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Wage convergence among ASEAN countries

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Abstract

This thesis discusses whether wage convergence has taken place between six countries in the Association of the Southeast Asian Nation (ASEAN) from the time between 2000 and 2014. The countries included are Singapore, Indonesia, Malaysia, Philippines, Thailand and Vietnam. Following the approach by Stehrer and Wörz (2003), a fixed-effects model which uses initial wage gap to a reference country (this case Singapore) was used.

Conclusions in this thesis lie mainly in line with previous literature. There seems to be convergence among all countries in the dataset, even when controlling for country-fixed effects and allowing for country specific slopes. However, the magnitudes do differ from previous literature, which could be due to misspecification or measurement errors.

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1 Introduction

The purpose of this paper is to analyze whether wage convergence has taken place between Singapore, Indonesia, Malaysia, Philippines, Thailand and Vietnam since the Association of the Southeast Asian Nations (ASEAN). ASEAN was originally formed in 1967 by representatives from Indonesia, Malaysia, Philippines, Thailand and Singapore. The main reasons behind the formation were to cooperate within the areas of economics, technology, culture, education and welfare in a more efficient manner. Through this interdependency the aim was also to bring peace to the region and battle communism. Enhancing economic growth was specifically targeted through improving transportation and communication facilities within the regions commodity sector. A more recent development is the formation of ASEAN Free Trade Area Framework Agreement (AFTA) in 1992. The treaty outlined the establishment of a free trade zone within ASEAN, which aimed to further boost economic growth through increased trade.

Three theoretical models are used as guidelines to explain the governing factors of convergence. The Heckscher-Ohlin model, Factor-Price Equalization theorem (extension of the Heckscher-Ohlin model) and the Neoclassical growth model.

In order to evaluate whether wage convergence has taken place, this study assessed if the wage growth of Indonesia, Malaysia, Philippines, Thailand and Vietnam had converged between the years of 2000 and 2014 with the country of comparison, Singapore. The main reason for choosing Singapore as the reference country was because it is the wealthiest and most mature economy within ASEAN for the chosen time period. This simplifies the comparison analysis of wages because of the different wage level. The specific time period was chosen because of the lack of available data prior to 2000, especially for the five poorer countries in this analysis. The methodology applied in this thesis is similar to that of Stehrer and Wörz (2003), which is making use of panel data and hence being able to have country-fixed effects. The variables of interest, wage growth on the left hand side and initial wage gap to the reference country on the right hand side, are defined in the same manner as Stehrer and Wörz.

The results indicate that there has indeed been a wage convergence in the given time period. However, the magnitudes are not in line with previous literature, and neither are their rankings as was previously expected. The ex-ante expectation of this thesis was simply that

the greater the initial gap, or rather the poorer the country, the greater the slope of the convergence parameter. And although the country with the greatest slope (Indonesia) indeed is not as wealthy (in terms of GDP/Capita) as neither Thailand nor Malaysia, these two wealthier countries still have greater slope than Philippines, which is the poorest country in the data set. Still, the signs for each country are in line with ex-ante expectations and the results are significant at the 1 % significance level. Some robustness checks were made, but due to data limitations, the robustness checks are not as thorough as one would wish.

The outline of this thesis is as follows. Section two addresses previous research carried out on wage convergence and trade between the countries in ASEAN. Section three focuses on the theoretical framework followed by section four which discusses the economic background in ASEAN. Section five focus on data and methodology and is accompanied by section six where results is discussed. Lastly section seven is devoted to conclusion and further research.

2 Previous research

ASEAN and economic convergence is areas frequently addressed by economists. However, there is a gap in the research done on economic growth and convergence in the East Asian countries. Menon (2012) states that the rapid economic growth within ASEAN is a result of trade, investments and other alternative market reforms. Menon (2012) further states that trade, investments and reforms mitigate wage inequalities, and have led to wage convergence within ASEAN. Stehrer and Wörz (2003) states that East Asia¹ has significantly lower wages compared to the OECD countries. They also state that trade patterns have changed which has caused wages to increase. East Asian nations now export relatively more in specific sectors such as in high tech industries. Futhermore. Stehrer and Wörz use an econometric model which makes use of panel data and thus has country and industry fixed effects, where they have growth of a variable of interest (wages, productivity and more) on left hand side, and the initial gap of the same variable on the right hand side. This thesis aims to have the same approach to the issue of interest.

