

**CHARLES UNIVERSITY**  
**FACULTY OF SOCIAL SCIENCES**

Institute of Economic Studies



**Bachelor's Thesis**

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**CHARLES UNIVERSITY**  
**FACULTY OF SOCIAL SCIENCES**

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**Prospects of Monetary Integration in the ASEAN**

Bachelor's Thesis

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Year of the defence: 2022

## **Declaration**

1. I hereby declare that I have compiled this thesis using the listed literature and resources only.
2. I hereby declare that my thesis has not been used to gain any other academic title.
3. I fully agree to my work being used for study and scientific purposes.

In Prague on May 3, 2022

Šimon Juhás

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## **Abstract**

The thesis examines the suitability of the ASEAN region for a currency union. The evaluation is conducted primarily through a model developed by Bayoumi and Eichengreen (1996b), used by them originally to assess the prospects of European currency integration. The equation of this model is first estimated anew using a sample focused on Asia containing data from the last decade. The resulting equation, despite problems linked with certain coefficients, is used to construct the OCA indexes, which in turn serve as the basis for assessing the preparedness of the ASEAN for a single currency. The discussion of the results concludes overall rather against the idea of a monetary union in Southeast Asia. Malaysia and Singapore are identified as having notably better chances of forming a successful currency union according to the value of the corresponding index. Besides this analysis, commentaries on several factors crucially linked with the issue of monetary integration are provided. This includes an overview of Southeast Asia's developments concerning the factors, which are used for evaluating adherence to the Maastricht criteria in Europe. Throughout the thesis, numerous indicators are found, which suggest that a monetary union in the ASEAN might currently not be considered a desirable option.

## **Abstrakt**

Práca skúma vhodnosť regiónu ASEAN pre menovú úniu. Vyhodnotenie je vykonané primárne cez model vyvinutý Bayoumim a Eichengreenom (1996b), ktorý nimi bol pôvodne použitý na posúdenie vyhliadok európskej menovej integrácie. Rovnica tohto modelu je najprv nanovo odhadnutá používajúc vzorku zameranú na Áziu obsahujúcu dáta z minulej dekády. Výsledný rovnica je, napriek problémom spojeným s určitými koeficientami, použitá na zostrojenie OCA indexov, ktoré zas slúžia ako základ pre posúdenie pripravenosti krajín ASEAN pre spoločnú menu. V diskusii výsledkov sa usudzuje celkovo skôr proti myšlienke monetárnej únie v juhovýchodnej Ázii. Malajzia a Singapur sú identifikované ako krajiny s významne lepšími šancami na sformovanie úspešnej menovej únie podľa hodnoty príslušného indexu. Okrem tejto analýzy sú poskytnuté komentáre k niekoľkým faktorom zásadne prepojeným s problematikou monetárnej integrácie. Zahrnutý je aj prehľad vývoja v juhovýchodnej Ázii súvisiaceho s faktormi, ktoré sú používané pre vyhodnocovanie zachovávaní Maastrichtských

kritérií v Európe. V práci sú nájdené viaceré indikátory, ktoré naznačujú, že monetárna únia pre ASEAN v súčasnosti nemusí byť považovaná za vhodnú možnosť.

## **Keywords**

ASEAN, economic integration, monetary union, optimum currency area,

## **Klíčové slová**

ASEAN, ekonomická integrácia, monetárna únia, optimálna menová oblasť

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# Bachelor's Thesis Proposal

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## Proposed Topic:

Prospects of Monetary Integration in the ASEAN

## Preliminary scope of work:

### *Research question and motivation*

In this thesis, I examine the potential of countries of the Association of Southeast Asian Nations for a currency union.

As the integration process in Southeast Asia proceeds, a question arises, whether the ASEAN should be aspiring to make a move towards a single currency. For the ASEAN region, ever more interesting for the outside world, it could naturally be seen as a great opportunity to grow further and to strengthen its position on the global stage. It is therefore essential to analyze whether a currency union could be a viable option for the ASEAN (or pairings of only some of its members) and to identify the obstacles standing in the way of such a project.

The assessment of the suitability for a monetary union in this thesis is done primarily by reviewing the theoretical criteria for an optimum currency area, as they were identified and discussed by economists pivotal in this field, particularly by Mundel (1960). I utilize the regression model built upon these theoretical foundations, which was created by Bayoumi and Eichengreen (1997). In their paper, the model was used for certain European countries, here it is reapplied for the ASEAN countries.

While the suitability of the ASEAN for a single currency has already been covered by several authors, these studies, being typically older, do not take into account the most recent developments in the area. In this thesis, I use the very latest data and consider also the current economic and political situation in the region. The outcomes based on the newest data are compared with the results generated by the older data. Comparisons with the Eurozone are also made in the thesis. Besides just looking at the differences in the relevant data between the two cases I also comment on how the ASEAN countries would do if faced with the Maastricht criteria.

All in all, the thesis attempts to answer the straightforward question "Should the ASEAN form a monetary union?", but also to further analyze issues related to the question. It thus investigates in more detail the problems for the single currency in Southeast Asia, compares the situation of the monetary integration in the ASEAN with the EU, and comments generally on how realistic it seems for a monetary union to be formed in the future.

### *Contribution*

Various papers concerning the topic have been written. They have employed various methods, including the regression model I use. Bayoumi, Eichengreen, and Mauro (2000) and Bayoumi and Mauro (2001) concluded that while the ASEAN is behind the founding countries of the EMU before the Maastricht



Treaty in terms of preparedness for a common currency, the difference is not as significant. Ng (2002) focused on the correlation of shocks and found the results for the ASEAN countries to be better in this regard than for the EU countries. A particularly high correlation was observed between Indonesia, Malaysia, and Singapore, suggesting a good potential of these three countries for monetary integration. Lee, Park, and Sheen (2003) studied the currency union prospects for the wider area of East Asia using the dynamic factor model and their conclusions were more ambiguous. Another study – Bacha (2008), utilized the VAR analysis and came with a rather negative verdict on the prospects of a currency union, pointing at numerous serious obstacles. Several other studies on the topic have been made as well.

As conclusions of the research in this area seem to vary to a certain extent, this topic appears to be open to further research. Since I use the latest data and consider the situation of the region as it is now, it is well possible for my conclusions to differ considerably from the older studies. It may also be interesting to observe the results based on the new data as the last year was heavily impacted by the coronavirus pandemic. A comparison with older results can also be useful by possibly revealing certain trends in economic integration in the region.

The thesis also makes the comparison with the Eurozone, which has become perhaps even more interesting as a model case for the study of currency unions after the Great Recession and the outbreak of the European debt crisis. Possible scenarios of only certain members of the ASEAN forming a currency union, as is the case in the EU, are also discussed.

Thus, I provide an overall summary of all the major issues linked with a hypothetical common currency area in the ASEAN and an up-to-date evaluation of the prospects of this project.

### ***Methodology***

The theory of optimum currency areas suggests certain criteria that are to be met and that can be measured quantitatively, such as significant intra-regional trade or high factor mobility. To get the data necessary for the assessment of these criteria, I chiefly use the databases of the UN (or its agencies).

To test the convergence to a common currency area, I employ the regression model by Bayoumi and Eichengreen (1997), originally used for European countries. Variables in the model are based on trade, exchange rates, output, and GDP of the concerned countries.

Other aspects, such as fiscal policies of the states (and whether they would be in accordance with the Maastricht criteria) and qualitative factors like the general political situation in the region, are also considered.

### ***Outline***

Abstract

Introduction

- a Overview of the topic, generally about the economic integration in the ASEAN
- b Existing theory and research on the topic
- c My contribution
- d Conclusions
- e Structure of the thesis

Literature review

- a Literature about optimum currency areas
- b Literature about a possible currency area in the ASEAN

Methodology

The description of methods employed to test the suitability for a currency area

Results

- a General verdict on the idea of a currency union in the ASEAN
- b Outline of the key obstacles
- c Comparison with Europe

Conclusion

- a Commentary on the results
- b Comparison with past research and options for further research

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**List of academic literature:**

***Bibliography***

- Bacha, O. I. (2008). A common currency area for ASEAN? Issues and feasibility. *Applied Economics*, 40(4), 515-529.
- Bayoumi, T., & Eichengreen, B. (1997). Ever closer to heaven? An optimum-currency-area index for European countries. *European economic review*, 41(3-5), 761-770.
- Bayoumi, T., Eichengreen, B., & Mauro, P. (2000). On regional monetary arrangements for ASEAN. *Journal of the Japanese and International Economies*, 14(2), 121-148.
- Bayoumi, T., & Mauro, P. (2001). The suitability of ASEAN for a regional currency arrangement. *World Economy*, 24(7), 933-954.
- Frankel, J. A., & Rose, A. K. (1998). The endogeneity of the optimum currency area criteria. *The economic journal*, 108(449), 1009-1025.
- Lee, J. W., Park, Y. C., & Shin, K. (2003). A currency union in East Asia. Available at SSRN 396260.
- McKinnon, R. I. (1963). Optimum currency areas. *The American economic review*, 53(4), 717-725.
- Mundell, R. A. (1961). A theory of optimum currency areas. *The American economic review*, 51(4), 657-665.
- Ng, T. H. (2002). Should the Southeast Asian countries form a currency union?. *The Developing Economies*, 40(2), 113-134.

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# 1. Introduction

The year 1967 saw the foundation of the Association of Southeast Asian Nations – ASEAN – by Indonesia, Malaysia, the Philippines, Singapore, and Thailand. The original five members have since been gradually joined by Brunei, Viet Nam, Lao, Myanmar, and Cambodia (ASEAN). When discussing the development of the ASEAN, the European Union naturally offers itself for comparison as a prime example of economic and political integration. One of the most notable steps in the integration in Europe has undoubtedly been the creation and operation of the euro. In the process of economic integration, the dismantling of the economic barriers resulting from different currencies can be seen as a major advancement towards greater economic unity and prosperity. A question may thus be raised if the ASEAN members could and should move towards creating a common currency area.

The achievements in the area of economics concerned with the study of the optimum currency areas (OCA) have made it possible to rigorously assess whether a particular group of states should adopt a single currency. In the spirit of the pivotal work of Mundell (1960), the theory juxtaposes the drawbacks of common currency areas stemming from the loss of monetary autonomy against the expected benefits. Numerous past empirical studies, especially from the 1990s and early 2000s, exist, which, building upon the OCA theory, conclude that the idea of the ASEAN or at least some of its members forming a monetary union could be seriously entertained (Bayoumi & Eichengreen, 1993, 1996c; Bayumi, Eichengreen, & Mauro, 2000; Madhur, 2002; Ng, 2002; Lee, Park, & Shin, 2003). The objective of this thesis is to revisit the idea and examine the ASEAN members' suitability for a common currency within the OCA theoretical framework using the latest data.

There are various approaches enabling a quantitative way of such an examination. In the thesis, an influential model developed by Bayoumi and Eichengreen (1996b) is used as the principal tool for deriving conclusions. This method consists of estimating the coefficients in the model's equation and then utilizing the result in the construction of the OCA indexes, which represent the projected standard deviation of the exchange rates between two states, with lower values signifying a greater preparedness for a monetary

union between these states. Instead of using the original estimates derived in 1996, new ones are found based on a different database with recent data and a higher focus on Asia and Southeast Asia in particular. This process may, besides producing more relevant coefficients for the present-day ASEAN, serve also as a way of testing the model's robustness and relevance. The resulting estimates then make a basis for the construction of the indexes and evaluation of Southeast Asia's suitability for a common currency. The thesis is, however, not limited only to this model but provides also additional discussion of potential monetary integration in the ASEAN.

