The Effect of Minimum Wage Policies on Economy and Employment: The Case of Thailand as a Part of the AEC

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The ASEAN Economic Community (AEC), established at the end of 2015, created an integrated regional economy with a single market and production base. This study attempts to estimate the impact of wage policies on the economy and employment of Thailand as a part of the AEC by using a computable general equilibrium model. The paper also suggests appropriate policies for a sustainable Thai economy in the long run.

The results indicated that negative correlations between minimum wage and the gross domestic product, and minimum wage and employment are the result of higher costs of production. Therefore, in this study, increasing minimum wage or subsidy wage policies are not appropriate for Thailand under the AEC because these policies would reduce investment and reduce incentives to accumulate human capital. The study found that increasing labor productivity can compensate the effect from these negative wage policies. However, a lower minimum wage led to an increase in the gross domestic product, investment, and employment for both the skilled and unskilled labor force in every sector. The study measured various adjustments in both minimum wage and labor productivity for policy makers.

Keywords: ASEAN Economic Community, Computable General Equilibrium, Minimum wage, Productivity of labor

1. Introduction

The minimum wage in Thailand is an important topic for debate. The potential effects of minimum wage government interventions on the economy and employment in Thailand with the newly liberated labor market under the ASEAN Economic Community (AEC)[3] is a concern

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[3] At the Bali Summit in October 2003, ASEAN leaders declared that the AEC shall be the goal of the regional economic integration (Bali Concord II) by 2020 (AEC Blueprint). However, at the

among Thai policy makers. Therefore, it is important to consider the policy options available to the Thai government.

Figure 1: Growth of gross domestic product (GDP), growth of the minimum wage, and the unemployment rate of Thailand

Source: Bank of Thailand, National Statistical Office of Thailand, and Ministry of Labour

Before the creation of the AEC, unemployment in Thailand was very low at around 1% on average from 2007 to 2015, see Figure 1. This indicates a tight labor market in Thailand. In 2012, the Thai government increased the minimum wage to 300 baht per day. This policy coincided with a lower Thai GDP growth rate. The change in the minimum wage policy was probably not the only factor behind the fall in GDP growth. Therefore, it is important to quantify the effect of the wage policy on the economy using a more thorough approach.

This study investigated the ways in which wage policies in Thailand, under the AEC, affect the economy as a whole and the labor market in particular. We considered the effects of three policy mechanisms which are (i) a minimum wage increase, (ii) a rise in minimum wages with government subsidization, and (iii) a minimum wage cut. The outcomes

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12th ASEAN Summit in January 2007, ASEAN leaders have changed the establishment date of the AEC to 2015.

of these policy changes were then compared in order to determine which approach might be the most beneficial option for the Thai economy.

The paper is divided into three parts. The first part is a literature review including literature on minimum wage policies and on the relationship between economic integration, the minimum wage, and labor productivity. The second part discusses the methodology containing the conceptual framework and the setup of the scenarios of the minimum wage adjustment and the labor productivity shock. The third part shows the results and the policy implications of the wage policy and labor productivity shocks on the economy and employment of Thailand under the AEC.

2. Literature Review

All countries around the world have some type of wage intervention by their government. The impact of a minimum wage policy has many aspects both social and economic impacts. Policy makers have often claimed that an increase in the minimum wage results in an increase in the income of the low-wage labor force, thereby serving as a means to reduce both inequality and poverty (Jayanthakumaran, Sangkaew, & O'Brien, 2013; Dolado, et al., 1996). However, its opponents have argued that it may take low-skill laborers out of jobs (Dolado, et al., 1996). There are studies which revealed that setting the minimum wage at a higher level can result in a lower level of employment (Holland, Bhattacharjee, & Stodick, 2006; Carpio, Nguyen, & Wang, 2012; Akpansung, 2014). This can be seen as a trade-off between wages and employment. The occurring employment reduction are spread broadly across all industries and regions and are not just focused on the industries which are highly labor intensive (Dixon, Madden, & Rimmer, 2009).

However, it has been shown that increasing the minimum wage does not in every case result in an increase in the unemployment rate (Reich, Jacobs, & Bernhardt, 2014). Raising wages can help to increase productivity as the employees are encouraged to work harder. This leads to a fall in turnover and companies are thus more likely to provide training to their staff (Raff & Summers, 1987; Levine, 1992).

Terra, Bucheli, Laens and Estrades (2006) stated that subsidy policies have a positive impact on GDP. They conducted a study in which wages

of unskilled workers were subsidized and found that wages increased, while GDP also benefitted due to efficiency gains derived from the fall in informal employment or unemployment. The subsidy stimulated the demand for unskilled laborers, thereby offsetting some of the fall in demand that would result from the inefficiencies caused by the wage premium. Subsidizing unskilled laborers' wages may therefore lead to higher employment levels and a better income distribution. However, the long term effects of such a policy may not be beneficial due to potentially negative consequences. The shortcomings are a likely fall in investment and a potential reduction in the incentive to accumulate human capital. This could adversely affect future growth rates. Thus, it is advisable to apply this policy only to specific labor sectors (Terra, Bucheli, Laens, & Estrades, 2006).

A study in the Democratic Republic of Congo by Erero, Pambudi, and Bonga (2013) examined the effects of subsidizing wages in the formal employment sector for unskilled laborers. The researchers employed a multi-sectoral empirically-calibrated general equilibrium (CGE) model to assess all the transactions taking place within the economy between the informal and formal sectors. The simulation showed that when the wage of the unskilled labor force was subsidized, household incomes in both formal and informal sectors increased, thus narrowing the income gap between rich and poor households, and also between informal and formal sectors. Also, targeting the unskilled formal laborers with the wage subsidy caused an increase in GDP in both the short-run and long-run.