According to Baddeley (2006) less developed countries do not benefit from globalization. Baddeley (2006) also states that an increase in international income² is not beneficial for

¹ East Asia includes all the members in ASEAN.

² International income is defined as the amount earned from foreign income that is not included in domestic taxation.

developing countries. In the study of Jayantha Kumaran and Lee (2013) they analyze income per capita convergence for the ASEAN-5³ nations by using a time series approach between the years 1967 and 2005. The study found evidence that beta convergence⁴ took place between Malaysia, Thailand, and Indonesia before the Asian financial crisis hit 1997-1998. However, between 1998 and 2005 divergence was identified. In the case of Singapore Jayantha Kumaran and Lee (2013) showed that convergence did not take place within the ASEAN-5 until after the Asian crisis 1997-1998. Lastly, Thailand showed consistent convergence throughout the measured time period 1967-2005.

Tuaño (2002) analyzes the impact of the Asian financial crisis on labor. The crisis resulted in high unemployment and affected real wages adversely in all ASEAN countries, especially Indonesia, Thailand and the Philippines. When exports from the Philippines got declined a hefty trade balance deficit occurred and resulted in devaluation of the Thai Baht⁵. The devaluation of the Baht also had a negative effect on wages.

³ ASEAN-5: Singapore, Thailand, Philippines, Malaysia and Indonesia.

⁴ Beta convergence is a hypothesis saying that poorer economies income per capita tends to grow faster than richer economies.

⁵ Devaluation of the Thai baht means a decrease in the domestic currency as a result of the Asian Financial crisis.

3 Theoretical framework

3.1 Heckscher-Ohlin model

This segment will shed light on some fundamental theories and drivers that explain key reasons for wage convergence.

Heckscher-Ohlin model (2x2x2 model)

The model developed by economists Bertil Ohlin and Eli Heckscher is a 2x2x2 model that includes two countries, two commodities and two factors of production. A nation's comparative advantage is determined by the relative endowments of the factors of production, i.e. land, capital and labor. Relatively abundant factors of production will imply a comparative advantage for a country. In an abundant nation these goods may be produced at a lower cost compared to nations where the goods are scarce. For example, a nation that is ample in land and capital but scarce in labor will have a comparative advantage in producing land and capital-intensive goods, such as grain. The costs of grain production will be low resulting in lower prices that will stimulate export and domestic consumption. Labor-intensive goods will be relatively expensive in this nation implying that it is better off importing these goods (Findlay, 2006). The 2x2x2 model explains why trade has taken place between Singapore, Indonesia, Malaysia, Philippines, Thailand and Vietnam which are all nations where the distribution of production factors are fundamentally different.

The Heckscher-Ohlin model predicts that trade will lead to a convergence in relative prices. Assuming the price of labor to be equal to the sum of all wages paid this suggests that wages will converge as a result of trade (Krugman, Obstfeld and Melitz, 2010). This further suggests that an increase in the rate of trade between regions will increase the rate of wage convergence, which may be used as an argument for trade reducing poverty levels.

The distribution of wages between nations is not only affected by trade, it is influenced by every economic change a nation undergoes. I.e. changes in consumer preferences, technology, exhaustion of existing resources and the identification of new resources all affect wage distribution (Krugman, Obstfeld and Melitz, 2010). This suggests that wages would still converge between Singapore, Indonesia, Malaysia, Philippines, Thailand and Vietnam even if the countries had not entered into the Free Trade Area Framework Agreement (AFTA).

3.2 The factor-price equalization theorem

An extension of the Heckscher-Ohlin model is the factor-price equalization theorem. The theorem explains how competition in two identical factors of production results in price convergence and equalization over time. When two countries integrate and form a unified market, the factors in the economy, which used to be more expensive will become less expensive while the factors in the economy that used to be less expensive, will become relatively more expensive (Brakman, Garretsten and van Marrevijk, 2006). When discussing international trade the factor price equalization theorem is a central model which entails two main approaches. The first approach is focused on nations' endowments and assumes that countries are completely specialized, the second approach focus on cost functions and assumes that nations are completely specialized.

As stated by Stephen M. Suranovic (1997) the price equalization theory suggests that “prices of the output goods are equalized between countries as they move to free trade, then the prices of the factors (capital and labor) will also be equalized between countries,” “wages of workers and the rents earned on capital” will also align as an effect of trade between nations.

