	0	1
Post-secondary	157,096	0.057	0.232	0	1
University	157,096	0.057	0.232	0	1
Occupation: Managers (Base)					
Professional	157,096	0.013	0.115	0	1
Technicians	157,096	0.062	0.241	0	1
Clerical support workers	157,096	0.044	0.206	0	1
Service and sales workers	157,096	0.009	0.096	0	1
Skilled agricultural workers	157,096	0.119	0.324	0	1
Craft workers	157,096	0.231	0.421	0	1
Plant/machine operators	157,096	0.293	0.455	0	1
Elementary	157,096	0.219	0.414	0	1
Company size: Small (Base)					
Medium	157,096	0.114	0.318	0	1
Large	157,096	0.325	0.468	0	1
Urban	157,096	0.533	0.499	0	1

Source: Authors

Table 2. Baseline Results

	All	Low	High
ln (1 + AFTA)	0.112	0.486	-0.435
ln (1 + AMS tariffs)	0.672	0.367	1.078*
ln Age	0.233***	0.261***	0.196**
Male	0.143***	0.166***	0.121***
Married	0.043***	0.054***	0.030***
Urban	0.016***	0.023***	0.006
Education: None or Unknown (Base)			
Less than elementary	0.050***	0.053***	0.044***
Elementary	0.148***	0.151***	0.137***
Lower secondary	0.209***	0.216***	0.192***
Upper Secondary	0.295***	0.305***	0.275***
Post-secondary	0.451***	0.466***	0.427***
University	0.605***	0.610***	0.599***
Occupation: Managers (Base)			
Professional	-0.170***	-0.173***	-0.160***
Technicians	-0.264***	-0.227***	-0.314***
Clerical support workers	-0.390***	-0.369***	-0.411***
Service and sales workers	-0.486***	-0.475***	-0.500***
Skilled agricultural workers	-0.588***	-0.597***	-0.576***
Craft workers	-0.592***	-0.572***	-0.612***
Plant/machine operators	-0.551***	-0.535***	-0.572***
Elementary	-0.669***	-0.657***	-0.674***
Company size: Small (Base)			
Medium	0.057***	0.073***	0.039
Large	0.085***	0.107***	0.062**
Number of observations	157,096	78,465	78,631
Adjusted R-squared	0.685	0.672	0.687

Notes: This table reports estimation results obtained using the OLS method. The dependent variable is the log of individual monthly wages. ***, **, and * indicate, respectively, the 1, 5, and 10% levels of statistical significance, which is based on the standard errors clustered at an industry level. In all specifications, we also control for industry, province, and year fixed effects.

Table 3. Interaction with AFTA Tariffs

	All	Low	High
ln (1 + AFTA)	6.48	-0.686	13.027
Interaction with ln (1 + AFTA)			
ln Age	-1.097	0.564	-2.602
Male	-0.162	0.253	-0.434
Married	0.09	0.189	-0.027
Urban	-0.134	-0.005	-0.312*
Education: None or Unknown (Base)			
Less than elementary	1.203**	1.602***	1.433**
Elementary	0.703	1.228**	0.714
Lower secondary	0.789	1.516***	0.562
Upper Secondary	1.029	1.764***	0.872
Post-secondary	1.808*	2.620***	1.525
University	1.762	2.104***	2.786*
Occupation: Managers (Base)			
Professional	-1.594***	-1.298**	-2.789**
Technicians	-2.374***	-1.779***	-4.199***
Clerical support workers	-2.200***	-1.461***	-3.734**
Service and sales workers	-2.277**	-2.119**	-2.789*
Skilled agricultural workers	-6.050***	-4.913***	-10.790***
Craft workers	-3.532***	-2.976***	-4.844***
Plant/machine operators	-2.779***	-2.213***	-4.198***
Elementary	-4.704***	-4.088***	-5.855***
Company size: Small (Base)			
Medium	-0.301	-0.095	-0.396
Large	-0.358	-0.182	-0.319
ln (1 + AMS tariffs)	0.441	0.041	1.049*
Number of observations	157,096	78,465	78,631
Adjusted R-squared	0.687	0.675	0.691

Notes: This table reports estimation results obtained using the OLS method. The dependent variable is the log of individual monthly wages. The standard errors reported in parentheses are clustered by industry. ***, **, and * indicate, respectively, the 1, 5, and 10% levels of statistical significance. In all specifications, we include the same variables for individual characteristics in addition to industry fixed effects, province fixed effects, and year fixed effects.