According to Heckscher–Ohlin's predictions, increased trade openness should narrow the wage gap between the skilled and unskilled labor force in developing countries due to an increase in the demand of unskilled labor. Revenga and Montenegro (1998) studied the evolution of average industry wages in Mexico relative to the United States. They found that the Mexico-U.S. wage gap was positively correlated with Mexican tariffs. A reduction in tariffs were associated with a reduction of the relative Mexico-U.S. wage gap for the unskilled as well as the skilled labor force (Revenga & Montenegro, 1998). Moreover, Hanson (2003) reported wage changes in Mexico were positively correlated with wage changes in the United States (Hanson, 2003).

Although eliminating trade barriers would presumably lower profit margins of domestic firms and cause a proportional decline in wages, it

induces higher productivity. Casacuberta, Fachola, and Gandelma (2004) found that in response to reductions in trade barriers, the Uruguayan manufacturing sector undertook a technological update in favor of more capital-intensive technologies which positively affected labor productivity (Casacuberta, Fachola, & Gandelman, 2004).

In developing economies, the effect of minimum wage changes on employment is negative and statistically significant, especially on small businesses and workers who have a low level of education (Carpio, Nguyen, & Wang, 2012; Carpio, Messina, & Galdeano, 2014)., The impact is typically less dramatic for large companies and educated workers with a high school or higher degree. Moreover, Carpio *et al.* (2014) studied minimum wages in Thailand and found that minimum wages had a negative effect on employment, especially among less-educated or unskilled laborers. Understanding the effects of minimum wage policies, labor productivity, and policy changes on the economy and employment are important, especially for Thailand where many sectors rely on small or informal businesses.

3. Methodology

The study used a dynamic multi-countries CGE model to investigate the potential effects of wage policy decision on the economy and employment in Thailand. The objective of this study is to estimate the effects of different wage policies and changes in labor productivity on the Thai economy under the AEC.

A CGE model can capture interactions of economic factors due to wage policy changes (Maechler & Holst, 1995). Thus, it is an appropriate model for this study.

The model in this study is structured into nine sets of equations, which are production, income and saving, producer supplies of products and international trade, prices, equilibrium conditions of all markets, GDP, dynamic conditions of investment variables, Warlas' law, and closure rules. The complete list of equation sets, variables and parameters are available upon request. It is calibrated from the 2007 GTAP 8 Data Base with 2007 also being the baseline year.

3.1 Model's assumptions

The basic assumptions for the CGE model are as follows. Prices were set at market-clearing levels, while businesses and consumers maximized their profits and utilities respectively. The proposed economy was expected to reach equilibrium in each market after supply and demand adjusted themselves in response to the relative costs of production. The production structure of businesses was assumed to encompass zero economic profits. The exogenous growth projection variables were drawn from several sources, see Table 1.

There are 7 closure rules: government spending growth equals to GDP growth, investment growth equals to GDP growth, household saving growth equals to GDP growth, the exchange rate is fixed, the GDP deflator of the rest of the world (ROW) is a numeraire, minimum consumption growth equals labor supply growth, and migrant labor wage growth equals to inflation growth. Different assumptions may affect the results of this studies empirical simulation.

Table 1: Growth rates of exogenous variables (unit in percentage per year)

Country	GDP growth (percent per year)	Labor supply growth[4] (percent per year)	Saving growth (percent per year)
Cambodia	4.49	2.35	-3.88
Indonesia	5.89	1.66	3.87
Lao PDR	7.94	2.88	-0.30
Malaysia	4.10	2.05	-3.60
Philippines	4.43	2.35	-3.34
Singapore	4.89	2.41	-0.01
Thailand	3.27	1.02	-1.84
Vietnam	6.06	1.90	1.11
REST OF ASEAN	9.75	1.95	5.11
ROW	1.85	1.38	-0.04

Source: (Fouré, Bénassy-Quéré, & Fontagné, 2012)

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[4] The labor force is composed of workers aged 15 years and older who are defined by the International Labour Organization (ILO) as members of the economically active population. The labor force includes employed and unemployed people, but members of the armed forces or people in seasonal or part time work may sometimes be considered differently depending on the country concerned. Housewives, caregivers who are not paid and informal laborers are not included in the labor force, *Key indicators of the labor market database* (ILO).

The model contains nine production sectors and commodities, five primary factors of production, four agents (households, firms, government, ROW), three types of taxes (import tax, indirect tax, and direct tax), and ten countries, see Table 2.

The model differentiates four types of factors of production which are capital, land, natural resources, and labor. Capital can flow freely. Land and natural resource are assumed to be completely immobile. There is one type of household and two types of workers which are either skilled or unskilled. Labor is assumed not to be freely mobile in the model. There is one government in each country. The governments in each country get their funds from the three previously defined types of taxes.

Table 2: Countries, production sectors and commodities and primary factors classification

Countries	Sectors and Commodities	Factors
Thailand	Grains and crops	Unskilled labor force[5]
Singapore	Livestock and meat products	Skilled labor force
Malaysia	Mining and extraction	Capital
Philippines	Processed food	Land
Indonesia	Textiles and clothing	Natural resource
Vietnam	Light manufacturing	
Cambodia	Heavy manufacturing	
Lao PDR	Utilities and construction	
Rest of ASEAN[6]	Other services	
ROW		

3.2 Data

The CGE model used in this study is based on a dynamic multi-country model developed by Partnership for Economic Policy (Decaluwé, Lemelin, Maisonnave, & Robichaud, 2013). The model parameters are calibrated with a multi-country Social Accounting Matrix based on data provided by the 2007 GTAP 8 Data Base (Narayanan, Aguiar, &

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[5] Labor was splitted by skill level — skilled and unskilled — based on ILO's classification of occupations, (Narayanan, Aguiar, & McDougall, 2012).
[6] Data in the GTAP 8 Data Base (Narayanan, Aguiar, & McDougall, 2012) combines Myanmar and Brunei and we use Rest of ASEAN to represent these two countries.