Suranovic (1997) further strengthens the hypothesis that international trade will lead to wage convergence between countries.

3.3 The Neoclassical Growth Model

The neoclassical growth model (NGM) was developed by Robert Solow and J. E. Meade in the late 1950s and 1960s. The model places focus on capital concentration, the rate of savings, which is assumed to be central determinants of economic growth and income distribution. The model considers two production factor functions where capital and labor explains the output. As an exogenous factor technology is added to the production function (Mankiw, 2005). Like various other economic models the NGM aims to predict stylized drivers of economic growth, including convergence. Empirical studies have shown that wealthy nations tend to grow less than poor nations, given that certain economic conditions are satisfied (Barrientos, 2007). Given a set of specific assumptions the NGM predicts that an economy will reach an equilibrium called the steady-state. Once a nation has arrived to its steady-state it cannot grow

any more. As long as an economy is moving towards steady-state convergence will take place but when moving away from steady-state divergence will occur (Barrientos, 2007).

4 Background

4.1 ASEAN

The Association of Southeast Asian Nation (ASEAN) was formed on August 8, 1967 in Bangkok from Indonesia, Malaysia, Philippines, Thailand and Singapore. The five foreign ministers of the member states are Adam Malik of Indonesia, Tun Abdul Razak of Malaysia, Narciso Ramos of the Philippines, Tun Thanat Khoman of Thailand and S. Rajaratnam of Singapore signed the ASEAN declaration and a trade block was formed. The main reasons behind formation of ASEAN were to cooperate more efficiently with the areas of economics, culture, technology, welfare and education. Members of ASEAN were specifically supposed to work towards accelerating economic growth and trade in the region, though close collaboration in improving transportation and communication facilities for the commodity sector. Another key reason for the formation in 1967 was to unite against communism and to build peace between the countries through securing respect for justice and the rule of law and loyalty to the principles of the United Nations Charter.

As discussed in section 3.2, Singapore is a more advanced and mature economy compared to the other founding members of ASEAN. Based on the fundamental theory within convergence, that less developed nation will actualize higher growth rates relative to developed nations, it may be argued that the incentive for Indonesia, Malaysia, Philippines, Thailand to enter into ASEAN may have been stronger compared to Singapore from a growth perspective (ASEAN Organization, 2015)

ASEAN is currently considered as one of the most successful intergovernmental organization among the developing world and since the formation in 1967 an additional five more countries have joined including Vietnam (1995), Brunei (1984), Laos (1997), Myanmar (1997) and Cambodia (1999). All member states in ASEAN can relatively easy transfer skilled labor, goods, services and capital across national borders as barriers of entry has been relaxed.

The primary aim of the ASEAN is to enhance economic growth, cultural expansion, social progress and stability in the region of Southeast Asia. It has also accredited other important

agreements such as the ASEAN Free Trade Area Framework Agreement (AFTA) in 1992, which aimed to establish a free-trade zone through commitment to the General Agreement on tariffs and trade. As a result ASEAN members have committed to try and eliminate all non-tariff barriers (ASEAN Secretariat, 2014).

4.2 *Economic background*

These sections will outline the economic climate for Singapore, Indonesia, Malaysia, the Philippines, Thailand and Vietnam. This includes each nation's relative economic position, brief economic history and real wage development. The analysis on change in real wages is based on data from the International Labour Organization between the years 2006 and 2013.

4.2.1 Singapore

As described in the article by Belinda Yuen published by the World Bank (2015) Singapore has one of the world's strongest economies. The economic journey began in the early 1800s when the British established a trading post for the British East India Company. Singapore has since then progressed and been through strong economic growth rising from a low-income country to a recognized high-income country today. Historically Singapore has derived its increase in GDP from international trade. The nation had in March 2010 has the highest trade to GDP ratio in the world according to Economywatch.com (2010).

Between Singapore's independence in 1965 to 1990 the country peaked its economic growth rate by an annual average of 9.2%. In the 1960s industrialization took a strong foothold and manufacturing became a central source of the nation's income. By the 1970s Singapore had reached full employment and by the 1980s it leveled with Hong Kong, Taiwan and South Korea in terms of industrialization. In recent years sophisticated service- and manufacturing sectors have become the two main economic drivers for the nation, serving various high demand markets across the globe according to the World Bank Group (2015). As suggested by the below table the average real wage growth in Singapore has been relatively stable between the years 2006 and 2013. Comparing to Indonesia, Malaysia, the Philippines, Thailand and Vietnam Singapore show a low average real wage growth rate, suggesting that the nation is a mature developed economy. The negative growth figures in 2008 and 2009 are assumed be a result from the global financial crisis that erupted in late 2007.