Table 4. Interaction with AFTA Tariffs: High Shares of Imports from AMS

	All	Low	High
ln (1 + AFTA)	-0.538	-1.128	-1.073
Interaction with ln (1 + AFTA)			
ln Age	0.366	0.721	0.818
Male	0.396*	0.388	0.286
Married	0.259	0.169	0.297
Urban	-0.019	0.115	-0.434
Education: None or Unknown (Base)			
Less than elementary	1.616***	1.406***	1.404*
Elementary	1.355***	1.031**	1.761**
Lower secondary	1.249**	1.200*	1.27
Upper Secondary	1.520***	1.220*	1.941**
Post-secondary	2.242***	2.104***	2.427**
University	2.420***	1.662*	4.049***
Occupation: Managers (Base)			
Professional	-1.667***	-0.992*	-3.986**
Technicians	-1.842***	-1.469***	-4.250**
Clerical support workers	-1.550**	-0.876**	-3.763
Service and sales workers	-2.400**	-2.082**	-3.915*
Skilled agricultural workers	-5.110***	-4.460***	-5.619**
Craft workers	-2.773***	-2.053**	-5.219*
Plant/machine operators	-2.200***	-1.936***	-4.004*
Elementary	-4.125***	-3.858***	-5.118**
Company size: Small (Base)			
Medium	-0.028	-0.317	0.506
Large	0.038	-0.336	0.511
ln (1 + AMS tariffs)	0.072	0.314	0.254
Number of observations	78,028	46,867	31,161
Adjusted R-squared	0.674	0.687	0.643

Notes: This table reports estimation results obtained using the OLS method. We restrict the sample industries to only those in which the share of imports from other AMS in 2015 was greater than its sample median. The dependent variable is the log of individual monthly wages. The standard errors reported in parentheses are clustered by industry. ***, **, and * indicate, respectively, the 1, 5, and 10% levels of statistical significance. In all specifications, we include the same variables for individual characteristics in addition to industry fixed effects, province fixed effects, and year fixed effects.

Table 5. Interaction with AFTA Tariffs: RCA based on Intra-ASEAN Trade

	Low	High
ln (1 + AFTA)	0.776	12.527
Interaction with ln (1 + AFTA)		
ln Age	-0.12	-2.04
Male	-0.051	-0.243
Married	0.084	0.057
Urban	0.091	-0.419***
Education: None or Unknown (Base)		
Less than elementary	1.640***	1.143**
Elementary	1.033**	0.676
Lower secondary	0.947*	0.761
Upper Secondary	1.391**	0.77
Post-secondary	2.402***	1.37
University	1.803**	1.941
Occupation: Managers (Base)		
Professional	-0.769	-2.884***
Technicians	-0.829	-4.459***
Clerical support workers	-1.116*	-3.663***
Service and sales workers	-0.209	-4.703***
Skilled agricultural workers	-4.322***	-10.875***
Craft workers	-1.967***	-5.767***
Plant/machine operators	-1.593***	-4.490***
Elementary	-3.613***	-6.189***
Company size: Small (Base)		
Medium	-0.219	-0.681
Large	-0.111	-0.99
ln (1 + AMS tariffs)	-0.425	1.102**
Number of observations	80,217	76,879
Adjusted R-squared	0.648	0.722

Notes: This table reports estimation results obtained using the OLS method. The dependent variable is the log of individual monthly wages. The standard errors reported in parentheses are clustered by industry. ***, **, and * indicate, respectively, the 1, 5, and 10% levels of statistical significance. In all specifications, we include the same variables for individual characteristics in addition to industry fixed effects, province fixed effects, and year fixed effects.