McDougall, 2012). The model was implemented in the General Algebraic Modeling System [7].

3.3 Model setup

3.3.1 Business as usual (BAU)[8] setup

The study simulated the effect of minimum wage policies and changes in labor productivity on the Thai economy under the AEC. The AEC was simulated according to elements of economic integration; zero import and export taxes, improvement of the investment climate, and a reduction in trade costs, see Table 3.

Table 3: Components of the AEC

Condition	Description
Zero tariff	The conclusion of the terms of the ASEAN Free Trade Agreement which sought to eliminate all remaining tariffs within ASEAN. In the model, the tariffs did set import and export taxes between ASEAN countries equal to 0%.
Improved investment climate	The investment climate were was modeled by increased FDI foreign direct investment inflows to each ASEAN country by 1% of relative to its GDP (Petri, Plummer, & Zhai, 2012)
Reduced trade costs	Lower trade barriers reduces the costs of international trade which reflects from the elimination of administrative burden and customs processes and procedures. Since the details of these barriers are neither clear nor available, the model assumes a reduction in trade costs of 5% of trade values (Petri, Plummer, & Zhai, 2012)

Table 4 reports the average real GDP value per country for the BAU case in 8 years in the first column. The second column compares the AEC effect on the real BAU GDP by showing the percentage change the AEC would induce on real BAU GDP per country after 8 years under the AEC. The last two columns compare the yearly GDP growth rates over the 8 years for these two scenarios. The base model found that Cambodia and Vietnam have the highest gains of GDP growth from the AEC by 6.07%

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[7] https://www.gams.com/
[8] Business as usual (BAU): AEC integration is occurred but no change in wage policy.

and 4.60% respectively while Thailand would gain a 2.35% GDP increase relative to the BAU case. The results from Table 4 are consistent with the existing literature as economic integration normally had a positive effect on the member countries (Plummer & Yue, 2009; Akapaiboon, 2010; Petri, Plummer, & Zhai, 2012). The percent growth of each country under the AEC are more than in the BAU scenario. Thus, the AEC clearly has a positive effect for every ASEAN member country.

Table 4: Effects of scenario shock to real GDP (the first 8 years under the AEC)

Country	Billion US Dollar	Average percent change from BAU	Average percent growth per year	
	BAU	AEC	BAU	AEC
Cambodia	8.62	6.07	3.77	4.46
Indonesia	501.91	1.28	4.99	5.23
Lao PDR	5.30	4.15	6.64	7.27
Malaysia	201.51	3.14	4.06	4.53
Philippines	157.48	1.75	4.33	4.60
Singapore	163.10	3.32	3.63	4.08
Thailand	*248.93*	*2.35*	*2.81*	*3.18*
Vietnam	64.57	4.60	3.57	4.24
REST OF ASEAN	37.21	2.79	8.48	8.89
ROW	54,728.16	-0.02	1.88	1.88

Source: Results from the study's model

3.3.2 Wage policy scenarios

The following models assumed wage to be exogenous. Wage increases cause a lower level of employment because the demand for labor will decline as the labor factor price increases. At the same time however, labor income increases together with demand for goods and services. We studied the following four different wage policies for Thailand.

  i. Minimum wage increase: The Thai government increases the minimum wage of unskilled labor in Thailand.

ii.   Minimum wage subsidy: The Thai government subsidizes the entire wage gap from the old to the new theoretical minimum wage by using the government budget to prevent rising costs on the production side.

iii. Minimum wage decrease: The most extreme policy scenarios. The study assumed that there is no political backlash upon the government and that the labor force accepts the lower minimum wage.

iv.   Minimum wage and labor productivity increase: In order to compensate the negative impact of the increased minimum wage, the productivity of the workers who earned the minimum wage increased as well.

This paper studied different levels of minimum wage increases and decreases. The government set wage of the unskilled workforce in Thailand increased or decreased by either 6.7%, 20%, or 50% while that of the other countries in the AEC remained the same. These adjustment is assumed arbitrarily to observe a scaling effect of the different levels of changes in minimum wage. Since we do not have the minimum wage variable in the model, we computed the average change of wage by a rise of the minimum wage from 300 to either 320, 360, or 450 baht per day, respectively. We assumed that only 10%[9] of the labor force in Thailand were paid the minimum wage of 300 baht per day. This group of labor is mostly from neighboring countries (CLM). Thai labors generally earn more than minimum wage. For simplicity, we assumed that the other 90% of labor in Thailand is unaffected by changes in minimum wage.

4. Results

This section consists of two parts. The first part shows the results of the combination of the minimum wage and labor productivity adjustments which simulated the effects of each scenario on the Thai and the other ASEAN economies. The second part discusses policy suggestions related to the results from the first part.