Growth of average real wages in Singapore 2006-2013 (in %)

2006	2007	2008	2009	2010	2011	2012	2013
2.2	4.0	-1.1	-3.2	2.7	0.7	-2.2	1.9

Source: International Labor Organization Global Wage Report 2014/15

4.2.2 Indonesia

In terms of the purchase power parity PPP, Indonesia is the 10th largest economy in the world. What is specific for Indonesia is its economic developing plans that covers a 20-year cycle between the years 2005 to 2025. The development plan is divided into 5-year medium term sections, each with different strategies to reach specific economic goals. Examples of economic goals are infrastructure investments, implementing social assistance programs in education and health care. However, Indonesia still suffers from poverty and the growth in population currently exceeds the rate of employment according the World Bank (2015).

Indonesia experienced a long lasting negative impact on key exports and manufacturing due to the Asian financial crisis 1997-1998 and the recent financial crisis in 2007. However, recently the economy has gradually started to recover and adapted a more stable and strong financial sector according to Marklund (2009). Similar to Singapore the below table show relatively stable average real wage growth for the measured years 2006 to 2013. Struck by the global financial crisis initiating in 2007 Indonesia show negative real wage growth of 2.1% for the year 2008. Noteworthy here is that the nation swiftly recuperated resulting a significant increase in real wage growth in 2009 by 8.7%.

Growth of average real wages in Indonesia 2006-2013 (in %)

2006	2007	2008	2009	2010	2011	2012	2013
1.7	2.5	-2.1	8.7	1.5	2.9	2.5	10.1

Source: International Labor Organization Global Wage Report 2014/15

4.2.3 Malaysia

Malaysia is a middle-income open economy and has according to the World Bank's annual Growth Report in 2008 a projected growth rate of 7% for the coming 25 years. Malaysia also has succeeded in nearly eliminating poverty, as the share of families living below the poverty line of 8.50 USD per day (2012) has declined from over 50% in the 1960s to below 1% in 2015 according to the World Bank Group (2015).

With its foundation as a producer of raw materials in the 1970s such as rubber and tin, the country is now a differentiated economy and a world-leading exporter of advanced electrical

components, palm oil and natural gas. Similar to Thailand Malaysia was negatively impacted by the Asian financial crisis in 1997-1998 but has since then rapidly recovered and showed strong economic growth rates averaging 5.5% between 2000 and 2008. Malaysia was hit by the financial crisis in 2007, however recuperated swiftly also here and has since 2010 produced annual average growth rates of 5.7% according to the World Bank Group (2015).

In order to assure sustainable growth whilst targeting recognition as a high-income country Malaysia launched the New Economic Model (NEM) in 2010. The model places focus on sparking growth in the private sector and includes various reforms that aims to move the economy into more advanced and value adding industries and services. The focus of NEM is similar to Singapore’s recent growth model, which is outlined above.

The growth in Malaysia’s real wages vary between 0.0% in 2006 and 2009 to 5.3% in 2013 for the analyzed years in below table. Also here we identify similarities to Singapore, Indonesia, Philippines, Thailand and Vietnam where the recent global financial crisis had a negative effect on wages resulting in negative growth in 2008.

Growth of average real wages in Malaysia 2006-2013 (in %)

2006	2007	2008	2009	2010	2011	2012	2013
0.0	3.2	-3.3	0.0	4.0	4.0	3.7	5.3

Source: International Labor Organization Global Wage Report 2014/15

4.2.4 Philippines

The Philippines is a vibrant economy with a stable average growth rate of 5% since 2002. Its workforce is competitive and globally recognized. In 2013 economic growth surged to 7.2% followed by a downfall in 2014 down to 6.1%. Explanatory factors behind the economic contraction are a reduction in governmental consumption and infrastructure investments accompanied by shrinkage in the agricultural production. The nation’s key economic driver, the service sector, also experienced difficulties, which strongly affected the economic slowdown even more.