Table 6. Interaction with Other AMS' AFTA Tariffs

	All	Low	High
ln (1 + AMS tariffs)	-0.303	-2.292	3.217
Interaction with ln (1 + AMS tariffs)			
ln Age	0.228	0.658	-0.549
Male	0.209	0.294*	-0.056
Married	0.069	0.025	0.191
Urban	0.024	-0.006	0.132
Education: None or Unknown (Base)			
Less than elementary	0.893***	0.942***	0.819
Elementary	0.763***	0.819***	0.69
Lower secondary	0.809***	0.964***	0.477
Upper Secondary	1.007***	1.016**	0.904
Post-secondary	1.428***	1.475***	1.171
University	1.331***	1.585***	0.939
Occupation: Managers (Base)			
Professional	-0.136	0.003	-0.602
Technicians	-0.804*	-0.841	-0.824
Clerical support workers	-0.661	-0.301	-1.437
Service and sales workers	-0.597	-0.619	-0.365
Skilled agricultural workers	-1.407	-1.952***	-2.438
Craft workers	-1.296**	-1.320**	-1.053
Plant/machine operators	-0.846*	-0.809*	-0.956
Elementary	-1.139*	-0.906	-1.895
Company size: Small (Base)			
Medium	0.165	0.112	0.366
Large	0.202	0.067	0.674*
ln (1 + AFTA)	0.11	0.438	-0.407
Number of observations	157,096	78,465	78,631
Adjusted R-squared	0.686	0.674	0.688

Notes: This table reports estimation results obtained using the OLS method. The dependent variable is the log of individual monthly wages. The standard errors reported in parentheses are clustered by industry. ***, **, and * indicate, respectively, the 1, 5, and 10% levels of statistical significance. In all specifications, we include the same variables for individual characteristics in addition to industry fixed effects, province fixed effects, and year fixed effects.