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[9] The report shows that about 3 million people were paid at minimum wage rate compared with the total labor force in Thailand at about 37 million people. Consequently, we arbitrarily assume a value of 10% for convenience *(source: http://service.nso.go.th/nso/ nweb/statseries/ statseries 03.html).*

4.1 Effect of minimum wage adjustment and labor productivity of Thailand

Table 5 shows the simulation results of the effects of the different minimum wage policies and the labor productivity adjustment on real GDP (average for the first 8 years). In the case of Thailand, the model shows that the real GDP has a negative relationship with the minimum wage, it decreases with a higher minimum wage but increases with a lower minimum wage. When comparing an increase in the minimum wage and in productivity, the changes in GDP depend on two opposing effects. The increased minimum wage causes higher production costs and the firms decide to decrease their production level in turn causing GDP to fall. On the other hand, the higher labor productivity leads to an increase in the level of output, this causes the GDP to rise.

Under the AEC, Cambodia, the Lao PDR, and the Rest of ASEAN are affected significantly by changes in the minimum wage and labor productivity in Thailand. This is because Thailand is the major trading partner for these countries, see Table 6. When Thai firms produce more output it causes a higher volume of trade between Thailand and these countries, hence the effect is felt more significantly in these countries relative to the others in the study. This result is in line with the study of Hanson (2003) who studied the effects of the US wages on Mexico's wages.

From the results from Table 5, when minimum wage increased from 300 to 320 baht per day (6.67%) and unskilled labor productivity increased by 2.5%, then the Thai GDP declined by 0.40% per year comparing to a 0.54% yearly fall without the increase in unskilled labor productivity (The effect in term of average percent change per year of real GDP from BAU and average percent growth of real GDP for each scenario in the first 8 years under each scenario.). This can be explained by the effects of changes in wage and changes in labor productivity. A change in the minimum wages could lead to a substitution of labor for capital and, also, labor intensive sectors may reduce production. On the other hand, increasing unskilled labor productivity has some positive effects. First, given the competitive markets assumption, a fall in production costs as a result of increased productivity will be passed on to consumers through lower product prices. This will increase the domestic demand and, hence, increase output level. Also, the direct effect of the increase in labor

productivity will be a higher demand for that factor which will increase the Thai economy's output due to the wealth effect of the employees.

Table 5: Percentage change of ASEAN countries' GDP from BAU by varying minimum wage, government subsidy and labor productivity (unit in percent change)

	Change in Labor Productivity	Change in Minimum Wage								
		Minimum Wage Increases			Government Subsidy			Minimum Wage Decreases		
	Percentage	6.67	20	50	6.67	20	50	6.67	20	50
Thailand	0	*-0.54*	*-1.58*	*-4.50*	-0.12	-0.35	-1.11	0.55	1.70	5.61
	2.5	*-0.40*	*-1.44*	*-4.37*	0.02	-0.21	-0.97	0.69	1.84	5.77
	10	*0.01*	*-1.03*	*-3.97*	0.44	0.20	-0.56	1.11	2.27	6.22
	20	*0.56*	*-0.50*	*-3.46*	0.99	0.75	-0.02	1.66	2.83	6.81
Cambodia	0	-0.07	-0.21	-0.60	-0.03	-0.09	-0.29	0.07	0.22	0.72
	2.5	-0.05	-0.19	-0.59	-0.01	-0.08	-0.28	0.09	0.24	0.73
	10	0.00	-0.14	-0.54	0.04	-0.03	-0.23	0.14	0.29	0.78
	20	0.06	-0.08	-0.47	0.10	0.04	-0.16	0.20	0.35	0.85
Indonesia	0	0.02	0.05	0.14	0.01	0.02	0.06	-0.02	-0.05	-0.18
	2.5	0.02	0.05	0.14	0.01	0.02	0.06	-0.02	-0.05	-0.18
	10	0.02	0.05	0.15	0.01	0.02	0.06	-0.02	-0.05	-0.18
	20	0.02	0.05	0.15	0.01	0.02	0.06	-0.02	-0.05	-0.18
Lao PDR	0	-0.17	-0.49	-1.42	-0.07	-0.20	-0.61	0.17	0.53	1.73
	2.5	-0.14	-0.47	-1.40	-0.04	-0.17	-0.58	0.20	0.55	1.76
	10	-0.07	-0.40	-1.33	0.03	-0.10	-0.51	0.27	0.62	1.83
	20	0.02	-0.31	-1.24	0.12	-0.01	-0.42	0.36	0.72	1.93
Malaysia	0	0.00	-0.01	-0.02	0.00	-0.01	-0.04	0.00	0.01	0.03
	2.5	0.00	-0.01	-0.02	0.00	-0.01	-0.04	0.01	0.01	0.03
	10	0.01	0.00	-0.02	0.00	0.00	-0.03	0.01	0.02	0.04
	20	0.01	0.01	-0.01	0.01	0.00	-0.02	0.02	0.03	0.05
Philippines	0	0.01	0.04	0.12	0.00	0.01	0.04	-0.01	-0.04	-0.15
	2.5	0.01	0.04	0.12	0.00	0.01	0.04	-0.02	-0.05	-0.15
	10	0.01	0.04	0.12	0.00	0.01	0.04	-0.02	-0.05	-0.15
	20	0.01	0.04	0.11	0.00	0.01	0.04	-0.02	-0.05	-0.15
Singapore	0	0.02	0.05	0.16	0.00	0.00	0.00	-0.02	-0.06	-0.19
	2.5	0.02	0.05	0.15	0.00	0.00	0.00	-0.02	-0.06	-0.19
	10	0.01	0.05	0.15	-0.01	-0.01	-0.01	-0.03	-0.07	-0.20
	20	0.01	0.04	0.14	-0.01	-0.01	-0.02	-0.03	-0.07	-0.21
Vietnam	0	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.00	-0.01
	2.5	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.00	0.00
	10	0.01	0.01	0.01	0.01	0.01	0.02	0.00	0.00	0.00
	20	0.01	0.01	0.02	0.01	0.01	0.02	0.01	0.01	0.01
Rest of ASEAN	0	-0.13	-0.38	-1.08	-0.04	-0.11	-0.35	0.13	0.41	1.39
	2.5	-0.12	-0.37	-1.06	-0.02	-0.10	-0.34	0.15	0.43	1.41
	10	-0.07	-0.33	-1.03	0.02	-0.06	-0.29	0.19	0.48	1.46
	20	-0.02	-0.27	-0.98	0.08	0.00	-0.24	0.25	0.54	1.53
ROW	0	0.00	0.00	-0.01	0.00	0.00	0.00	0.00	0.00	0.01
	2.5	0.00	0.00	-0.01	0.00	0.00	0.00	0.00	0.00	0.01
	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
	20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01