With the economic challenges in mind, the Philippines still assumes a strong position in the region in terms growth, only to be exceeded by China. From a business perspective the Philippines is considered to have a stable investment climate holding investment grade ratings from leading credit rating institutes. The nations’ macroeconomic fundamentals are sound with low inflation and a healthy fiscal policy that have resulted in relatively robust international reserves. Average savings rates are higher than current investment levels,

implying that the country should utilize the saving by investing in its deteriorating infrastructure. Not doing so may result in declining growth rates in the coming decades according to the World Bank (2015).

The World Bank (2015) also states that the country has made significant progress in the areas of gender equality, basic education and reducing infant mortality. However, the World Bank also stresses the need for improving availability of good jobs for low-income earners and through this combat poverty in a more efficient way. The growth is estimated to increase by 0.3% from 2014 to 6.5% in 2015, given that the government utilizes its budget efficiently and implement planned reforms.

Relative to Singapore, Indonesia, Thailand, Malaysia and Vietnam the Philippines show the weakest growth in average real wages between the years 2006 – 2013. As the other nations included in this study the Philippines was also impacted by the global financial crisis in 2007, resulting in a negative real wage growth rate in 2008 of 3.4% and 0.0% in 2009. The nation also suffered the longest as shown by the below table only reaching a modest growth rate of 1.5% in 2013.

Growth of average real wages in Philippines 2006-2013 (in %)

2006	2007	2008	2009	2010	2011	2012	2013
1.5	-1.1	-3.4	0.0	1.6	-1.0	1.9	1.5

Source: International Labor Organization Global Wage Report 2014/15

4.2.5 Thailand

According to the World Bank annual review performed in 2011 Thailand has progressed from a lower-middle income economy to an upper-middle income country. Thought-out the 1980’s Thailand has experienced a strong economic growth and significant reduction in poverty. The average annual economic growth during the 1980’s and beginning of the 1990’s varied between 8-9%. This increase was however challenged by the Asian Crisis 1997-1998. Since then Thailand has endured a moderate growth rate with a peak of average 5% between the years 2002 and 2007. In 2007 the global financial crisis further challenged Thailand’s economy lowering economic growth and adversely affecting poverty levels. In more recent years, 2010-2015, natural disasters, political tensions and uncertainty have also affected Thailand’s economy negatively according to the World Bank Group (2015).

As a result of the above outlined events Thailand low- and middle-income segments have not progressed at the same rate as its neighboring economies. This has resulted in a global lower demand for Thailand’s key export goods such as hard drive disks. In 2014 economic growth was measured at 0.7% with an anticipation to increase to 3.5% in 2015, according to the World Bank Group (2015).

For the years leading up to 2008 in the below table Thailand show a modest growth rate in real wages, which vary from 1.5% in 2006 to 0.7% in 2007. Noteworthy is that Thailand is the only nation included in this study which shows positive growth in real wages for the year 2008. This suggests a unique resiliency against the unfavorable global economic climate in 2008, resulting from the global financial crisis.

Growth of average real wages in Thailand 2006-2013 (in %)

2006	2007	2008	2009	2010	2011	2012	2013
1.5	0.7	4.5	-1.6	3.2	3.3	8.5	5.8

Source: International Labor Organization Global Wage Report 2014/15

4.2.6 Vietnam

Transforming from one of the poorest countries in the world to a present lower middle-income country Vietnam’s economic growth is rapid and firm. The share of individuals living under the poverty line was approximately 60% during the 1990s but has today reduced to approximately 3%. During the last 10 years Vietnam’s growth rate has averaged 6,4% on an annual basis. Macroeconomic stability has been improved with inflation rates decreasing from 23% in August 2011 to around 4,1% in 2014 according to the World Bank Group (2015).

Vietnam’s traditional labor-intensive manufacturing industries, e.g. furniture, footwear and garments continue to show significant growth. Recent additions of more value adding goods such as advanced electronics, computers, mobile phones etc. has also positively affected growth rates and risen as the largest share of the country’s total export. In 2014 the value of total exports was estimated to have increased by 11,4%, surpassing all peers in the region.

The World Bank Group (2015) states that through recent governmental initiatives which places focus on efficiency improvements in the business environment, Vietnam is aiming to produce a business climate similar to the average of the ASEAN-6 Group.