Firstly, section 2 provides an overview of some of the most important literature regarding the topic of the thesis. This review of literature is divided into a section concerning the general OCA theory and a section providing an overview of empirical research on the ASEAN's currency integration. Section 3, then, starts the evaluation of the criteria for a currency area with a brief commentary on some crucial issues linked with the topic, namely the state of exchange rates, intraregional trade, and labor mobility in the ASEAN. It is in section 4 where the procedure involving the model of Bayoumi and Eichengreen (1996b) is discussed. Both the methodology of the procedure and its results are described in this part. Section 5 contains an additional inquiry into how the ASEAN members would do when faced with the Maastricht criteria, which have served as prerequisites for joining the Eurozone. Finally, section 6 summarizes the conclusions.

Throughout the thesis, the most recent data available are used. The assessment's results can thus be contrasted with studies that used older data and different techniques of assessing the OCA criteria. Overall, the thesis should provide a contemporarily relevant evaluation of the ASEAN's readiness for a common currency area.

## **2. Review of Literature**

A wide body of literature concerning the OCA theory exists, while some notable contributions have been made also in empirical research on the suitability of Southeast Asia for a currency union. Firstly, we may briefly summarize the key achievements of developments in the theory of OCAs, particularly the methods important for research in this thesis. We may then proceed by discussing specifically the literature concerning the topic of OCAs in regard to the ASEAN.

### **2.1 Literature on the OCA Theory**

A principal contribution to the OCA theory, essentially its foundational work, is Mundell's 1961 paper. In discussing the topic of fixed and floating exchange rates, Mundell (1961) points out that nations and areas with different monetary policy needs (in regard to the trade-off between unemployment and inflation) do not necessarily have to overlap. The crucial point of the paper is the role of factor mobility in determining desirable currency areas, as it is shown how the monetary policy in a single nation with a single currency may be rendered problematic if there is factor immobility between the nation's different regions, while it may be beneficial for different nations to form a currency union if the condition of factor mobility is met. It is also suggested that the benefits of a single currency present an upper limit of the maximum possible number of currency areas and that their comparison with the adjustment costs can reveal suitability for a monetary union. Mundell (1961) also directly states that the question of monetary integration in Europe could be seen as an empirical problem of whether there is (or will be) sufficient factor mobility between the concerned countries for the common currency to be beneficial.

McKinnon (1963) provides one of the most notable subsequent developments of Mundell's work. The paper looks at the OCA problem through the lenses of trade, as it shows how the structure of tradables and non-tradables in different economies affects their suitability for a currency union. A country's openness is thus shown as another

determinant for assessing prospects of a monetary union, with more open countries being more suitable for such arrangements. McKinnon (1963) points out that besides immobility of factors of production between different regions it is also immobility of factors between different industries within one region that presents a major obstacle for the economy and thus affects the evaluation of currency regimes.

The extensive literature on the OCA theory goes well beyond these few fundamental contributions mentioned in this section. Of all the studies, we shall not omit to mention the one by Kenen (1969), as it is also often regarded as a key work in this area of economics. All in all, it could be concluded that textbook prerequisites for a monetary union, which will be assessed in this thesis, are factor mobility, correlation of macroeconomic shocks, and high trade within the currency union. Beyond these purely economic factors, political reality and level of integration in general in a region may also affect the outcome of a single currency. As we turn to Bayoumi and Eichengreen's contributions, we may start by referring to their 1996 paper, which discusses the development of the OCA theory and provides an extensive review of empirical studies applying various methods based on this theory to European countries (Bayoumi & Eichengreen, 1996a).

In another 1996 paper, which is of particular importance for this thesis, Bayoumi and Eichengreen created a model using which it is possible to derive OCA indexes quantitatively expressing a country's suitability for a monetary union with another one. They estimated the coefficients of this regression model using the data from 21 industrialized countries and then derived the OCA indexes vis-à-vis Germany for several European countries, which resulted in the division of the countries into "core" and "periphery" (Bayoumi & Eichengreen, 1996b). This model has been since used in other studies, some of which slightly modified the model. In this thesis, the original model is applied to the ASEAN countries, however, the coefficients are reestimated with the recent data, as the data utilized in this paper may now be considered quite remote. The method employed in this study is discussed in more detail in section 4.

Finally, it is important to have in mind the conclusion of another highly influential paper, published by Frankel and Rose in 1998. This paper can be seen as a response to various papers on the monetary integration in Europe, including Bayoumi and Eichengreen's

1990s studies. Of these a particularly notable research, besides the one mentioned in the previous paragraph, is the 1992 paper, which concludes that a single currency in Europe should be more problematic than in the United States because of the economic shocks in the regions being considerably more idiosyncratic and the adjustment process slower. Frankel and Rose's research shows that these studies and more broadly evaluation of the OCA criteria based on historical data, which is done also in this thesis, have to be regarded cautiously, as the OCA criteria are shown to be endogenous. While the theory does not conclude clearly on the effect of trade on the correlation of business cycles, Frankel and Rose (1998) prove empirically that the relationship is indeed there, i. e. that higher intensity of trade between countries leads to a higher correlation between cycles of these countries. This means that while this thesis may show how suitable do the ASEAN members seem to be to form a currency union based on the data from the recent years, the conclusions are limited in that they cannot predict if a member would not experience a significant increase in trade with other members after adopting the single currency. Such an increase in trade could possibly make a country suitable for a single currency, even if the opposite seems to be true before the currency union is formed.

The 2000 paper by Alesina and Barro is particularly interesting because of how it studies the relationship between size and suitability for a monetary union. It is concluded that a country, which would be leaning the most towards forming a currency union would be "a small country with a history of high inflation" close or closely related to a "large and monetarily stable country". Alesina and Barro (2000) also suggest that as the world splits into smaller countries, there are likely to be more countries entering monetary unions and that an increase in the number of countries could even lead to a decrease in the number of currencies.

It may perhaps seem that all these papers are generally optimistic about the idea of creating new currency unions. The aftermath of the Great Recession in Europe could, however, naturally make one feel more concerned about the drawbacks of monetary unions – a sentiment that might be felt in various post-crisis works, notably perhaps Krugman's 2013 paper (or his other works). Krugman's discussion of the problems of the euro stresses how important the lack of fiscal coordination in Europe was and leads thus to a conclusion that a significantly greater level of integration would be needed for the



Eurozone to work properly. Such an approach would suggest that even if the theoretical criteria are met, a currency union might still not be a good idea.

## **2.2 Literature on a Currency Union in the ASEAN**

As numerous papers on the issues of potential monetary union in the ASEAN (or regions containing ASEAN members) have been written, this review is by no means complete. It is merely an attempt to highlight some of the studies, which might perhaps be considered the most notable.

We may start with the work of the already-mentioned authors Bayoumi and Eichengreen. They identified the region as having a potential for a currency union already in their 1993 paper. Their analysis of supply and demand shocks in various parts of the world showed three world regions with similar shocks, which could thus meet this OCA criterion. One of them was Southeast Asia, defined in this case as Hong Kong, Indonesia, Malaysia, and Singapore (Bayoumi & Eichengreen, 1993). In another study from 1996, Bayoumi and Eichengreen used their model for the OCA indexes to examine Asian countries' potential for a currency union. They estimated the same model used in the study on Europe again, this time using the data for Japan and its leading partners. While this inquiry goes well beyond the ASEAN region, the conclusions nevertheless show that Asian countries are generally comparable with European countries in terms of OCA criteria and some pairs of countries from the ASEAN are identified as being particularly suitable for a currency integration (Bayoumi & Eichengreen, 1996c). Finally, a 2000 paper by Bayoumi, Eichengreen, and Mauro looks at the currency integration potential specifically in the ASEAN. After an overall discussion of the OCA criteria in the case of the ASEAN, the study concludes that while the Southeast Asian nations seem to be less prepared for a single currency than the European nations were before the Eurozone, they are not lacking much. This paper stresses political obstacles for the integration and the great political commitment that would be needed from the ASEAN states (Bayoumi, Eichengreen & Mauro, 2000).

The papers mentioned in the previous paragraph, all at least 20 years old, still seem to be the most-cited studies on the currency integration in the ASEAN. While they are quite complex and also highlight obstacles to the idea of a single currency in Southeast Asia, their overall verdict on the project can be seen as positive and optimistic. Of the many other studies that have been written since numerous are more sceptical of the prospect. While it may not be possible to mention all the studies made on the topic in the last 20 or so years, we might briefly go through at least some in the next paragraph.

Madhur's (2002) conclusions can perhaps be considered as echoing those of Bayoumi, Eichengreen, and Mauro (2000) – while non-economic obstacles are highlighted, the study assesses the OCA criteria and finds the ASEAN states to be meeting them similarly well as the Eurozone countries. Madhur (2002) builds on the work of Barro concerning particularly the role of the size of countries and trade in monetary integration, using it as a support for the case of the ASEAN. Ng (2002) examines the correlation of the shocks criterium and finds that the ASEAN countries could be suitable for a currency union - Indonesia, Malaysia, and Singapore in particular. Lee, Park, and Shin (2003) conclude that a wider region of East Asia seems to satisfy the condition of correlated shocks similarly as pre-euro Eurozone countries. This paper also notes that a higher financial liberalization leads generally to greater financial integration on the global rather than on the regional level, meaning that increasing financial liberalization in the region could counter the forces pushing in the direction toward greater monetary integration (Lee, Park & Shin, 2003). Huang and Guo (2005) employ a VAR model in the case of the East Asian region. While they find the whole region unsuitable for a single currency, they identify four ASEAN members – Indonesia, Malaysia, Singapore, and Thailand among the potential leaders in monetary integration efforts (Huang and Guo; 2005). Kim (2007) uses the VAR analysis to study adjustments to shocks in East Asia and concludes clearly against the idea of a currency area in East Asia and also in the ASEAN specifically. Similarly, Bacha (2008), using VAR and correlation analysis methods and the data from 1970 to 2003, concludes that there seem to be significant discrepancies in the ASEAN and that the region is far from being ready for a single currency. The same four ASEAN members are identified though by Bacha (2008) as having a potential for a currency union as by Huang and Guo (2005), with Malaysia and Singapore pair meeting the criteria the best. Cortinhas (2007) finds that the disputed famous conclusion of Frankel and Rose (1998) should hold for the ASEAN, i. e. increased trade should lead to a greater similarity

in business cycles, which may make the ASEAN states better suited for a currency union after they form one. A more recent study by Alvarado (2014), which find the idea of a monetary union in the region problematic in certain regards, shall be noted because it, just like this thesis, uses the model of Bayoumi and Eichengreen (1996b). There are, however, still significant methodological differences between this study and the thesis, crucially when it comes to the database for estimation of the coefficients. The database used by Alvarado (2014), besides having slightly older data, covers the 10 ASEAN states or the ASEAN together with China, Japan, and South Korea, i. e. the same countries that are studied in their suitability for a monetary union. In this thesis, I have decided to use for the purpose of reestimating the equation of the model a broader database of 15 countries, only 6 of which are from the ASEAN and 3 of which are from outside the Asia-Pacific region. The choice of countries in the database is described in detail in section 4.1.1.

While numerous studies on the currency integration in the ASEAN have been made, they seem to be leaving enough space for further research. Some contradictions in the studies' conclusions can also be found. Although there exist also numerous more recent papers not mentioned in the previous paragraph, it still seems that the most significant contributions to the topic of monetary integration in the ASEAN come from the 2000s, particularly the early 2000s. Research based on newer data could thus be beneficial also in this regard, leading possibly to considerably different results.

### 3. General Remarks

Before constructing the OCA index, we may first look at certain important issues interlinked with the ASEAN's potential for a monetary union. A very broad commentary on these issues is provided in this section.