Source: Results from the study's model

The ASEAN economies that are important Thai trading partners, Cambodia, the Lao PDR, and Rest of ASEAN, saw a reduction in their yearly GDP growth figures compared to the BAU case. This effect may be due the lower Thai output, this would cause a lower trade volume between Thailand and these countries which in turn impacts their GDP negatively.

Table 6: Share of ASEAN intra-trade from 2015-2023 (unit in percentage)

	Camb odia	Lao PDR	Rest of ASEAN	Thail and	Mala ysia	Philip pines	Singa pore	Indon esia	Viet nam
Cambodia		0.00	0.01	*19.52*	1.77	0.15	3.81	1.45	7.45
Lao PDR	0.01		0.02	*51.79*	1.90	0.06	0.55	0.32	9.98
REST OF ASEAN	0.01	0.00		*21.21*	4.14	0.12	5.06	8.89	0.55
Thailand	0.71	0.59	1.70		6.65	1.83	4.77	3.61	2.09
Malaysia	0.06	0.02	0.30	6.03		1.95	13.16	3.63	1.40
Philippines	0.01	0.00	0.02	4.23	4.98		5.13	2.56	1.55
Singapore	0.11	0.00	0.32	3.78	11.50	1.76		6.61	1.96
Indonesia	0.07	0.00	0.94	4.76	5.28	1.46	10.99		1.42
Vietnam	0.74	0.31	0.12	5.69	4.20	1.82	6.75	2.93	

Source: Results from the study's model

In order to compensate the GDP loss from a 6.67% increase in minimum wage, a boost in unskilled workers' productivity by at least 10% expanded GDP by at least 0.01%, see Table 5. On the other hand, implementing a government subsidy to compensate for the 6.67% increase in minimum wage will require unskilled labor productivity to increase only by 2.5% to compensate for the negative effect on GDP which is 0.02% relative to BAU because the government will pay for the wage gap to support the production side.

Table 7: Percentage change of investment in Thailand from BAU by a 20 percent increase in labor productivity (unit in percent change)

Government Subsidy (%)	2016	2017	2018	2019	2020	2021	2022	2023
6.67	-0.90	-1.06	-1.09	-1.18	-1.29	-1.42	-1.55	-1.69
20	-2.71	-3.18	-3.28	-3.53	-3.87	-4.24	-4.64	-5.07
50	-8.29	-9.74	-10.02	-10.76	-11.80	-12.92	-14.11	-15.39

Source: Results from the study's model

Total investment was reduced overtime as shown in Table 7. This result is in line with the results of Terra *et al.* (2006). Agénor and Aynaoui (2003), also, found that, in the long run, minimum wage subsidy policy led to a disincentive of human capital accumulation and an unsustainable increase in fiscal deficits overtime.

In the decreased minimum wage scenario with increased unskilled labor productivity, Thai GDP increased since both changes have positive effects on GDP. The study arbitrarily assumes that the minimum wage of unskilled labor in Thailand will decrease without the political context and that the workers can accept the minimum wage. From our results, we can see that producers produced more products and hired more employees because of the cheaper costs of labor in Thailand relative to other countries in the AEC. Moreover, the higher labor productivity also had a positive impact on Thai GDP.

When minimum wage increased, the firm's cost were higher resulting in lower labor demand. Firms then decided to produce less. On the other hand, higher labor productivity per unskilled worker led to a higher output level.

Regarding government subsidizes, output decreased less than when the government increased the minimum wage because consumption increased due to a higher household income. However, output still declined since total investment decreased due to a lower amount of government saving.

Table 8: Percentage change of sectoral employment from BAU by varying minimum wage policies with a 2.5% increase in unskilled labor productivity in Thailand (unit in percent change)