As suggested by the below table the real wage growth rate in Vietnam has been relatively volatile compared to Singapore, Indonesia, Thailand, Malaysia and the Philippines between

the years 2006 and 2013. The data is incomplete for the years 2008, 2009 and 2013 implying that the nation may be lacking appropriate structures to assess fundamental statistics such as national wage levels. This phenomenon is also visible for other developing nations not included in this study, such as Cambodia (International Labor Organization, 2014)

Growth of average real wages in Vietnam 2006-2013 (in %)

2006	2007	2008	2009	2010	2011	2012	2013
5.6	2.2	-3.7	3.9	10.9	..

Source: International Labor Organization Global Wage Report 2014/15

5 Data and methodology

The analysis of wage convergence conducted between the six chosen member countries in ASEAN is based on balanced panel data for the period 2000 to 2014. In order to evaluate whether real wages in Indonesia, Malaysia, Philippines, Thailand and Vietnam has converged to the real wages in Singapore after the initiation of ASEAN 1967, data needed to be found on nominal wages, real gross domestic product (GDP) and PPP-conversion factor for all six countries. Nominal wages and GDP was collected via Thomson Reuters DataStream, whilst the PPP-conversion factor was collected via the World Bank.

In total, there are 90 observations, which can be broken down to 15×6 (T*N), where 15 (T) is the amount of years and 6 (N) is the amount of countries. Hence, annual data was used in this thesis.

There were some transformations made with the data. For one, nominal wages for each country is expressed in local currency. Hence, to make a fair and just comparison, these values were converted by PPP-conversion. Note that as annual data was used, the PPP-conversion factor for a given country may differ from one year to the next, although in practice the difference was minimal. Note further that the use of PPP rates may be problematic, as pointed out in Sorensen (2001). As Sorensen argues, the convergence may depend on the choice of the base year, in other words, the year in which the fixed prices originate. Further discussions regarding the caveats of conversion using current PPP can be found in Landesmann and Stehrer (2001). However, as this thesis is interested in wage growth, the PPP-adjusted wages had to be transformed into growth rates. This was achieved by simply

taking the log-difference of the variable, i.e.

$$Wage\ Growth = \ln\left(\frac{Wage_t}{Wage_{(t-1)}}\right) = \ln(Wage_t) - \ln(Wage_{(t-1)}).$$

As GDP-growth was to be used in this thesis, GDP was also transformed to growth-rates in same fashion as wages. This way, as the left-hand and right-hand sides are expressed in logarithms, one will be able to interpret the coefficient results of the regression as elasticities.

Mimicking Stehrer and Wörz (2003), and what is quite standard in the literature, an *initial gap* variable was created. Hence, following Stehrer and Wörz (2003) and Landesmann and Stehrer (2001), I define initial gap at time $t = 0$ as

$$G_0^c = \ln\frac{V_0^c}{V_0^{SP}}$$

Where G_0^c denotes the gap for country c at time 0 and estimate catching-up equation denoted by

$$Wage\ Growth^c = \sum_{j,g} \beta_j^g D_j^g G_{i,0}^c + \Sigma_c + \delta^c D^c + \Sigma_i \delta_i D_i + \beta^c GDP\ Growth^c + \varepsilon^c \quad (1)$$

Where $Wage\ Growth^c$ simply the wage growth rate for country c . Catch-up is then measured by regressing the growth rate on the initial wage gap. The first set of variables $D_j^g G_{i,0}^c$ allows for different slope parameters, β_j^g , according to country, as such D_j^g denotes a set of dummy variables for each country, less Singapore. This is achieved by simply factoring what will be referred to as the *Convergence Parameter* with each country in the dataset. The first set of variables is included in the fifth regression in Table 1. Note that this model is a very similar approach as Stehrer and Wörz (2003), except an additional control variable, GDP Growth, which is used as in robustness tests. Furthermore, note that a significantly negative coefficient indicates that growth of wages is higher, the higher the initial gap of this country. Finally, the coefficients δ^c and δ_i indicate the presence of individual country fixed effects, denoted by the dummy variables D^c and D_i respectively.

One slight addition from the model of Stehrer and Wörz is however, the addition of a *rolling gap*, i.e. instead of having an initial gap (which is fixed for time $t = 0$), a variable which measures the gap between time $t = 0$ and time $t = i$ where $i \neq 0$.

Formally, the variable *rolling gap* is defined as $Rolling\ Gap^C = \ln \frac{V_t^C}{V_0^{SP}}$ where C denotes country C and i denotes time $t = i$ where $i \neq 0$.