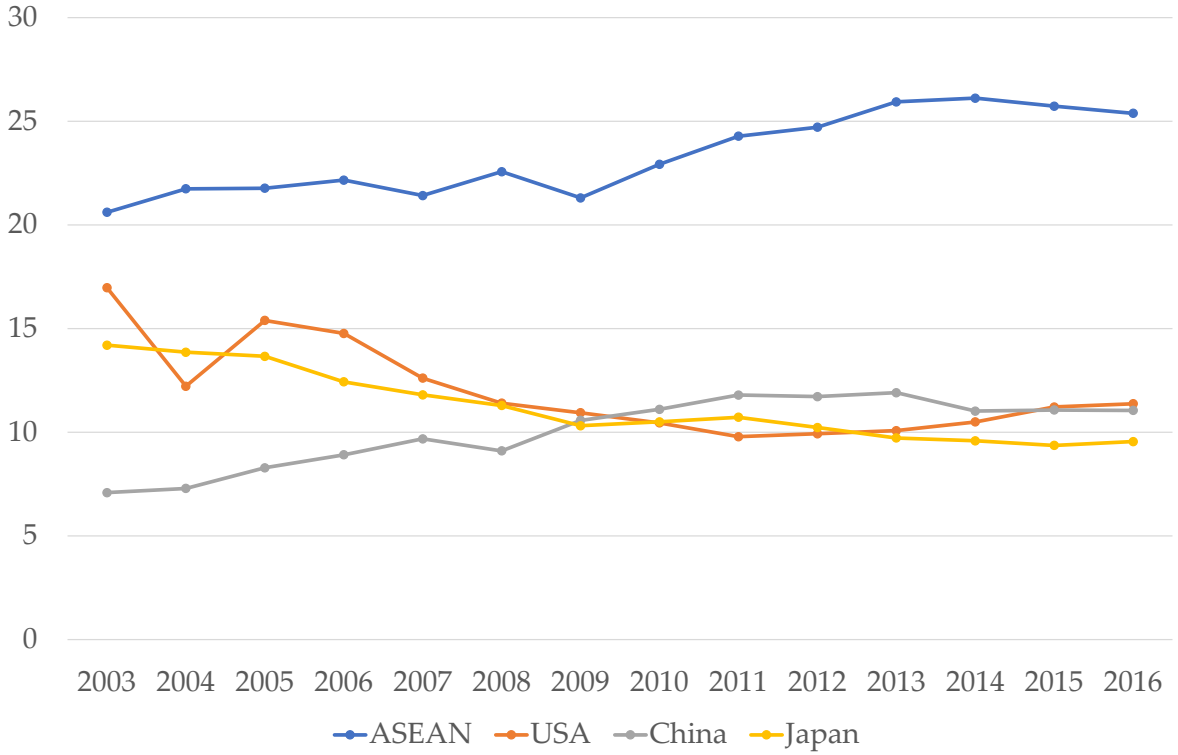
Table 6. Interaction with ACFTA Tariffs

	All	Low	High
ln (1 + ACFTA)	0.008	0.006	0.006
Interaction with ln (1 + ACFTA)			
ln Age	-0.001	0.000	0.000
Male	-0.001	-0.001	0.000
Married	-0.001	0.000	-0.001
Urban	0.000	0.000	0.000
Education: None or Unknown (Base)			
Less than elementary	0.002**	0.002**	0.002
Elementary	0.001	0.001	0.001
Lower secondary	0.001	0.002	0.001
Upper Secondary	0.002	0.003	0.002
Post-secondary	0.003**	0.004**	0.003
University	0.003	0.003	0.003
Occupation: Managers (Base)			
Professional	-0.003*	-0.003	-0.005
Technicians	-0.006***	-0.006***	-0.006*
Clerical support workers	-0.006***	-0.005***	-0.007***
Service and sales workers	-0.006***	-0.006**	-0.005
Skilled agricultural workers	-0.017***	-0.012***	-0.020***
Craft workers	-0.009***	-0.010***	-0.008**