#### 3.1 Exchange Rates

In the thesis, suitability for a monetary union will be judged based on the theoretical criteria presupposing a functioning common currency area and the actual exchange rates between the ASEAN members will essentially not affect this evaluation. Nevertheless, it may still be worth taking a look at these exchange rates. Table 1 summarizes the average exchange rates against the dollar in 2021, the data being from the IMF.

**Table 1**

*Exchange rates of the ASEAN members against the US dollar*

Country	Exchange rate
Brunei	1.38
Cambodia	4 092.78
Indonesia	14 582.20
Lao	9 143.94
Malaysia	4.20
Myanmar	1 381.62
Philippines	49.62
Singapore	1.38
Thailand	31.29
Vietnam	23 208.37

Firstly, we may observe the same value for Brunei and Singapore. This is due to the fact that the Brunei dollar has been pegged to the Singapore dollar under the Currency Interchangeability Agreement since 1967 (Monetary Authority of Singapore). As the theory suggests that smaller countries should be more likely to peg their currencies or join

monetary unions (Alesina and Barro, 2000), it should come as no surprise that the ministate of Brunei has opted for such a monetary arrangement. While Brunei is included in the assessment of the OCA criteria further in the thesis, its inclusion may practically not be necessary, as we could expect that Brunei would simply follow Singapore if the latter were to join a monetary union with other ASEAN member states.

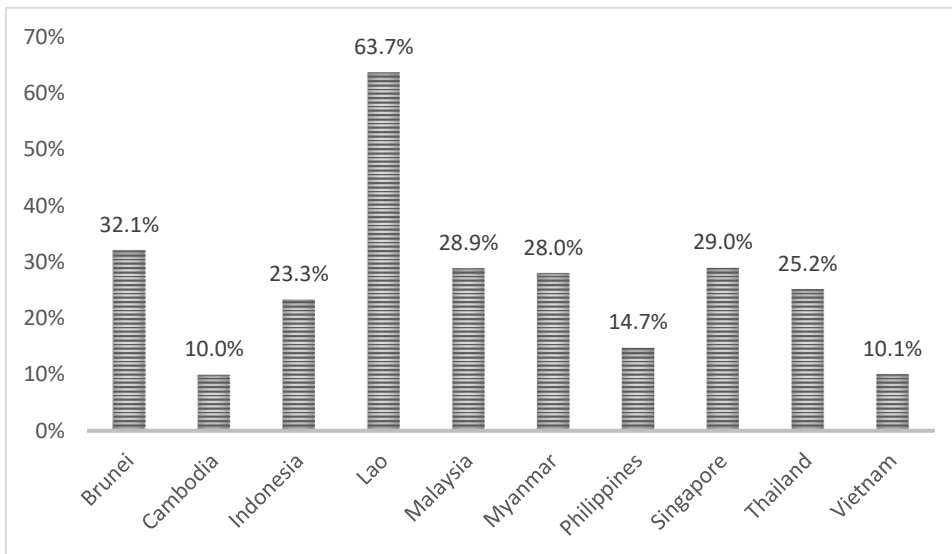
The value of the Singapore dollar is similar to that of the US dollar. Malaysia has a weaker currency but is still relatively close to Singapore. Thailand and the Philippines are further away but one US dollar is still worth only tens of units of their currencies. Other states all seem to have quite weak currencies, as one US dollar would be worth more than one thousand units of them in each case with Indonesia and Vietnam's currencies having particularly low values. The creation of a single currency for the whole ASEAN would likely mean a sharp change in currency value for several states. Rather huge differences between some of the countries of the ASEAN could naturally signal that different members may have significantly different preferences in terms of how strong should their currency be.

### **3.2 Trade**

To get a perspective on how important trade with the ASEAN is for each member, we may get the data from the UN Comtrade database and determine the share of exports to other ASEAN members in total exports. Figure 1 shows the numbers from 2017 - the latest year from which data of all the member states are available. We may observe that Lao stands out with more than 63% of all its exports directed towards the ASEAN while Cambodia, the Philippines, and Vietnam, all lack behind the others with the values being less than 15%.

**Figure 1**

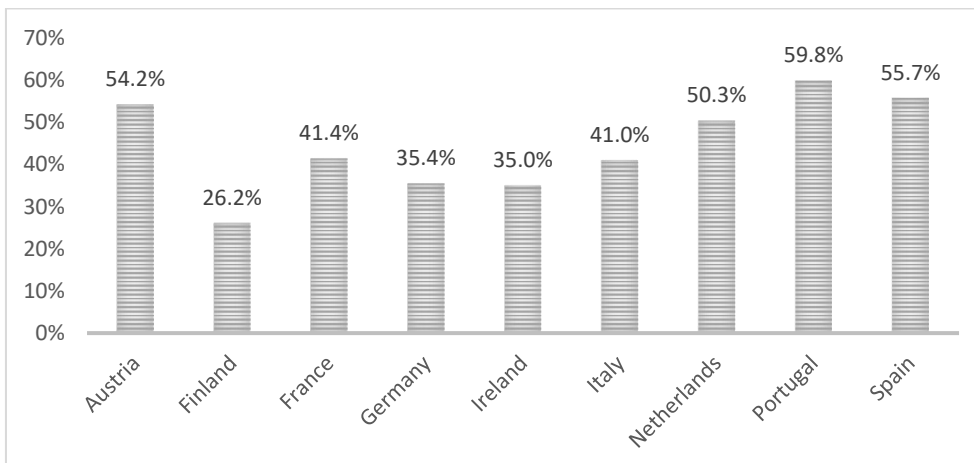
*ASEAN members - share of exports with the ASEAN in total exports in 2017*



To assess these values, a comparison with Europe is essential. Unfortunately, of the 11 founding members of the Eurozone, only 9 can be studied in this regard, as the Comtrade database does not offer any data on Belgium and Luxembourg from the years preceding the creation of the Eurozone in 1999. Nevertheless, it should hopefully be possible to get the general picture even without them. Figure 2 provides the summary for the same variable as the previous one for the other 9 founders of the Eurozone in 1998.

**Figure 2**

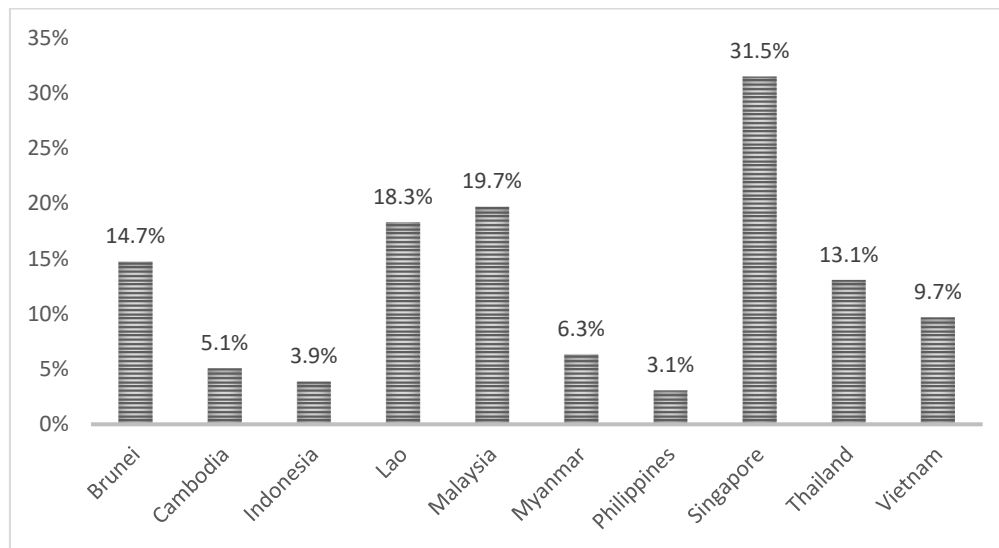
*9 of the original Eurozone states – share of exports with the other 8 in total exports in 1998*



From the graph, it seems that European countries were better prepared in terms of trade for a single currency year before its creation. All directed at least one quarter and with the exception of Finland more than one-third of their exports towards the other members. These figures would be even higher if Belgium and Luxembourg were included. It may, however, be useful to take into consideration also how important trade is for the economies of the ASEAN and the Eurozone. This might be done by calculating the share of exports to other members in total GDP. Figures 3 and 4 provide these numbers, first for the ASEAN and then for the Eurozone founders.

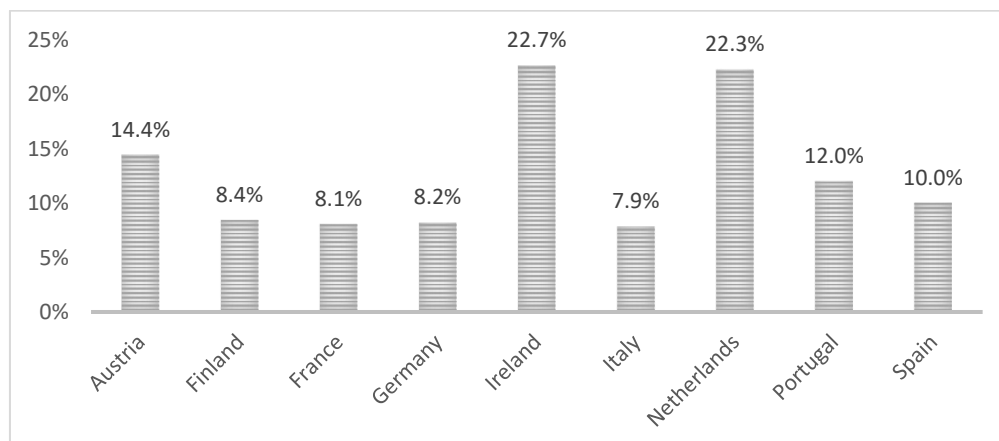
**Figure 3**

*ASEAN members – share of exports with the ASEAN in total GDP in 2017*



**Figure 4**

*9 of the original Eurozone states – share of exports with the other 8 in total GDP in 2017*



Again, it must be taken into account that if Belgium and Luxembourg were included, the figures for Europe would be higher. Nevertheless, using just the 9 of the founders, it may seem that Europe was still generally somewhat better also in this regard, however, the difference between Europe and the ASEAN appears to be considerably less visible when GDP is considered. Particularly notable may be Singapore, which is a rather rare case of a country with exports considerably higher than the total GDP, and which, as can be seen, actually reaches a higher share in the second graph. Judging by the GDP-adjusted metric, it would not seem that the ASEAN is significantly behind the Eurozone founders before its foundation. It might also be noted that the theory would suggest a possibility of a significant rise in intraregional trade after the formation of the currency union (Frankel and Rose, 1998; Cortinhas, 2007). We, however, still cannot clearly conclude on trade developments in the hypothetical scenario of a single currency.