		Minimum Wage Increases			Government Subsidy			Minimum Wage Decreases		
	Percentage	6.67	20	50	6.67	20	50	6.67	20	50
Unskilled Labor	Grains&Crops	-0.84	-3.03	-9.09	0.25	0.11	-0.43	1.49	3.94	12.52
	LiveStk&Meat	-1.03	-3.70	-11.01	0.51	0.76	1.51	1.82	4.85	15.57
	Mining&Extractn	-0.73	-2.65	-7.89	-0.12	-0.89	-3.21	1.31	3.49	11.22
	Procfood	-1.56	-5.59	-16.34	0.80	1.24	2.56	2.80	7.51	24.70
	Textiles&Clothing	-1.91	-6.82	-19.66	0.84	1.10	1.86	3.44	9.29	31.10
	LightMnfc	-1.83	-6.55	-18.94	0.72	0.80	1.03	3.29	8.87	29.52
	HeavyMnfc	-1.71	-6.13	-17.81	0.53	0.30	-0.38	3.08	8.28	27.43
	Util&Constuct	-1.95	-6.99	-20.24	-0.24	-2.18	-8.35	3.51	9.46	31.44
	OthServices	-1.80	-6.48	-18.78	0.71	0.75	0.84	3.28	8.80	29.23
Skilled Labor	Grains&Crops	-0.52	-1.86	-5.60	0.11	-0.03	-0.57	0.88	2.35	7.37
	LiveStk&Meat	-0.44	-1.50	-4.50	0.24	0.50	1.25	0.68	1.85	5.83
	Mining&Extractn	-0.50	-1.79	-5.33	-0.22	-0.99	-3.31	0.87	2.33	7.49
	Procfood	-0.28	-0.86	-2.48	0.23	0.67	1.98	0.31	0.93	3.02
	Textiles&Clothing	-0.48	-1.54	-4.53	0.20	0.45	1.21	0.63	1.79	5.75
	LightMnfc	-0.40	-1.25	-3.69	0.08	0.16	0.39	0.48	1.40	4.47
	HeavyMnfc	-0.28	-0.81	-2.34	-0.12	-0.34	-1.02	0.28	0.85	2.79
	Util&Constuct	-0.41	-1.27	-3.86	-0.92	-2.85	-8.99	0.47	1.35	4.15
	OthServices	-0.26	-0.74	-2.16	0.02	0.06	0.15	0.25	0.76	2.46

Source: Results from the study's model

From Table 8 we see that the net employment changes are negative in all sectors for both unskilled and skilled labors for a Thai minimum wage increase of 6.67% and a labor productivity hike of the unskilled labor force of 2.5%. Hence, the negative effect of the 6.67% minimum wage increase outweighed the positive effect of the unskilled labor productivity increase. Furthermore, the employment of unskilled labor decreased more than the employment of skilled labor in every sector, while the utilities & construction sector was most severely affected. This is because unskilled labor responses more to a change in the minimum wage than skilled labor

as the skilled labor wage stays constant. However, skilled labor is affected indirectly due to a lower level of production but with a relatively low amount because firms can partially use skilled labor instead of unskilled labor under the constant elasticity of substitution production function assumption. The simulation result is in line with Carpio *et al.* (2012) and Carpi*o et al.* (2014) who claimed that the employment effects of a rise in the minimum wage are significant and negative on firms and on the less educated labor force or unskilled labor. Additionally, our result showed there is negative effect on skilled labor as well while Carpio *et al.* (2012) found no effect of an increased minimum wage on skilled labor.

Concerning the minimum wage subsidy scenario, sectoral employment changes are ambiguous while more subsidies on the minimum wage will cause higher labor demand for both skilled and unskilled labors in sectors with more favorable working conditions. From Table 8 we can see that the mining, agricultural, heavy manufacturing, and construction sectors lost workers to the other sectors, especially when the subsidies increase in size. Moreover, the employment of unskilled labor was affected by the minimum wage subsidy scheme more than the skilled labor force. This is because the relative price between unskilled and skilled labors becomes closer. As the subsidies increased, firms with hard working conditions which normally had paid more to attract workers, were not able to compete with firms in less demanding sectors anymore because the effective wage was in a similar range and the firms were not able to increase wages to much due to market competition both domestically and internationally.

In the decreased minimum wage scenario, employment increased in every sector for both unskilled and skilled labor. The minimum wage adjustment affected employment for both types of workers in the same direction but different in magnitude. Employment of unskilled labor was affected directly while skilled laborers were affected indirectly from the increase of the production level. However, this indirect effect was relatively lower since firm shifted to use unskilled labor instead of skilled labor under the constant elasticity of substitution production function assumption.

Table 9 shows the percentage changes from the BAU scenario of sectoral employment in Thailand of an increased unskilled labor productivity of 10% and varying minimum wages. Under this condition, employment of

unskilled labor mostly increased due to the higher productivity effect that outweighed the effect of the minimum wage hike for the lower values. However, employment of skilled labor still decreased. Additionally, in the subsidy and minimum wage decrease case, the employment numbers of unskilled labor increased more than the growth in employment of the skilled labor force in every sector. The utilities & construction sector showed the largest swings in employment. Some skilled workers may have lost jobs to unskilled ones due to the substitution effect as GDP remained almost unchanged, see Table 5.

Table 9: Percentage change of sectoral employment from BAU by varying minimum wage with a 10% increase in unskilled labor productivity for Thailand (unit in percent change)

		Minimum Wage Increases			Government Subsidy			Minimum Wage Decreases		
	Percentage	6.67	20	50	6.67	20	50	6.67	20	50
Unskilled Labor	Grains&Crops	0.08	-2.14	-8.25	1.17	1.03	0.48	2.42	4.90	13.56
	LiveStk&Meat	0.08	-2.63	-10.03	1.63	1.89	2.65	2.96	6.02	16.87
	Mining&Extractn	0.07	-1.87	-7.17	0.69	-0.10	-2.46	2.14	4.34	12.17
	Procfood	0.15	-3.96	-14.89	2.55	2.99	4.33	4.58	9.37	26.85
	Textiles&Clothing	0.17	-4.84	-17.96	2.98	3.24	4.02	5.64	11.60	33.88
	LightMnfc	0.15	-4.65	-17.30	2.76	2.84	3.08	5.38	11.06	32.12
	HeavyMnfc	0.15	-4.35	-16.25	2.43	2.20	1.51	5.03	10.33	29.85
	Util&Constuct	0.17	-4.97	-18.49	1.92	-0.06	-6.34	5.74	11.80	34.21
	OthServices	0.21	-4.56	-17.12	2.77	2.81	2.90	5.39	11.02	31.86
Skilled Labor	Grains&Crops	-0.02	-1.36	-5.13	0.61	0.47	-0.07	1.38	2.86	7.91
	LiveStk&Meat	-0.11	-1.18	-4.19	0.58	0.84	1.59	1.01	2.19	6.19
	Mining&Extractn	0.00	-1.30	-4.88	0.28	-0.50	-2.86	1.39	2.86	8.08
	Procfood	-0.25	-0.83	-2.45	0.26	0.70	2.00	0.34	0.96	3.05
	Textiles&Clothing	-0.28	-1.34	-4.34	0.40	0.66	1.42	0.83	2.00	5.96
	LightMnfc	-0.29	-1.15	-3.58	0.19	0.27	0.50	0.59	1.51	4.58
	HeavyMnfc	-0.29	-0.83	-2.35	-0.13	-0.35	-1.03	0.26	0.84	2.77
	Util&Constuct	-0.32	-1.17	-3.74	-0.84	-2.76	-8.87	0.55	1.42	4.19
	OthServices	-0.28	-0.76	-2.17	0.00	0.04	0.13	0.22	0.74	2.43