Plant/machine operators	-0.007***	-0.007***	-0.006**
Elementary	-0.010***	-0.012***	-0.008**
Company size: Small (Base)			
Medium	0.000	-0.001	0.000
Large	0.000	0.000	0.000
ln (1 + AFTA)	-0.025	0.614	-1.511
ln (1 + AMS tariffs)	0.218	0.176	0.500
Number of observations	127,624	62,398	65,226
Adjusted R-squared	0.71	0.694	0.712

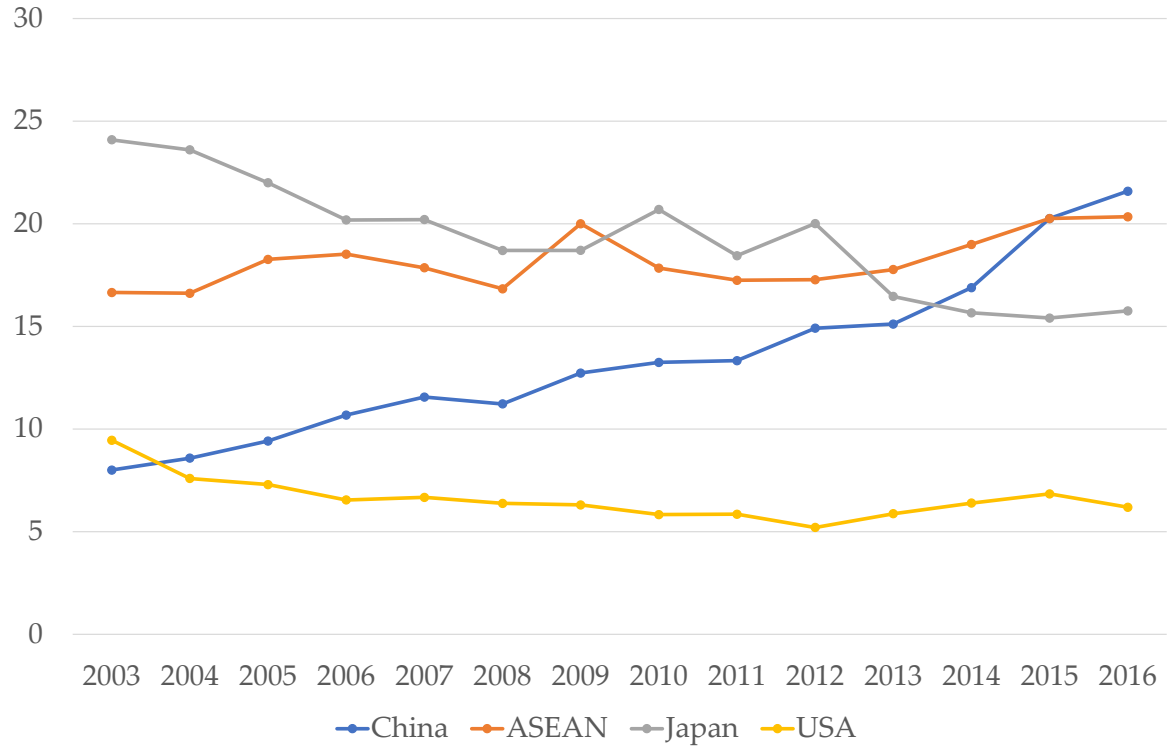
Notes: This table reports estimation results obtained using the OLS method. The dependent variable is the log of individual monthly wages. The standard errors reported in parentheses are clustered by industry. ***, **, and * indicate, respectively, the 1, 5, and 10% levels of statistical significance. In all specifications, we include the same variables for individual characteristics in addition to industry fixed effects, province fixed effects, and year fixed effects.