### **3.3 Labour Mobility**

It is certainly a difficult task to try and properly examine labour mobility in a given region, made even more problematic by the often-missing data. While such an examination is beyond the scope of this section, a few crucial notes regarding labour mobility in the ASEAN may still be made. While there are approximately 337 million people making up the labour force of the ASEAN, about 7.1 million of them account for labour migration within the ASEAN (ILO, 2021). This corresponds to slightly more than 2% of the labour force. For comparison, in 2019, migrant workers within the EU28 constituted approximately 4,2% of the total labour force (European Commission, 2020). While this statistic covers a region wider than just the Eurozone and while such metrics do not comprehensively express the labour mobility, we can still get at least a glimpse of what the situation with labour mobility in the ASEAN might be like in comparison with Europe. The ASEAN seems to be likely lacking in this regard. An interesting case to support this may be the Philippines – while this nation is a prime example of a state with a major part of the labour force working abroad, it does not contribute as significantly to the labour migration in the ASEAN, with the majority of the workers being directed



elsewhere (ILO, 2021). On the other hand, Indonesia, which is also a major destination of origin of labour migrants, has most of its migrating workers heading to other ASEAN members, with more than one-half of them working in Malaysia (World Bank, 2017). It could thus perhaps be concluded that certain ASEAN states might seem to be doing relatively well in this regard but the ASEAN as a whole may not have high levels of labour mobility. The Great Recession and its aftermath have shown how important labour mobility can be for the functioning of a common currency area, as the lack of it has arguably been a major reason why dealing with the crisis has been so problematic in Europe, especially in comparison to the United States (Krugman, 2013). It could thus not be sufficient for the ASEAN to have similar labour mobility as Europe has now or had before the Euro – based on the Eurozone’s experience, it could be argued that an even higher level of labour mobility is a prerequisite for a common currency. Should there be any larger crisis, the hypothetical common central bank in the ASEAN could have it more difficult to react properly because of the state of the labour market.

## 4. OCA Indexes

To assess the OCA criteria in a more quantitative and rigorous way, we may employ the model of Bayoumi and Eichengreen from their 1996 paper on Europe, which should lead us to assign the OCA indexes to the ASEAN members. The procedure has two steps – firstly the (re)estimation of the coefficients, then the actual construction of the OCA indexes based on the derived results.

### 4.1 Estimation of the Coefficients

#### 4.1.1 Methodology

In their 1996 paper, Bayoumi and Eichengreen created a model based on the OCA theory, which allows for an empirical investigation of the desirability of a currency union. The equation of the model is as follows:

$$SD(e_{ij}) = \alpha + \beta_1 SD(\Delta y_i - \Delta y_j) + \beta_2 DISSIM_{ij} + \beta_3 TRADE_{ij} + \beta_4 SIZE_{ij}$$

The dependent variable  $SD(e_{ij})$  is the standard deviation of the change in the logarithm of the end-year bilateral exchange rate between the potential currency union members  $i$  and  $j$ . This variable is intended to express nominal exchange rate variability, which, being the result of the choice of monetary arrangement, should carry the crucial information telling us whether the hypothetical single currency should or should not be adopted (Bayoumi & Eichengreen, 1996b). To get the exchange rates, the data from the IMF showing the exchange rates against the US dollar are used, based on which the exchange rates between the concerned countries are calculated.

The variable  $SD(\Delta y_i - \Delta y_j)$  is the standard deviation of the difference of the logarithms of real output in countries  $i$  and  $j$ . It should serve as a measure of the correlation of business cycles. A similarity in business cycles should mean that countries' outputs

“move together” and thus should lead to a small value of this variable (Bayoumi & Eichengreen, 1996b). The data containing national GDPs at constant 2015 prices expressed in US dollars from the World Bank are used.

The variable  $DISSIM_{ij}$  is the sum of the absolute differences in the shares of agricultural, mineral, and manufacturing trade in total merchandise trade. It is also intended as a way of examining the symmetry of business cycles. Pairs of countries with higher values of this variable, that is with higher dissimilarities in the sector decomposition of exports, should have less symmetric sector-specific shocks (Bayoumi & Eichengreen, 1996b). Bayoumi and Eichengreen define the three different sectors used in more detail in another 1996 paper where the model is used again for Asian countries. In an attempt to adhere to this clarification, the following way of determining this variable is chosen: For the share of agricultural trade, the statistic on the share of food exports is used (agricultural raw material exports not included), for the mineral trade the data on the share of ores and metal exports are used (oil exports not included) and finally in the case of manufacturing trade the share of manufactures exports statistic is used. All the data for this variable are from the World Bank database.

The variable  $TRADE_{ij}$  is the mean of the ratio of bilateral exports to domestic GDP of the countries  $i$  and  $j$ . It should thus represent a measure of the importance of trade between the hypothetical members scaled by their GDPs (Bayoumi & Eichengreen, 1996b). The data on bilateral trade from the WITS database of the World Bank are used (it may be noted that numbers can differ based on which country is chosen as the reporter of the data since countries might have different methodologies of calculating trade movements). The data on current GDP (expressed in US dollars) from the World Bank are used for domestic GDPs.

Finally, the variable  $SIZE_{ij}$  is the mean of the logarithm of the GDPs (in US dollars) of the states  $i$  and  $j$ . This variable is meant to account for the benefits of the single currency, which should be according to the theory greater for smaller countries (Bayoumi & Eichengreen, 1996b). The data used to calculate the values are again the data on the GDP at 2015 constant prices (in US dollars) from the World Bank.

For variables  $DISSIM_{ij}$ ,  $TRADE_{ij}$ , and  $SIZE_{ij}$ , the average over the whole studied period is used. For the other two variables, standard deviations are used, as per their definitions. Some studies employing this model try to make slight adjustments to it. We can stick to the original model in this thesis, however, we might not use the original 1996 estimates but try to get the new ones instead. In the 1996 paper on Europe, the data from 21 industrialized countries are used to get the following estimate of the equation:

$$(1) \quad SD(e_{ij}) = -0.09 + 1.46 SD(\Delta y_i - \Delta y_j) + 0.022 DISSIM_{ij} - 0.054 TRADE_{ij} \\ + 0.012 SIZE_{ij}$$

It can be observed that the coefficients have indeed the expected signs. To interpret the result, we might imagine that if  $i$  is fixed the model suggests that  $j$  is less suitable for a common currency arrangement if the changes of outputs of  $i$  and  $j$  follow less similar patterns, if  $i$  has a more dissimilar composition of exports, if the trade between the two is less significant and if  $j$  has a larger economy.

As has already been mentioned, Bayoumi and Eichengreen (1996b) themselves do not use these values of coefficients when they employ their model in another paper (1996c), this time examining Asian countries. Instead, they estimate the equation again with the data “for Japan and its 19 leading trade partners” from 1976-1995 (Bayoumi & Eichengreen, 1996c). The new estimate of the equation can be seen below. We may observe that while the coefficients are different in the second case, their signs remain the same.

$$(2) \quad SD(e_{ij}) = -0.01 + 0.79 SD(\Delta y_i - \Delta y_j) + 0.01 DISSIM_{ij} - 0.34 TRADE_{ij} \\ + 0.01 SIZE_{ij}$$

#### 4.1.2 Data

We shall clearly use more recent data for my estimation. The choice of countries, on the other hand, seems like a rather arbitrary matter. Nevertheless, Bayoumi and Eichengreen

(1996b) stress using the data from developed countries in the paper on Europe, while in their paper on Asia they opt for the inclusion of more countries from the region by choosing Japan and its main trade partners. In the case of Europe, most of the 21 countries used in the dataset were from the continent. We could exclude the largest EU members, as they now share the same currency. All in all, if we are to try to proceed similarly with the model as its authors, it seems reasonable to choose the main developed economies (as has been mentioned, excluding the Eurozone members) together with at least some largest ASEAN members and other crucial Asian economies.

Of the ASEAN states, four are excluded – Brunei, Cambodia, Lao, and Myanmar. This is chiefly due to some missing data for these countries, however, their exclusion can be grounded also on other reasons. They represent what could be seen as a group of smaller ASEAN economies divided by a rather significant margin from the rest. Brunei is one of the world's ministates while the other three are all considerably behind the rest of the ASEAN in terms of their economic development, as the data from the IMF or World Bank can reveal. These reasons may perhaps also explain why it is in certain instances difficult to get the relevant data for these particular ASEAN members. Nonetheless, the database used includes the remaining six members – Indonesia, Malaysia, Thailand, Philippines, Singapore, and Vietnam. In the database, we can then use the data for the “usual suspects” – Japan and South Korea together with another smaller developed Asian economy logically complementing the ASEAN group – Hong Kong. It would also seem reasonable to include Taiwan in the database, however, it has been omitted as its absence in numerous databases could cause problems. We may also include Australia, which does not lie in Asia but still belongs to the Asia-Pacific region. China and India, even though not considered developed countries, are included as well, being now the two largest Asian economies. Finally, the database comprises also three important wealthy countries from different geographic areas – Canada, the United Kingdom, and the United States. The database used for the estimation thus contains 15 primarily wealthier and larger economies – while the focus is largely on the ASEAN and Asia, countries from other parts of the world are also included, possibly making the results more robust. The data come from the 2010-19 period. The database should hence hopefully lead us to relevant estimates.

Table 2 summarizes the mean, median, minimum, and maximum values of all the variables (the size of our sample is 210). We may see that the values for the variable  $SIZE_{ij}$  are noticeably higher than for the other variables, however, this should be in line with the model's intentions since this variable, as has been already described above, is calculated exactly according to Bayoumi and Eichengreen (1996b).

**Table 2**

*Statistics of the values of the variables*

Variable	Mean	Median	Min	Max
$SD(e_{ij})$	0.03095165	0.03018311	0.00153493	0.05941568
$SD(y_{ij})$	0.03054186	0.02649431	0.00256209	0.07864359
$DISSIM_{ij}$	0.3768824	0.32732986	0.02803369	1.23334677
$TRADE_{ij}$	0.02035307	0.01458974	0.0009424	0.10216623
$SIZE_{ij}$	12.0581149	12.0327011	11.3710928	13.1396486

### 4.1.3 Results

The above-described database yields the following equation:

$$(3) \quad SD(e_{ij}) = -0.040281 + 0.002615 SD(\Delta y_i - \Delta y_j) + 0.00411 DISSIM_{ij} \\ - 0.133415 TRADE_{ij} + 0.006113 SIZE_{ij}$$

The coefficients all have the expected signs. However, the results for the difference in logarithms of the real output and the  $DISSIM_{ij}$  variable are not statistically significant. While in the paper on Europe by Bayoumi and Eichengreen (1996b) all the coefficients are “different from zero at one percent confidence level”, here this holds only for the variables  $TRADE_{ij}$  and  $SIZE_{ij}$ . It is true that in Bayoumi and Eichengreen's paper on Asia (1996c) the estimate for  $DISSIM_{ij}$  falls out of the one percent confidence interval but it still remains at least in the ten percent confidence interval. In our case, the estimates for  $SD(\Delta y_i - \Delta y_j)$  and  $DISSIM_{ij}$  do not differ from zero even at the ninety percent confidence level. It should be noted that I tried to estimate the equation using an extended

version of the database including also states, which I consider less relevant for this estimation, namely New Zealand and 4 additional European economies not using the euro – Denmark, Poland, Norway, and Sweden. This led to a problematic equation, as the coefficient for the difference in outputs variable, while remaining close to 0, moved to the negative territory. Having the theory in mind, a coefficient with a negative sign would not make sense in this case.

Nonetheless, the equation shown above may still be usable for the construction of the indexes despite all the problems mentioned in the previous paragraph. While the coefficients of our estimation differ from Bayoumi and Eichengreen (1996b) – the equation (2) - and thus hopefully provide an “updated” version of the equation, there are also clear similarities - the coefficient for  $TRADE_{ij}$  has a significantly greater absolute value than the others and most importantly the signs are all as expected. Equation (3) appears to be more comparable with (2) than with (1). The differences between all these equations can perhaps signify that the choice of the database and its geographical focus may indeed matter to a considerable extent. We could maybe conclude that Bayoumi and Eichengreen’s model has been shown by our estimation as somewhat problematic since the use of a new database with different countries and years turned two of the estimated coefficients statistically insignificant and as has been mentioned, the addition of further countries could even lead to a negative sign there where the opposite would be expected. Nonetheless, the variant of the database with only 15 states is our database of choice, as this seems like the more meaningful version than the one with other states less relevant for the ASEAN included. Despite the problems with the first two coefficients in our equation, their signs are as expected and their magnitudes also seem sensible. It is thus this new equation rather than any of those by Bayoumi and Eichengreen that is used in the next part to derive the indexes.