The reason for this variable is simply because *initial gap* is time-invariant, and hence, time-fixed effects cannot be used and were not used by Stehrer and Wörz (2003), who focused on country fixed and industry fixed effects. The addition of this variable, although not identical interpretation, does open for time-fixed effects for an additional robustness check of whether the change in the base of the initial gap (i.e. a rolling gap) also matters.

As outlined in Stehrer and Wörz (2003), the concept of β convergence is not entirely uncontroversial. Friedman (1992) and Quah (1993) have argued that this methodology produces a problem known as “Galton’s fallacy”, as it yields biased estimates. There is an ongoing debate in the literature regarding this problem, however, the presence of the debate is simply acknowledged in this thesis. Hence, albeit not completely uncontroversial, this is still the approach of the thesis, although I acknowledge that it may be problematical⁶.

As the framework of this thesis is time-fixed effects, an identifying assumption is that unobservable factors that might simultaneously affect the left hand side and the right hand side of the regression are time-invariant. Finally, note that clustered standard errors were used, where the clustering was on country-level.

6 Results

This thesis is using methods very similar to that of Stehrer and Wörz (2003), who investigated the technological convergence of OECD North, OECD South and some East Asian countries.

As mentioned in previously section and as pointed out by Stehrer and Wörz (2003), a negative coefficient indicates that growth of wages is higher, the higher the initial gap for this country.

As previously mentioned, the first regression (1) in Table 1 is a simply bivariate regression, in this case Pooled-OLS with a control variable⁷. The reason for this regression is to simply see if there are any correlations at this basic level, and as can be seen, the results are in line with

⁶ See 1996 *Economic Journal* symposium including contributions by Bernard and Jones (1996b), Quah (1996) and Sala-i-Martin (1996). Defense of this approach can be seen by Hart (1995) and Sala-i-Martin (1996).

⁷ The presence or absence of GDP Growth did not change the results or coefficients significantly in any of the regressions in Table 1.

was is expected by theory – convergence is present. Note that in all regressions except the fifth, the *Convergence Parameter* is the average effect in all countries used in the dataset. It is not until the last regression that one actually allows for different slope parameters. Although not present in Table 1, column 3 was replicated with country-fixed effects as well as time-fixed effects, with similar results.

Table 1. Regression Results

	1	2	3	4
VARIABLES	Wage Growth	Wage Growth	Wage Growth	Wage Growth
GDP Growth	-0.430 (0.729)	-0.527 (0.667)	1.220 (1.701)	-0.567 (0.765)
Convergence Parameter	-0.879*** (0.130)	-0.992*** (0.141)	-0.828*** (0.132)	-0.677*** (0.00506)
Indonesia				-1.159*** (0.0718)
Malaysia				-0.503** (0.124)
Philippines				-0.211*** (0.0244)
Thailand				-0.559*** (0.0119)
Observations	75	75	75	75
Pooled	YES	NO	NO	NO
Country Fixed	NO	YES	NO	YES
Time Fixed	NO	NO	YES	NO
Interactions	NO	NO	NO	YES
Rolling Gap	NO	NO	YES	NO
R-squared	0.439	0.484	0.518	0.525

Note: Robust/clustered standard errors in parenthesis. One asterix implies significance at 10% level, two asterix at 5% level and three asterix at 1% level. Note that in regression 3, the “Convergence Parameter” is based on the *Rolling Gap* variable defined in Data and Methodology. Note that that one country has been dropped due to collinearity issues and one (Singapore) is the reference country, and hence not present either.

Continuing to the second regression, which is mimicking the previously mentioned study with the exception of not having industrial levels controlled for, one can notice that the Convergence Parameter is still quite robust, and still in line with expectations, i.e. a negative coefficient indicating convergence. One worrisome feature that is however present in all regressions is the magnitude – the slope coefficient in this thesis is much, much greater than that of Stehr and Wörz (2003). It is not clear why this may be the case. It could be that there are some factors, uncontrolled for (so called omitted variables), that are blowing up the estimates. It could also be the size of the sample in this thesis, as there are merely 75 observations, instead of the 600 which comparable studies have. Finally, it could also be

measurement errors, as the underlying data is annual and neither the source of the countries is the same as comparable studies.

In the third regression (3), I diverge from the approach of the previous literature and introduce a *rolling gap*, in order to introduce time-fixed effects and hence use this as a proxy for the main question, but also as a robustness check. As can be seen in the third column of Table 1, this attempt lead to little to no change in neither the estimate nor the significance level, as the convergence parameter is still significant at the 1% level, with the correct sign.