Figure 1. Shares of Trade with Major Economies in Thailand (%)

(a) Exports



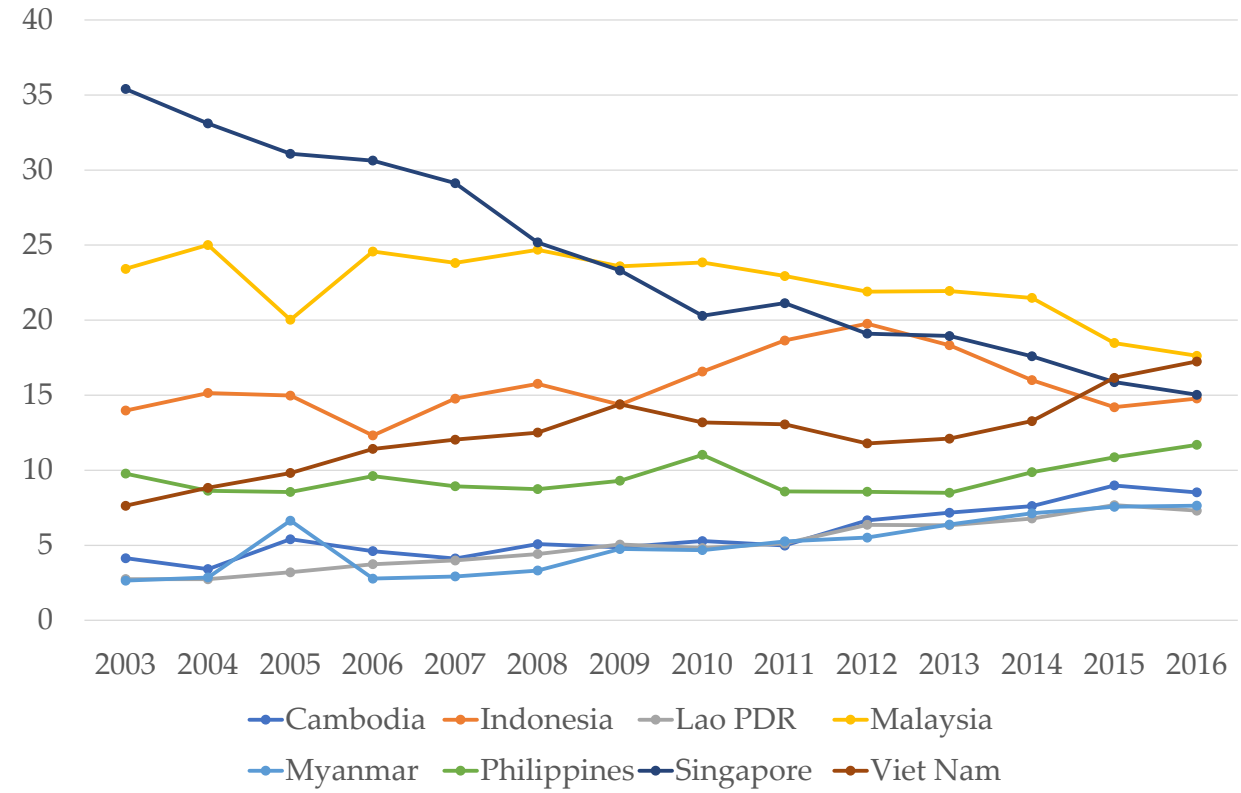
(b) Imports



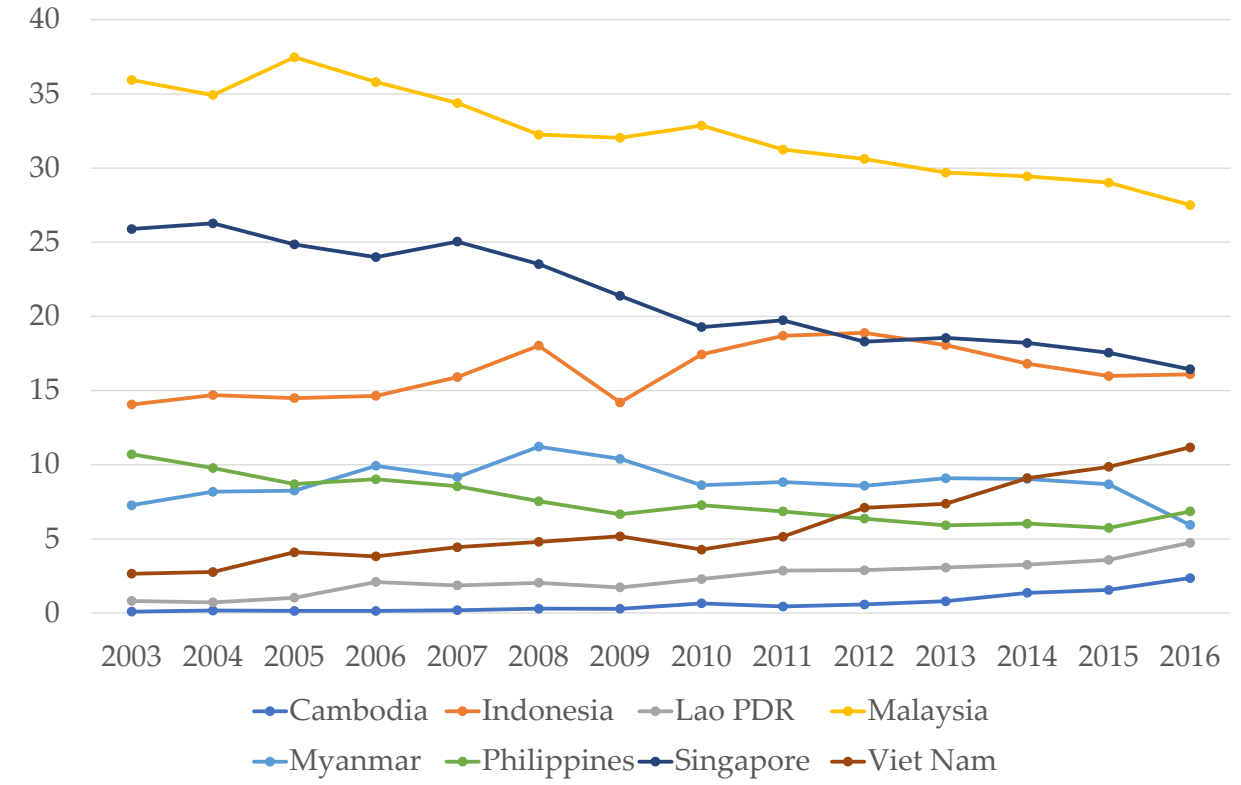
Source: ASEAN Stats Data Portal.