It shall also be noted that the residual standard error of the regression (3) is 0.009324. Bayoumi and Eichengreen (1996b) use the standard error of the regression as a benchmark for evaluating the indexes – their standard error was almost three times higher at 0.027. Another interesting parameter to consider is the R-squared of the regression (3), which is notably low – the adjusted R-squared is equal to 0.1105. For comparison, the R-squared of the original regression (1) was 0.51 (Bayoumi & Eichengreen, 1996b) and in the case of (2), it was 0.36 (Bayoumi & Eichengreen, 1996c). Our value is closer to (2),

i. e. to the paper on Asia but is still more than 3-times lower. This suggests that the model explains only a small portion of the variance in the independent variable, that is in the standard deviation of the exchange rates. In the debate on whether exchange rates can serve as shock absorbers, we may be inclined to believe that this is not so, at least for our database, since we would rather expect a high portion of the variance in the exchange rate variable to be explained by the model if the exchange rate really was a shock absorber. This result would be in line with numerous studies focusing specifically on this issue, for example, the paper of Canzoneri, Vallés Liberal, and Viñals (1996) on Europe. Another study that may be mentioned here is that by Artis & Ehrmann (2000), which finds that whether the exchange rate serves as a shock absorber or not varies by the studied countries. If the exchange rate does not serve as a shock absorber, we may also expect that it could be rather generating shocks. If this is the case monetary unions can generally be deemed as more desirable since the foregoing of monetary independence then seems like a less of a problem – if the exchange rate under the independent monetary policy does not absorb the shocks, it does not appear much costly to give up the monetary autonomy. It must be noted though that all these thoughts on the issue of the exchange rate as a shock absorber are only hypothetical. The low R-squared could naturally be highly influenced by missing variables in the equation. To properly assess whether the exchange rate indeed does not absorb shocks, separate research would be necessary.

## 4.2 Deriving the Indexes

In the paper where the model is originally used, Bayoumi and Eichengreen estimate the indexes vis-à-vis Germany. We may thus proceed by deriving the values of the indexes vis-à-vis Indonesia. This country was identified among the ones with the greatest potential for a common currency in several papers (Bayoumi & Eichengreen, 1993; Ng, 2002; Huang & Guo, 2005) and it is by far the largest economy in Southeast Asia. We may thus calculate the indexes with  $i$  being Indonesia and  $j$  one of its fellow ASEAN members. The data used for determining the values of the variables in this section come from the same sources as in the previous section. Table 3 describes the values of the indexes we



get by simply substituting the values for the 2010-19 period in the equation (3). These indexes are also compared with the actual values of the dependent variable.

**Table 3**

*OCA Indexes in the ASEAN against Indonesia (approx..) and the true values of  $SD(e_{ij})$*

Country	OCA Index	True $SD(e_{ij})$
<b>Brunei</b>	0.0260	0.0327
<b>Cambodia</b>	0.0277	0.0363
<b>Lao</b>	0.0274	0.0371
<b>Malaysia</b>	0.0286	0.0377
<b>Myanmar</b>	0.0292	0.6783
<b>Philippines</b>	0.0310	0.0294
<b>Singapore</b>	0.0259	0.0332
<b>Thailand</b>	0.0299	0.0267
<b>Vietnam</b>	0.0296	0.0412

A comparison with the indexes as they were for Europe is not directly possible. The values in the table above are in fact quite similar to the lowest values of indexes for Europe before the Eurozone, however, we have to keep in mind that the standard error of the regression is much lower in our case. Taking this into account, the numbers seem to be speaking against the common currency, as the value for Singapore, the country that should have the greatest potential for a monetary union with Indonesia, is still almost three times greater than the standard error. The comparison between the countries reveals that Brunei and Singapore appear to be the best partners for a common currency while the Philippines, one of the ASEAN founders, is shown perhaps slightly surprisingly as the worst candidate with the OCA index higher than 0.03. To assess the causes of these indexes, we may simply compare the values of the independent variables. Table 4 summarizes them using the green-yellow-orange-red colour scheme with green signifying that the variable has a “better” value for the suitability for a common currency, that is a greater value for *TRADE* and a smaller value otherwise.

**Table 4***The values of the independent variables against Indonesia*

Country	$SD(y_i - y_j)$	$DISSIM_{ij}$	$TRADE_{ij}$	$SIZE_{ij}$
Brunei	0.07307545	0.60064186	0.01110494	11.0196005
Cambodia	0.02344147	0.72907275	0.00074422	11.0820252
Lao	0.0249776	0.60920723	0.00049195	11.0309761
Malaysia	0.00256209	0.24533671	0.0204162	11.6945442
Myanmar	0.02168379	0.37705986	0.00121747	11.3580863
Philippines	0.01627724	0.48124499	0.00388684	11.6989248
Singapore	0.01753505	0.53190956	0.04222402	11.7003535
Thailand	0.02568026	0.43992661	0.01458974	11.761881
Vietnam	0.01385364	0.47371843	0.0093202	11.5994025

We may note that a country's size plays a considerable role in the determination of the index, as smaller countries are expected to be better fitted for common currencies and have thus in this regard an "advantage" over the larger economies. This can largely explain why the index value for Brunei – the smallest member – is one of the lowest, even though none of the other three variables are in green in the table. When it comes to the standard deviation of the GDP differences, Brunei has actually the highest value with a significant margin. On the other hand, Malaysia has the lowest value of this variable, suggesting that its business cycle follows the most similar path to that of Indonesia. These two countries have also the most similar composition of their exports. Singapore ending up as the best potential partner for a monetary union should come as no surprise since Indonesia and Singapore seem to be doing the best of these pairs in terms of trade between them.

To get a better picture of how low or high these OCA indexes are, we may use table 5, which shows the indexes if  $i$  is Australia and  $j$  is one of the other countries of the database from the estimation of the equation (again, the indexes are derived by simply substituting the values of the dependent variables for 2010-2019).

**Table 5***OCA Indexes against Australia (approx.) and true values of  $SD(e_{ij})$* 

Country	OCA Index	Country	OCA Index
Canada	0.0342	Philippines	0.0322
China	0.0333	Singapore	0.0299
Hong Kong	0.0318	South Korea	0.0331
India	0.0343	Thailand	0.0308
Indonesia	0.0330	United Kingdom	0.0348
Japan	0.0339	United States	0.0371
Malaysia	0.0302	Vietnam	0.0303

The values in this table are generally higher than in the previous table, suggesting that ASEAN states are more suitable for a monetary union than this group of states. That is, however, not much of a support for a common currency area in the ASEAN, as the table contains essentially a “random” group of states and it would be thus surprising if the values were not higher. What may be more important is that the differences between the values do not seem to be as notable. While Bayoumi and Eichengreen (1996b) find the difference between the indexes for European states and for selected pairs of “random” countries to be significant, this cannot be said in our case. For example, the index between Australia and India - two countries that would seem like rather unlikely candidates for a monetary union – is quite close to that between Indonesia and the Philippines. The index between Australia and Singapore is even lower than those between Indonesia and the Philippines and Thailand. Based on these results, we would conclude against the idea of establishing a monetary union in the ASEAN. None of the individual pairs appears to be revealed as suitable for a common currency.

We may alternatively try to construct the indexes against Singapore. While not as large, it may be seen as standing out from the rest of the ASEAN in economic terms, being by far the richest member. As has already been mentioned, Brunei has decided to peg its currency to the Singapore dollar, which perhaps makes Singapore seem even more interesting for our consideration (taking into account for example also the fact that Brunei is surrounded by Malaysia). Table 6 below summarizes the approximate values of OCA indexes if  $i$  is Singapore and  $j$  its fellow ASEAN members, with Indonesia being left out this time.

**Table 6**

*OCA indexes in the ASEAN against Singapore (approx..) and true values of  $SD(e_{ij})$*

<b>Country</b>	<b>OCA Index</b>	<b>True <math>SD(e_{ij})</math></b>
<b>Brunei</b>	0.0249	0.00104228
<b>Cambodia</b>	0.0238	0.02099499
<b>Lao</b>	0.0263	0.01975372
<b>Malaysia</b>	0.0124	0.01945702
<b>Myanmar</b>	0.0274	0.69096347
<b>Philippines</b>	0.0271	0.01593673
<b>Thailand</b>	0.0258	0.0151184
<b>Vietnam</b>	0.0261	0.02671665

Brunei must be taken as an extraordinary case – although the true value of the standard deviation of the changes in exchange rates is still not equal exactly to 0, it is very close to 0 because of the peg. The indexes appear smaller overall, suggesting that Singapore is generally a more suitable partner for a common currency for other ASEAN states than Indonesia. We must remember, however, the effect of size – Singapore has a significantly smaller GDP than Indonesia and thus also smaller values of the variable  $SIZE_{ij}$ . The most notable value is the index for Malaysia – at approximately 0.012 it is about two times smaller than the next smallest one. This result is also approaching the standard error and we may thus say that the Malaysia-Singapore pair is not as far from being theoretically suitable for a single currency. While this pair was identified among the most suitable in several other studies (Bayoumi and Eichengreen, 1996; Ng, Huang and Guo, 2005; Bacha, 2008), our conclusions differ in that Malaysia and Singapore essentially appear as the single example of where a common currency could be considered a viable option. Interestingly, no other members, neither Indonesia nor Thailand in particular, seem to be anywhere near Malaysia in the values of their OCA indexes against Singapore. Table 7 summarizes the values of the independent variables using a colour scheme in the same way as the last table on the indexes against Indonesia.

**Table 7***The values of the independent variables against Singapore*

Country	$SD(y_i - y_j)$	$DISSIM_{ij}$	$TRADE_{ij}$	$SIZE_{ij}$
Brunei	0.05654449	0.68521696	0.0094688	10.7971
Cambodia	0.04083506	0.2308982	0.01898691	10.8595247
Lao	0.04194861	1.08966507	0.00032235	10.8084756
Malaysia	0.01672434	0.54460439	0.13303988	11.4720438
Myanmar	0.03881579	0.33874176	0.00445407	11.1355858
Philippines	0.03352289	0.20355937	0.02211801	11.4764244
Thailand	0.01107551	0.13662306	0.0342404	11.5393805
Vietnam	0.03103119	0.18349034	0.02515054	11.376902

The values for Brunei may be interesting in that all the factors except for size seem to be speaking rather against any common monetary arrangement. Brunei's peg to the Singapore dollar can thus be seen as a further demonstration of the importance of size in monetary matters. The numbers for Malaysia show that the reason for such a low OCA index stems primarily from the importance of trade between Singapore and Malaysia since the value for the trade-related variable for this pair is well above all the others. Additionally, these two countries appear to have relatively similar business cycles compared to the other pairs.

Finally, we could also look at Malaysia just to check if no other notably suitable pair appears (for example with Thailand). Table 8 below summarizes the OCA indexes for Malaysia, with Indonesia and Singapore excluded.

**Table 8***OCA indexes in the ASEAN against Malaysia (approx.)*

Country	OCA index	True $SD(e_{ij})$
Brunei	0.0247	0.01962363
Cambodia	0.0257	0.03777918
Lao	0.0262	0.03635097
Myanmar	0.0276	0.69070085
Philippines	0.0287	0.02952564
Thailand	0.0257	0.01861959
Vietnam	0.0265	0.04137332

We can observe that all the indexes are in the territory between 0.024 and 0.029. This means that no other pair involving Malaysia has a noticeably lower value of the index, leaving us thus still only with the Malaysia-Singapore pair. To conclude, we may just note once again that the results discussed should lead us to be rather sceptical about the hypothetical monetary union in the ASEAN.