Source: Results from the study's model

In regard to the minimum wage subsidy scenario of a subsidy equal to an increase of the minimum wage of 6.67% and a 10% jump of the unskilled labor productivity, employment for unskilled labor increased in every sector and in most sectors for skilled labor. Higher subsidies caused a higher labor demand in sectors with relatively more favorable working conditions. These results are basically the same as the scenario where the

labor productivity was increased by 2.5%. However, we observe a smaller negative impact on employment due to the higher labor productivity increase which can keep firms competitive. In the decreased minimum wage scenario, employment in all sectors increased in both unskilled and skilled labor.

Table 10: Percentage change of sectoral employment from BAU by varying minimum wage with a 20% increase in unskilled labor productivity for Thailand (unit in percent change)

		Minimum Wage Increases			Government Subsidy			Minimum Wage Decreases		
	Percentage	6.67	20	50	6.67	20	50	6.67	20	50
Unskilled Labor	Grains&Crops	1.28	-0.97	-7.16	2.38	2.24	1.68	3.65	6.16	14.92
	LiveStk&Meat	1.54	-1.21	-8.72	3.11	3.38	4.15	4.46	7.57	18.58
	Mining&Extractn	1.13	-0.84	-6.22	1.76	0.94	-1.48	3.23	5.47	13.43
	Procfood	2.41	-1.79	-12.97	4.86	5.32	6.68	6.95	11.84	29.72
	Textiles&Clothing	2.95	-2.21	-15.68	5.83	6.10	6.91	8.56	14.70	37.59
	LightMnfc	2.80	-2.13	-15.11	5.47	5.56	5.81	8.16	14.00	35.60
	HeavyMnfc	2.64	-1.98	-14.17	4.97	4.74	4.02	7.64	13.07	33.07
	Util&Constuct	2.99	-2.27	-16.14	4.80	2.78	-3.65	8.71	14.93	37.92
	OthServices	2.89	-2.01	-14.89	5.52	5.56	5.65	8.21	13.98	35.37
Skilled Labor	Grains&Crops	0.63	-0.72	-4.51	1.27	1.13	0.58	2.05	3.54	8.62
	LiveStk&Meat	0.33	-0.75	-3.77	1.02	1.28	2.04	1.46	2.64	6.66
	Mining&Extractn	0.67	-0.66	-4.28	0.95	0.14	-2.26	2.07	3.57	8.87
	Procfood	-0.21	-0.78	-2.41	0.30	0.74	2.04	0.39	1.01	3.09
	Textiles&Clothing	-0.01	-1.08	-4.09	0.67	0.93	1.69	1.10	2.27	6.25
	LightMnfc	-0.15	-1.00	-3.44	0.33	0.41	0.65	0.73	1.65	4.71
	HeavyMnfc	-0.31	-0.85	-2.37	-0.15	-0.37	-1.05	0.24	0.82	2.75
	Util&Constuct	-0.21	-1.05	-3.59	-0.73	-2.64	-8.73	0.65	1.51	4.24
	OthServices	-0.30	-0.78	-2.19	-0.03	0.01	0.10	0.20	0.71	2.39

Source: Result from the study's model

Table 10 shows the percentage changes from the BAU scenario of sectoral employment in Thailand of an increased unskilled labor productivity of 20% and varying minimum wages. Employment of unskilled labor increased in most cases due to the higher productivity effect that outweighed some of the effect of an increased minimum wage. Further, employment of skilled labor still decreased in some sectors. Additionally, employment of unskilled labor increased more than employment of skilled labor in every sector and the utilities & construction sector gained or lost the most, respectively. Again, some skilled workers may have lost jobs to unskilled laborers due to the substitution effect.

For the 6.67% minimum wage subsidy scenario and a 20% jump of unskilled labor productivity, employment for the unskilled labor force increased in every sector and in most sectors for skilled employees, while more subsidies on the minimum wage caused a higher labor demand. In the decreased minimum wage scenario, employment in all sectors increased for both types of skill levels.

4.2 Policy suggestions

An increased minimum wage enhances the well-being of low-wage workers and strengthens domestic demand because laborers have more income for domestic consumption. Moreover, it induces the adjustment to a more knowledge and skilled-based society and firms focus on hiring staff with more knowledge and experience to make the higher cost of labor worth it. However, large and sudden increases in the minimum wage produce adverse effects as well because it causes lower employment due to the higher production costs. Small and medium-sized firms with large proportion of labor costs to total costs are hard hit in particular[10]. On the other hand, if Thai real wages do not grow, it is difficult to keep domestic demand growing steadily. Further, with a relatively low unemployment rate[11], Thailand has some room for higher minimum wages. Nevertheless, the Thai government should have a long-term plan for their wage policy.