Dropping the *rolling gap* variable and continuing in the steps of Stehr and Wörz, the fourth and final regression in Table 1 is an extension of the second column (2), which is adding the first set of variables in equation (1) – i.e. introducing different slopes. This addition leads to the greatest impact on the Convergence Parameter, by decreasing it significantly, although the sign and the significance level is still as it was before. However, looking at the (clustered) standard errors, it seems something is at odd. The standard errors are now less than half than they were before.

The notion that one should expect less variation of the convergence parameters within similar countries due to wage drift across sectors (Landesmann and Stehrer, 2001) can be partly observed in Table 1. As can be seen, all countries have similar parameter magnitudes with the exception of Indonesia, which sticks out. There could be many reasons as to why Indonesia differs greatly from that of the other countries in the dataset. It could be anything from the distribution of growth of wages within sectors in each country being different, severely different initial gaps to Singapore, ability to retain wage growth throughout time, and more. However, as can be seen, even when allowing for different slopes, each countries coefficient has the correct sign and is statistically significant at the 1% level.

Ideally, one would want to run parallel regressions where wage is substituted for productivity, in order to see if these variables tell the same story. This is because a growth of wages should be as a result of growth in productivity. Another interesting aspect would of course be to include trade and trade patterns. This because of two reasons. Firstly, there is clear theoretical arguments (see Heckscher-Ohlin model in Theoretical Framework section) that increases in trade should decrease relative prices. There are many studies that give evidence to this notion, Stehrer and Wörz (2003) is one example of many of this. Secondly, this thesis aims to investigate the wage convergence between these particular countries specifically because of the ASEAN collaboration, and hence, this thesis implicitly assumes that the ASEAN

agreement has increased trade. However, simply assuming this may lead to problems in estimation (possible omitted variable bias) but it may also not be a true assumption. Hence, including it in the model would shed some light on all of these factors, not mentioning one would have a quantitative understanding of the economic significance of trade on wage convergence. All this considered, one of the major papers relevant for this thesis (Stehrer and Wörz, 2003) did not use trade as a control variable, as they too estimated equation (1).

7 Conclusion

The aim of this thesis was to evaluate whether wage convergence has occurred between the years 2000 and 2014 since the formation of Association of the Southeast Nation (ASEAN). The thesis employs a fixed effects approach, assumes Singapore as a reference country and assesses whether wage convergence between Singapore, Indonesia, Malaysia, Philippines, Thailand and Vietnam has taken place by regressing the growth of wages on initial wage gap and GDP growth with country-fixed effects.

The results from Table 1 suggest that wage convergence has taken place between the years 2000 and 2014. The convergence parameter is rather stable despite the changes in the specifications from column 1-4, albeit not too stressful robustness checks were applied to due data limitations. However, one check not done in the main paper which inspired this thesis was conducted, which allowed for time-fixed effects, as a substitution and also as an addition to country-fixed effects. This check did not change the parameter stability significantly. The results survived the introduction of country specific slopes, as shown in column 4 of Table 1. Notice that the magnitudes are much greater than that of previous literature. The rankings of parameter size are not as one would expect, in other words, if the ex-ante expectation is such that the poorer the country the greater the convergence parameter – then the results of this thesis violates this expectation.

Faced with possible omitted variable bias and smaller dataset than what would be ideal, and given that these structural weaknesses are taken into consideration in ones interpretation, one can cautiously interpret the results of this thesis as confirming Stehrer and Wörz (2003). In other words, it seems that convergence indeed has and is taken place among these countries.

There is plenty of research that could be done on this topic. One suggestion to further research could be to analyze the impacts of Foreign Direct Investment (FDI) on wages, and to see whether it would contribute to convergence or divergence. Also it would be interesting to see more in-depth studies on the impact of ASEAN Free Trade Area Framework Agreement (AFTA) on all countries in ASEAN. Furthermore, important variables such as trade, trade patterns could and should be used when examining a research question like this. One could also include productivity as a substitute for wage in order to have a separate regression as a robustness check. This thesis used annual data. One way to gain precision is of course to use higher frequency data, could be quarterly data if one is to use GDP as a variable, or monthly data if GDP is proxied by industrial production. Variables such as inflation, productivity and wage are sometimes available on monthly frequency, although it was not always available for all countries in this dataset – hence annual data.

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