## 5 Maastricht Criteria

In assessing the readiness for a common currency in the ASEAN, we may also use the Maastricht criteria. These are the EU's requirements for joining the Eurozone. Even though the ASEAN may not be fully comparable with the Maastricht criteria, it can still be interesting to examine whether the ASEAN members would be able to meet these or similar criteria. The comparison is not applicable in the case of the criterium regarding the exchange rates stability, as this deals with the ERM II mechanism and the exchange rate between the Euro and the domestic currency before joining the Eurozone, i. e. it is in a way too specific to the EU (European Commission). Nevertheless, we can discuss if the other three criteria would be met in the ASEAN.

### 5.1 Inflation

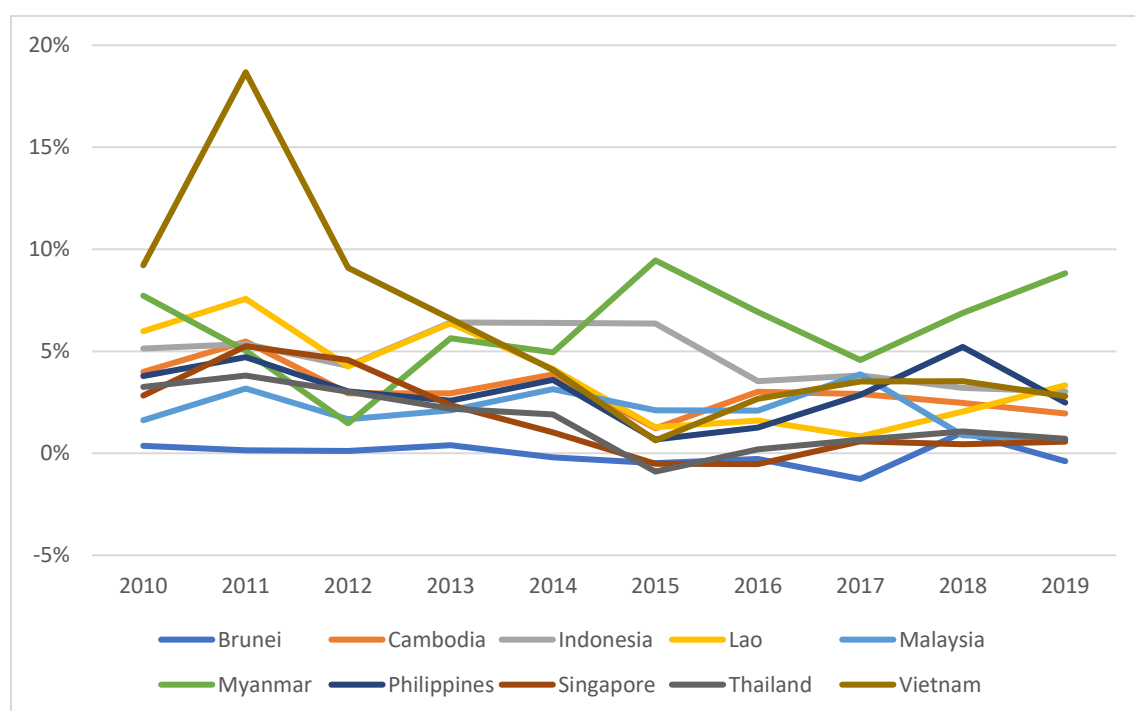
Maastricht criteria require that Eurozone members have their inflation level by no more than 1.5 percentage points higher than the three best-performing states (European Commission), with the consumer price inflation being used for the evaluation. We may thus proceed by examining the inflation levels of the ASEAN members accordingly.

Figure 5 summarizes the development of inflation levels of the ASEAN members in 2010-19. We may observe that the inflation figures got somewhat better in this period, although Myanmar went on to experience high inflation in recent years. Vietnam, on the other hand, started the decade with an alarming inflation rate but it seemingly managed to control it. In 2019, we can see two groups of states with very similar inflation rates – these are Malaysia, Singapore, and Thailand and then Indonesia, Lao, Philippines, and Vietnam, with the inflation levels being clearly higher by more than 1.5 percentage points in the latter group than in the former. Brunei appears to be steadily maintaining low inflation, typically the lowest in the ASEAN. Cambodia has a higher rate in 2019 than the

first group of states but should be still within the range of the criterion and finally, Myanmar has significantly higher inflation than the other members. As the IMF data reveal, 11 founders of the Eurozone experienced considerably different and in certain cases relatively high levels of inflation in the earlier 1990s, however, in 1998, before the creation of the single currency, they reached similar figures. This is not yet the case in the ASEAN, although if the currency union were to be created just between Malaysia, Thailand, and Singapore for example, the criterion of inflation should easily be met. Notably, the ASEAN's largest economy, Indonesia, can be seen experiencing relatively higher inflation, being also quite further away from the above-mentioned trio in this regard.

**Figure 5**

*The inflation levels of the ASEAN members in 2010-2019*



## 5.2 Deficit and Debt

Another of the Maastricht criteria concerns public finances. To meet the requirement, a member state shall not be under excessive deficit procedure (EDP). To avoid EDP, a

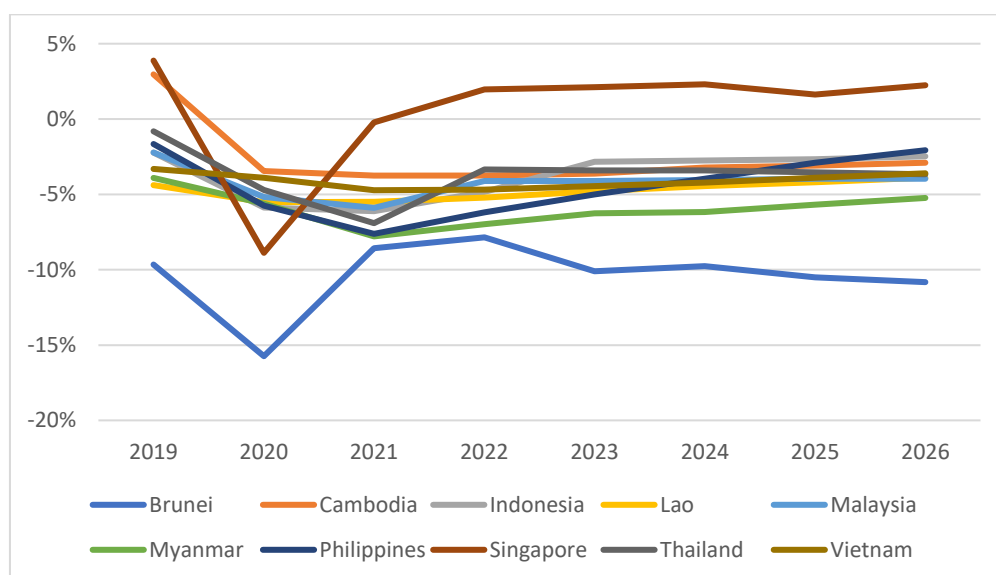


country's budget deficit must not be greater than 3% of GDP and its public debt must not exceed 60% of GDP (European Commission).

To examine the government finances, we may turn to IMF's World Economic Outlook's most recent data from October 2021. We may use IMF's data on general government net lending/borrowing expressed as % of GDP to assess budget deficits. Figure 6 shows the figures for the ASEAN from 2019 and 2020 together with the estimates for 2021-2026. For Cambodia, the 2019 figure is already an IMF estimate, while for Singapore the estimates only start in 2022. We may observe an apparent disruption in 2020, which may likely be the result of the coronavirus pandemic. Singapore, despite a rather larger deficit in 2020 is projected to return back to having a surplus. Brunei's position further below the -3% threshold, on the other hand, appears to be quite stable. We can see that other members were either above the threshold or not far below it but experienced a decrease in their deficits in 2020. They are, however, predicted to be generally quite close to -3% in the future. This means that with the exception of Brunei, ASEAN members seem to have the potential to meet the deficit criterium.

**Figure 6**

*General government net lending/borrowing in % of GDP in 2019-2026 in the ASEAN*

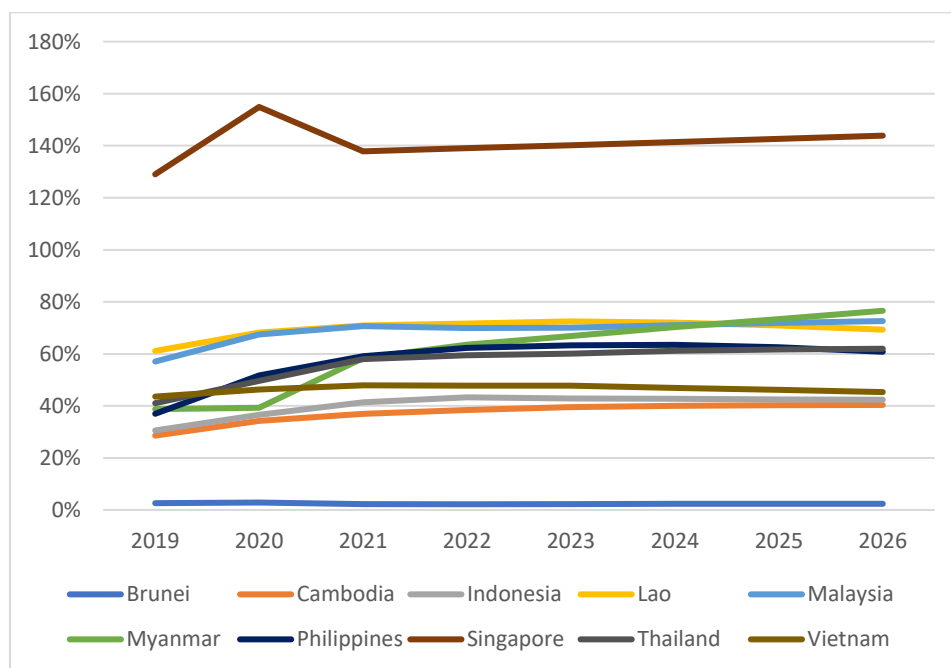


For public debt, IMF's data on general government gross debt expressed as % of GDP may be used. Figure 7 shows public debts in the ASEAN in 2019 and 2020 together with the projected public debts in 2021-2026. For Cambodia, the 2020 value is an IMF

projection too. We may observe two clear outliers – Brunei with a very low government debt on one hand and Singapore with a high debt value well above 100% on the other. Currently, Lao and Malaysia are moving around the 60% threshold while all the remaining members are below it. Of these, however, it is projected that only Cambodia, Indonesia, and Vietnam will remain with Brunei below 60%. Still, it seems that with the exception of the ASEAN’s wealthiest country, Singapore, all the members would have the potential to meet the public debt requirement.