Figure 2. Shares of Trade with ASEAN Countries out of Intra-ASEAN Trade in Thailand (%)

(a) Exports

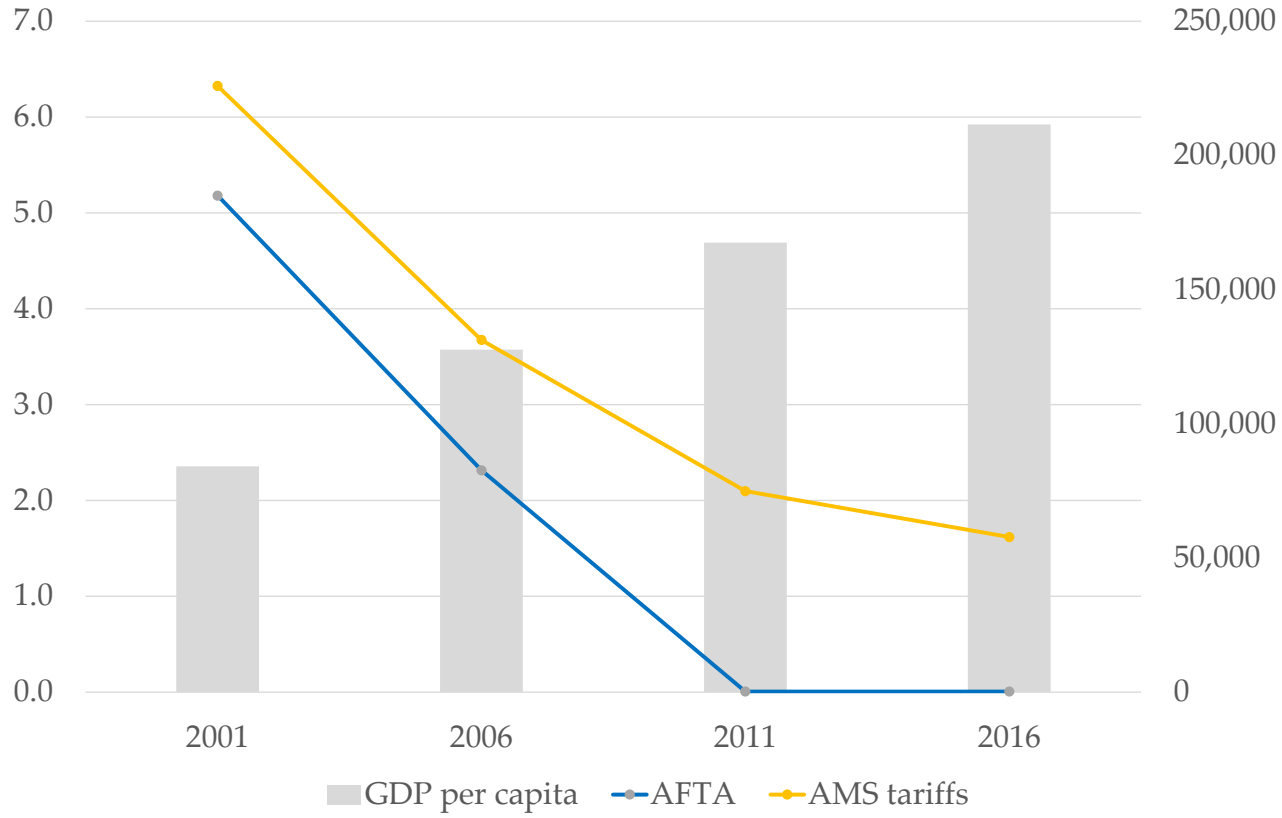


(b) Imports



Source: ASEAN Stats Data Portal.

Figure 3. Average Tariffs (Left, %) and GDP per capita (Right, THB) in Thailand



Sources: WDI and WITS