In order to minimize the potential adverse impacts, the minimum wage should be increased along other policies that offset the adverse impacts. In this study for example, an increase in the minimum wage should be implemented after a productivity rise of the unskilled labor force has been recorded, otherwise the new minimum wage policy may help some groups of workers but increases the cost of living for everyone in the country including farmers. Furthermore, when wage grows faster than productivity, it will weaken the competitiveness of the country.

As seen in Table 5, if the Thai government intends to implement a 6.67% increase in the minimum wage from 300 to 320 Baht per day, unskilled

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[10] According to a study project on SME with the input-output table, the cost of labor and salary of SMEs, on average, accounted for 16.2% of all costs of inputs. Meaning if the minimum wage increased by 1 %, the cost of labor would increase by 0.16 %. *Source: The Office of SMEs Promotion (OSMEP) http://www.sme.go.th/Lists/EditorInput/DispF.aspx?List=15dca7fb-bf2e-464e-97e5-440321040570&ID=1525*
[11] *National Statistical Office of Thailand.*

labor productivity should increase at least 10% in order to have a positive real GDP change over the BAU scenario. However, a 10% labor productivity increase in one year is not realistic considering the historical growth rate of Thai labor productivity since the year 2000, see Table 11. However, assuming a similar skilled and unskilled labor productivity growth rate, a 2.5% per year increase is potentially possible. Thus, it takes about 4 years to accumulate an increase of 10% in unskilled labor productivity which then may fully compensate a real GDP loss from a 6.67% increase in the minimum wage. Therefore, if the Thai government wants to increase the minimum wage to 450 Baht per day it needs implement policies that increase labor productivity of all labor classes to shorten the time of compensation.

Table 11: Growth of labor productivity per person employed in Thailand

Growth of labor productivity per person employed (percent growth)										
Year	2000	2001	2002	2003	2004	2005	2006	2007	Average	Standard deviation
LP growth	2.35	0.83	3.08	4.72	3.57	2.61	3.65	3.81		
Year	2008	2009	2010	2011	2012	2013	2014	2015	2.62	2.36
LP growth	-0.46	-2.67	6.48	-0.5	5.75	2.98	2.91	2.84		

Source: The Conference Board 2015[12]

The simulation also shows that, currently, the relative wage in Thailand is high comparing to other ASEAN member states. A minimum wage policy has to be used with caution. The model suggests that, unless we improve the productivity of the unskilled workforce, a minimum wage policy that increases the minimum wage creates a negative effect on both the GDP growth and employment in Thailand. Also, the best policy to improve the well-being of low-wage workers and to sustain economic growth is to use a minimum wage subsidy policy together with an improving labor productivity of both skilled and unskilled labor. Using a government subsidy policy generates adverse effects on sectors with less favorable working conditions *i.e.* the agriculture, mining, heavy manufacturing, and utility and construction sectors. Other government actions are needed to mitigate these adverse effects if these sectors are strategically important to the country in the long run.

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[12] The Conference Board Total Economy Database™, May 2015,
http://www.conference-board.org/data/economydatabase/

5. Conclusions

The minimum wage in Thailand is an important topic for debate, with labor representatives seeking to increase the minimum wage. Higher wages of the unskilled labor force improves the livelihood of the low-income group and, also, increase domestic consumptions. A higher average wage induces demand for higher labor productivity in the private sector as a mean to preserve profit. This can be achieved by improving the productivity of the overall labor force, through a higher use of equipment, investment in knowledge and training of the unskilled staff or a shift of labor demand to skilled workers. Some unskilled workers may be negatively affected by the minimum wage policy. Furthermore, a single economy that raises its minimum wage will raise its wages relative to its competitors with adverse effects on the economy because of the higher costs of producing goods and services. This may lead to the relocation of the production to countries where labor is relatively cheaper, especially in labor-intensive industries. With the economic integration under the AEC, the Thai government must take a careful approach on any wage policy concerning the minimum wage.

The result of the study indicates negative correlations between the minimum wage and both the GDP and employment due to higher costs of production in Thailand. Therefore, increased minimum wage and subsidy wage policies are not appropriated for Thailand as a part of AEC because these policies reduce investment as well as bring about a disincentive to accumulate human capital. Although a lower minimum wage leads to a rise in GDP, investment, and employment for both skilled and unskilled laborers in every sector, it is politically hard to implement for policy makers.

Further, an increase in the minimum wage without any labor productivity growth could affect the economy harshly. In response to an increased minimum wage, productivity of workers who earn the minimum wage should increase in order to compensate for the negative impact of the minimum wage policy. This is because the advantages of the productivity increase causes producers to become more competitive which may lead to a substantial higher growth in the economy. The study measured the effects of adjustment in both the minimum wage and labor productivity which policy makers can use as a basis for adjusting minimum wages in Thailand. Also, the study reveals how different sectors react to the wage

policies as the effective wage increases, the sectors with unfavorable working conditions will see an adverse effect relative to the other sectors. Furthermore, it is clear that there will be a shift in employment from skilled to unskilled labor with policies that aim to increase the effective wages of the unskilled labor force.

This study provides results that support the findings of previous research in this field. Policies designed to support and enhance the condition of the Thai economy should be carefully constructed with full consideration of the connections of these wage policies on employment and the economy and the possible negative effects thereof.

For the further research, it would be interesting to specify the nature of the interactions between the formal and informal sectors of the economy as they are likely to affect the implementation of any wage policy on the labor market and the whole economy.

Acknowledgement

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