**Figure 7**

*General government gross debt in % of GDP in 2019-2026 for the ASEAN states*



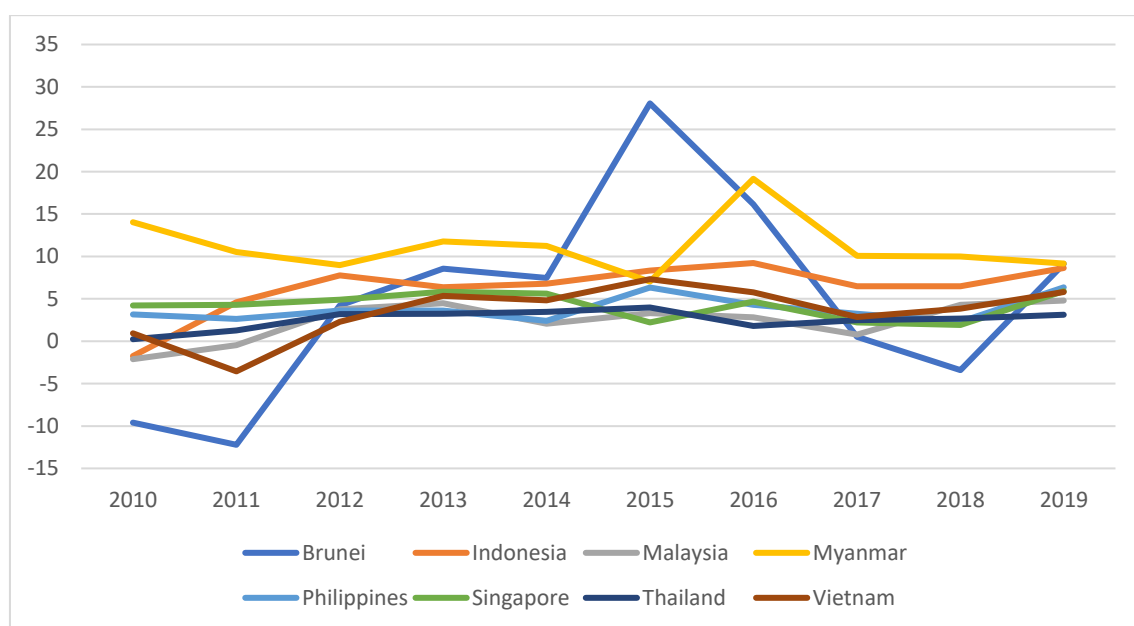
Although the projections would suggest that many of the members are not able to meet the criteria on government finances, it might still perhaps be concluded that the ASEAN members generally could be able to fulfil the government debt and deficit criteria similar to that of the Maastricht criteria, as they are mostly relatively close to the required values. In fact, it has already happened that EDPs were launched in Eurozone states (European Commission) and it is not uncommon among the members to be considerably above the 3% deficit or 60% public debt, as the IMF data say (although the EU’s numbers may perhaps differ because of the differences in methodology). The current figures for the Eurozone members would likely paint a much worse picture of the state of the government finances. The ASEAN states may thus not be doing that badly in this regard.

### 5.3 Interest Rates

The Maastricht criteria require a member’s long-term interest rates not to differ by more than 2 percent from those of the 3 states with the lowest inflation levels (European Commission). More broadly said, the countries should not differ significantly in their interest rates. The database of real interest rate value from the IMF, unfortunately, does not contain the data for Cambodia and Lao, the states, which could be found missing in numerous databases. Nevertheless, we may look at the data for the remaining 8 countries. Figure 8 summarizes the development of interest rates in the 2010s.

**Figure 8**

*Interest rates of the ASEAN members in 2010-2019*



It seems that some of the states moved considerably away from the others in certain years. If we looked only at the founding five states, we would find their interest rate values to remain relatively close to each other for the whole period, mostly in the area between 0 and 5 percent. In the year 2019, the 7 of the states could be grouped into two groups – one containing Brunei, Indonesia, and Myanmar slightly below 10%, and the other composed of Malaysia, Philippines, Singapore, and Vietnam at around 5%, with Thailand being located approximately 2 percentage points below the latter group. While we do not have the data on Cambodia and Lao and while some countries seem to be turning into

outliers at times, the overall conclusion on interest rates could still be rather positive, with most states generally having similar rates and also seemingly following somewhat similar patterns in their rates' development in time.

## 6 Conclusion

The thesis' aim has been to evaluate whether a currency union could be a viable option for the ASEAN states. The primary method of this evaluation has been the model for deriving the OCA indexes developed by Bayoumi and Eichengreen (1996b), originally applied to monetary integration in Europe. The reestimation of the coefficients of the equation of this model using recent data from a database more focused on Asia and particularly Southeast Asia has led to a new equation. This equation, however, can be seen as problematic in certain regards. That is so because two of the estimated coefficients, specifically the ones concerning the similarity of business cycles and structures of exports, have been found to be statistically insignificant and unstable in their signs if the database is altered. Nevertheless, the other coefficients, concerning the trade between countries and the size of their economies, have been revealed as statistically significant, while also having their signs in line with the theory. Chiefly because of this and the fact that all the four coefficients have been estimated with the expected signs, this equation has been, despite its shortcomings, used for the derivation of the OCA indexes by a simple substitution of the corresponding values with the recent data.

The results of this process could be the basis for a rather negative verdict on the prospect of a single currency in the ASEAN, at least for now. Crucially, the indexes constructed vis-à-vis Indonesia, ASEAN's largest member, have not shown any of the pairs of countries as particularly suitable for a monetary union. These findings can thus be contrasted with older more optimistic conclusions about a common currency in Southeast Asia or wider regions of Asia-Pacific, such as those of the studies by Bayoumi, Eichengreen, and Mauro (2000), Madhur (2002), Ng (2002) or Lee, Park, and Shin (2003). On the other hand, they might be comparable with rather negative conclusions like those of the VAR-analysis-based studies of Kim (2007) or Bacha (2008). The OCA index for the pair between Malaysia and Singapore has a value suggesting significantly greater suitability for a common currency relative to the other studied pairs. While it should come as no surprise that particularly Malaysia and Singapore are identified as an ASEAN pair with a higher potential for a single currency, it is interesting that the thesis finds them to stand out in this regard, as other member's combinations, even those

including other original members, do not come close to the value between Malaysia and Singapore.

The scepticism about the idea of a single currency in the ASEAN could be further supported by the brief introductory look at the data for Southeast Asia, which has revealed that the countries of the region seem to be lacking compared to the Eurozone in intraregional trade and possibly also in labour mobility. The comparison with the Maastricht criteria has shown some problems too, however, it would not seem impossible for the ASEAN and even more so for its certain subgroups to meet such criteria.

As the literature on the OCA theory continues to extend and as the ASEAN continues its development, there is surely much space left for further research on this topic. If nothing else, it could still be essential to update the assessment with newer data. The results such as those of this thesis are also necessarily incomplete in that it is unclear if the adoption of a single currency could not lead to the states clearly meeting the criteria after the formation of a currency union. The topic of a hypothetical currency union in the ASEAN has been covered using various methods and there may always be a place for new approaches to the evaluation of this idea.

## Bibliography

- Alesina, A., & Barro, R. J. (2002). Currency unions. *The Quarterly Journal of Economics*, 117(2), 409-436.
- Alvarado, S. (2014). Analysis of the optimum currency area for ASEAN and ASEAN+3. *Journal of US-China Public Administration*, 11(12), 995-1004.
- Artis, M., & Ehrmann, M. (2000). The exchange rate—a shock-absorber or source of shocks? A study of four open economies. *Journal of International Money and Finance*, 25(6), 874-893.
- ASEAN. (n.d.). *The Founding of ASEAN*. Retrieved May 3, 2022, from <https://asean.org/about-asean/the-founding-of-asean/>
- Bacha, O. I. (2008). A common currency area for ASEAN? Issues and feasibility. *Applied Economics*, 40(4), 515-529.
- Bayoumi, T., & Eichengreen, B. (1992). Shocking aspects of European monetary unification.
- Bayoumi, T., & Eichengreen, B. (1993). One money or many? On analyzing the prospects for monetary unification in various parts of the world (No. 1554-2016-132533).
- Bayoumi, T., & Eichengreen, B. (1996a). Operationalizing the Theory of Optimum Currency Areas.
- Bayoumi, T., & Eichengreen, B. (1996b). Ever closer to heaven? An optimum-currency-area index for European countries.
- Bayoumi, T., & Eichengreen, B. (1996c). Is Asia an optimum currency area? Can it become one? Regional, global and historical perspectives on Asian monetary relations.
- Bayoumi, T., & Eichengreen, B. (1999). Operationalizing the theory of optimum currency areas. *Market integration, regionalism and the global economy*, 187-215.
- Bayoumi, T., Eichengreen, B., & Mauro, P. (2000). On regional monetary arrangements for ASEAN. *Journal of the Japanese and International Economies*, 14(2), 121-148.
- Canzoneri, M. B., Vallés Liberal, J. J., & Viñals, J. (1996). *Do exchange rates move to*

- address international macroeconomic imbalances?*. Banco de España. Servicio de Estudios.
- Cortinhas, C. (2007). Intra-industry trade and business cycles in ASEAN. *Applied Economics*, 39(7), 893-902.
- European Commission. (2019, April 26). *Convergence criteria for joining*. Retrieved May 3, 2022, from [https://ec.europa.eu/info/business-economy-euro/euro-area/enlargement-euro-area/convergence-criteria-joining\\_en](https://ec.europa.eu/info/business-economy-euro/euro-area/enlargement-euro-area/convergence-criteria-joining_en)
- European Commission. (n. d.). *The corrective arm/ excessive deficit procedure*. Retrieved May 1, 2022, from [https://ec.europa.eu/info/business-economy-euro/economic-and-fiscal-policy-coordination/eu-economic-governance-monitoring-prevention-correction/stability-and-growth-pact/corrective-arm-excessive-deficit-procedure\\_en](https://ec.europa.eu/info/business-economy-euro/economic-and-fiscal-policy-coordination/eu-economic-governance-monitoring-prevention-correction/stability-and-growth-pact/corrective-arm-excessive-deficit-procedure_en)
- European Commission. (2021). *Annual report on intra-EU labour mobility 2020*. European Website on Integration. Retrieved May 3, 2022, from [https://ec.europa.eu/migrant-integration/library-document/annual-report-intra-eu-labour-mobility-2020\\_en](https://ec.europa.eu/migrant-integration/library-document/annual-report-intra-eu-labour-mobility-2020_en)
- European Commission. (n.d.). *Glossary: Excessive deficit procedure (EDP)*. eurostat Statistics Explained. Retrieved May 3, 2022, from [https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Glossary%3AExcessive\\_deficit\\_procedure\\_%28EDP%29](https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Glossary%3AExcessive_deficit_procedure_%28EDP%29)
- Frankel, J. A., & Rose, A. K. (1998). The endogeneity of the optimum currency area criteria. *The economic journal*, 108(449), 1009-1025.
- Huang, Y., & Guo, F. (2006). Is currency union a feasible option in East Asia?: A multivariate structural VAR approach. *Research in international business and finance*, 20(1), 77-94.
- ILO. (2021). *Triangle in ASEAN quarterly briefing note*. Retrieved May 3, 2022, from [https://www.ilo.org/wcmsp5/groups/public/---asia/---ro-bangkok/documents/genericdocument/wcms\\_647658.pdf](https://www.ilo.org/wcmsp5/groups/public/---asia/---ro-bangkok/documents/genericdocument/wcms_647658.pdf)
- Kenen, P. B. (1969). The theory of optimum currency areas: an eclectic view. In *Essays in International Economics* (pp. 163-182). Princeton University Press.
- Kim, D. (2007). An East Asian currency union?: The empirical nature of macroeconomic shocks in East Asia. *Journal of Asian Economics*, 18(6), 847-866.



- Krugman, P. (2013). Revenge of the optimum currency area. *NBER macroeconomics annual*, 27(1), 439-448.
- Lee, J. W., Park, Y. C., & Shin, K. (2003). A currency union in East Asia. Available at SSRN 396260.
- Madhur, S. (2002). Costs and Benefits of a Common Currency for ASEAN.
- McKinnon, R. I. (1963). Optimum currency areas. *The American economic review*, 53(4), 717-725.
- Monetary Authority of Singapore. (n.d.). *Brunei-Singapore currency interchangeability agreement*. Retrieved April 14, 2022, from <https://www.mas.gov.sg/currency/Currency-Interchangeability-Agreement-between-Brunei-Darussalam-and-Singapore>
- Mundell, R. A. (1961). A theory of optimum currency areas. *The American economic review*, 51(4), 657-665.
- Ng, T. H. (2002). Should the Southeast Asian countries form a currency union?. *The Developing Economies*, 40(2), 113-134.
- World Bank. (2017.). *Indonesia's Global Workers* . Retrieved May 1, 2022, from <https://documents.worldbank.org/en/publication/documents-reports>

## Appendix A: The Summary of Regression (3) in 4.1

```
=====
                        Dependent variable:
                        -----
                                e
-----
y                                0.003
                                (0.047)

DISSIM                           0.0004
                                (0.003)

TRADE                             -0.133***
                                (0.043)

SIZE                               0.006***
                                (0.002)

Constant                          -0.040
                                (0.028)

-----
Observations                       105
R2                                 0.145
Adjusted R2                         0.110
Residual Std. Error      0.009 (df = 100)
F Statistic                4.229*** (df = 4; 100)
=====
Note:                *p<0.1; **p<0.05; ***p<0.01
```

Reference: Hlavac, Marek (2018). stargazer: Well-Formatted Regression and Summary Statistics Tables.  
R package version 5.2.2. <https://CRAN.R-project.org/package=stargazer>

## Appendix B: The Dataset for Regression (3) in 4.1

i	j	e	y	DISSIM	TRADE	SIZE
Australia	Canada	0,02160208	0,00799143	0,6281188	0,00101532	12,1567457
Australia	China	0,03489386	0,05830943	1,23334677	0,02971759	12,5747409
Australia	Hong Kong	0,03898006	0,00523857	0,73234815	0,00328817	11,804078
Australia	India	0,03115929	0,05315419	0,85251816	0,00471644	12,216614
Australia	Indonesia	0,02610081	0,03312813	0,62076673	0,00424616	12,0237891
Australia	Japan	0,03404529	0,0204421	1,17984802	0,01559969	12,3845002
Australia	Malaysia	0,02335639	0,0320628	0,8550412	0,01541171	11,7954794
Australia	Philippines	0,02605438	0,04873658	0,96072453	0,00156874	11,79986
Australia	Singapore	0,02099559	0,01661144	1,01509599	0,01830922	11,8012886
Australia	South Korea	0,03148711	0,00476799	1,17863261	0,00976732	12,1420786
Australia	Thailand	0,02242509	0,00917591	0,9477207	0,01405967	11,8628161
Australia	United Kingdom	0,0470493	0,00724632	0,92408246	0,00319406	12,2946092
Australia	United States	0,03856285	0,0051644	0,82548108	0,00406758	12,6896318
Australia	Vietnam	0,04353411	0,04599862	0,99600208	0,01100347	11,7003376
Canada	China	0,03153424	0,06575749	0,60709625	0,00769565	12,6067624
Canada	Hong Kong	0,03476696	0,00861432	0,35996344	0,00130855	11,8360995
Canada	India	0,03315483	0,06061575	0,22924959	0,00156352	12,2486355
Canada	Indonesia	0,03162921	0,04058492	0,16425005	0,00115449	12,0558105
Canada	Japan	0,04318062	0,01353847	0,55359749	0,00398387	12,4165217
Canada	Malaysia	0,018243	0,03948769	0,23627083	0,00361885	11,8275008
Canada	Philippines	0,02712654	0,056173	0,33473856	0,00197436	11,8318814
Canada	Singapore	0,01975641	0,02397087	0,38884547	0,00201816	11,8333101
Canada	South Korea	0,02683086	0,01197061	0,55238208	0,00351354	12,1741
Canada	Thailand	0,01902319	0,01642211	0,34022069	0,00326102	11,8948376
Canada	United Kingdom	0,0421368	0,00481407	0,29783193	0,00576675	12,3266306
Canada	United States	0,0345317	0,00510158	0,19923055	0,10216623	12,7216533
Canada	Vietnam	0,03665441	0,0532763	0,38586767	0,00742046	11,7323591
China	Hong Kong	0,02089399	0,05925231	0,50695971	0,03765549	12,2540948
China	India	0,03593867	0,00993159	0,38082861	0,00698006	12,6666308
China	Indonesia	0,04180304	0,02524143	0,75016034	0,0165445	12,4738058
China	Japan	0,04752892	0,07864359	0,09546616	0,02307248	12,8345169
China	Malaysia	0,03227485	0,02649431	0,38813333	0,09323476	12,2454961
China	Philippines	0,02326587	0,01203723	0,27262225	0,03376589	12,2498767
China	Singapore	0,02039175	0,04225485	0,22911704	0,04973411	12,2513053
China	South Korea	0,01803451	0,05410863	0,08740285	0,06477728	12,5920953
China	Thailand	0,03018311	0,05075634	0,31056117	0,04844562	12,3128328
China	United Kingdom	0,02300992	0,06468892	0,30926431	0,00602637	12,7446259

China	United States	0,02029848	0,06244878	0,40786569	0,02277558	13,1396486
China	Vietnam	0,02730025	0,01492481	0,29470321	0,07857464	12,1503543
Hong Kong	India	0,03114748	0,05404577	0,38872043	0,02591136	11,8959679
Hong Kong	Indonesia	0,03615301	0,03436719	0,41471191	0,00669792	11,7031429
Hong Kong	Japan	0,04268295	0,02004971	0,47155552	0,03208875	12,0638541
Hong Kong	Malaysia	0,03983545	0,03322148	0,40426727	0,02840485	11,4748332
Hong Kong	Philippines	0,02143552	0,04996297	0,41146176	0,018808	11,4792138
Hong Kong	Singapore	0,02392001	0,01724587	0,38293723	0,07161447	11,4806425
Hong Kong	South Korea	0,02621157	0,00678551	0,46522981	0,02206747	11,8214324
Hong Kong	Thailand	0,02919941	0,01186103	0,47700571	0,02784022	11,54217
Hong Kong	United Kingdom	0,03357773	0,00781033	0,36570141	0,01544475	11,973963
Hong Kong	United States	0,00153493	0,0070748	0,40045948	0,07413093	12,3689857
Hong Kong	Vietnam	0,01260473	0,04727325	0,45530013	0,02911473	11,3796915
India	Indonesia	0,03397304	0,02095798	0,36933173	0,00887249	12,1156789
India	Japan	0,0438467	0,07320757	0,32732986	0,00230786	12,4763901
India	Malaysia	0,03551811	0,02147948	0,04421569	0,01618638	11,8873692
India	Philippines	0,02870937	0,00608308	0,16342918	0,00118563	11,8917498
India	Singapore	0,0249018	0,03780114	0,16257783	0,01673326	11,8931785
India	South Korea	0,02998682	0,04878705	0,32611445	0,00577193	12,2339684
India	Thailand	0,02052907	0,0455323	0,12985267	0,00772542	11,954706
India	United Kingdom	0,04297203	0,05907827	0,07927046	0,00314546	12,386499
India	United States	0,03052164	0,05690704	0,06866339	0,01012665	12,7815217
India	Vietnam	0,02760882	0,00943075	0,16915676	0,00997658	11,7922275
Indonesia	Japan	0,02944678	0,05348725	0,69666158	0,01405092	12,2835651
Indonesia	Malaysia	0,03773536	0,00256209	0,36202701	0,0204162	11,6945442
Indonesia	Philippines	0,02942957	0,01627724	0,48124499	0,00388684	11,6989248
Indonesia	Singapore	0,03321684	0,01753505	0,53190956	0,04222402	11,7003535
Indonesia	South Korea	0,04398501	0,02895202	0,69544618	0,00921229	12,0411435
Indonesia	Thailand	0,02674195	0,02568026	0,43992661	0,01458974	11,761881
Indonesia	United Kingdom	0,05506132	0,03956375	0,44089603	0,00104559	12,193674
Indonesia	United States	0,03617542	0,03726153	0,34229465	0,00910956	12,5886967
Indonesia	Vietnam	0,04121083	0,01385364	0,47371843	0,0093202	11,5994025
Japan	Malaysia	0,04636023	0,05234243	0,33691828	0,03960857	12,0552554
Japan	Philippines	0,0423051	0,06890835	0,21912349	0,01719942	12,059636
Japan	Singapore	0,03960208	0,03669992	0,19438876	0,01535621	12,0610646
Japan	South Korea	0,04978082	0,02463704	0,02803369	0,0163959	12,4018546
Japan	Thailand	0,03883108	0,02869712	0,28056076	0,0300371	12,1225921
Japan	United Kingdom	0,05941568	0,01430045	0,25576556	0,00251363	12,5543852
Japan	United States	0,04233966	0,01658664	0,35436694	0,0147768	12,9494079
Japan	Vietnam	0,05011962	0,06616548	0,26718267	0,0427358	11,9601136
Malaysia	Philippines	0,02952565	0,0169872	0,18341014	0,00910946	11,4706151

Malaysia	Singapore	0,01945703	0,01672434	0,16988255	0,08468177	11,4720438
Malaysia	South Korea	0,02730216	0,027787	0,33365031	0,01514635	11,8128337
Malaysia	Thailand	0,01861958	0,02466646	0,12377626	0,03245475	11,5335713
Malaysia	United Kingdom	0,04063712	0,03830927	0,09462424	0,0039176	11,9653643
Malaysia	United States	0,03927095	0,03603821	0,06104473	0,03214256	12,360387
Malaysia	Vietnam	0,04137331	0,01450358	0,16665992	0,02073707	11,3710928
Philippines	Singapore	0,01593673	0,03352289	0,20355937	0,01657724	11,4764244
Philippines	South Korea	0,02539035	0,0444711	0,21790808	0,00689268	11,8172143
Philippines	Thailand	0,02083824	0,04090192	0,16994748	0,00994662	11,5379519
Philippines	United Kingdom	0,03283037	0,05485488	0,15487129	0,0009424	11,9697449
Philippines	United States	0,02172909	0,05256741	0,20425917	0,01521878	12,3647676
Philippines	Vietnam	0,02634385	0,00491053	0,14163786	0,00611008	11,3754734
Singapore	South Korea	0,01500572	0,01273561	0,18414728	0,0319239	11,818643
Singapore	Thailand	0,01511841	0,01107551	0,13662306	0,0342404	11,5393805
Singapore	United Kingdom	0,03071593	0,02322401	0,09101353	0,00880223	11,9711736
Singapore	United States	0,02336164	0,02117346	0,18961491	0,04076479	12,3661963
Singapore	Vietnam	0,02671665	0,03103119	0,18349034	0,02515054	11,376902
South Korea	Thailand	0,02638766	0,00688314	0,27031928	0,00869383	11,8801705
South Korea	United Kingdom	0,02609748	0,01073831	0,25455015	0,00314129	12,3119635
South Korea	United States	0,02536884	0,00856965	0,35315153	0,02379365	12,7069862
South Korea	Vietnam	0,02638464	0,04166727	0,25694118	0,03608808	11,717692
Thailand	United Kingdom	0,03830717	0,01566886	0,14517089	0,00506085	12,0327011
Thailand	United States	0,02878602	0,01310108	0,16930403	0,02925181	12,4277238
Thailand	Vietnam	0,02928894	0,03821639	0,09085632	0,02000839	11,4384295
United Kingdom	United States	0,03335819	0,00316053	0,11436066	0,01318535	12,8595168
United Kingdom	Vietnam	0,03496018	0,05208681	0,18823516	0,01186451	11,8702226
United States	Vietnam	0,01244551	0,04970753	0,20952748	0,09159379	12,2652453