

An Application of the Theory of Optimum Currency Areas to the Euro Area

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Abstract

This paper examines the theory of optimum currency areas (OCA) and applies it to the Euro area. The theory of OCA consists of seven main criteria, which are labor and factor mobility, price and wage flexibility, similar inflation rates, fiscal integration, a high degree of production diversification, political integration and economic openness. The main objective is to analyze the degree of fulfillment of the criteria of the OCA theory by the Euro zone. Based on the data of the Euro area, I find that there is price and wage flexibility, a high degree of production diversification and economic openness. Further, the results show a low labor and factor mobility, varying inflation rates, a low level of fiscal integration and limited political integration. Therefore, the Euro area fulfills only some of the OCA criteria, while others remain unrealized. Hence, the Euro area is not an optimum currency area based on the main criteria of the OCA theory. This research paper enlarges the understanding of the theory of OCA and its application to the Euro zone. Furthermore, it points out implications on how economists and politicians may further integrate and develop the Euro area in order to become an optimum currency area in the future, which can absorb economic shocks.

KEYWORDS: Optimum currency areas, Euro, Monetary policy, European Central Bank, Monetary integration

1 INTRODUCTION

Economic integration is the development of countries in the same region adopting a unified monetary union. The integration must be more than two countries with an agreement to bring the economies of each participating country together. Economic integration leads to more cooperation among European countries (Mihi-Ramirez et. al, 2022). In addition, the economic system that must be linked has also removed restrictions and regulations on trade and payment practices in international transactions. The main objective of economic integration is to create competitiveness in the global arena because free trade and production will reduce the cost of production and international transactions. According to Bertasiute et. al (2020), economic integration is essential for the stability of a currency union. Furthermore, economic integration creates great flexibility for member states as more countries open. For example, labor can move freely, resulting in the production of goods that are well distributed among the member states. Campos et. al (2019) found that an EU membership can lead to large economic growth. However, economic integration is not easy to establish or manage and is difficult to avoid when various economic crises arise. Although economic integration

brings many benefits, countries that agree to combine their economies may have to pay high costs because those countries must deactivate their local currency and use the single currency area.

The Euro area is the economic integration of countries in the same region. The Euro was introduced for the members of the European Union (EU) in 1999. At the time of its introduction, 11 member states agreed to share the same economic foundation and currency by participating in the euro area. In 2022, there are 27 European Union member states and 19 states participate in the Euro area. The eurozone consists of Latvia, Lithuania, Greece, Italy, Malta, the Netherlands, Finland, Slovenia, Austria, Estonia, Portugal, Ireland, Spain, Cyprus, Luxembourg, Slovakia, Belgium, France, and Germany. After the end of the unique currencies of those countries, the eurozone has a policy for member states to adjust. In addition, the eurozone has set an exchange rate to allow member states to convert their local currency into the euro. After that, all countries must use the single currency as member countries must have the same monetary policy. The use of the single currency requires the alignment of monetary policy and of the economic system. Therefore, the European Central Bank (ECB) was established to keep inflation under control and manage the functions of the single currency system, such as the exchange rates and interest rates of the countries in the Eurozone. Europe was the first continent to use the single currency system. Padilla (2020) found that the productivity growth of countries which joined the Euro was higher than of countries which kept their own currency. The use of different currencies in production, trading and marketing in various fields is complex and difficult in processes of conducting transactions between countries on the same continent due to the use of different currencies. Economic integration into the eurozone has greatly simplified the process and implementation of policies in countries on the same continent. Moreover, the contribution of the single currency has resulted in an increase in international trade due to the simplification of the transaction process and the reduction in the cost of multiple transactions. On the other hand, a common currency results in a loss of independence of monetary policy (Goczek & Mycielska, 2019).

The Optimum Currency Areas (OCA) theory is used to analyze economic integration. Economists have been particularly interested in the Optimum Currency Areas theory. This theory was proposed by Mundell (1961) and obtained further development by McKinnon (1963) and Kenen (1969). The optimum currency area theory provides a group of criteria to analyze a country's suitability for membership in the single currency area. According to Mundell and other economists, there are seven main criteria, consisting of the first, factor mobility and labor mobility. Workers are free to move between member states, including the physical ability to travel, such as visas. Labor and other production factors can flow freely (Eichengreen, 1998). The second is price and wage flexibility. This ensures that labor and capital are distributed among all members of the euro zone, leading to an ease of the impact of economic shocks. The third is the similar inflation rates. If member states in the euro zone have similar inflation rates, it will help the ECB to cope with fluctuating exchange rates, as well as be able to foster growth. The fourth is fiscal integration to share risks between members in the Optimum Currency Area. Member states in the euro zone share the risks when a euro zone member state suffers from financial and economic crises. The fifth, political integration, having similar intentions in political views in each member state, including similar intentions in applying the same monetary policy. The sixth is the degree of diversifi-

cation in production and export. This criterion means the more risks are diversified outside the euro zone countries, the lower the risk of fluctuating trade conditions in the Euro area. The last important criterion is the degree of economic openness. Economic openness means more financial and economic openness (trade) and will result in stronger financial growth. Beck (2021) stated that labor mobility is one of the main criteria and found that the European Union is improving to become an OCA. Countries with higher factor mobility can gain from a currency area, but the Euro area does not perfectly realize this mobility (Akalpler, 2020). Nanovsky (2022) concluded that the core Euro area countries fit the Euro based on the OCA theory.

2 RESEARCH OBJECTIVES

The paper focuses on three main objectives, consisting of the study of assessing whether the euro area is an optimum currency area and explaining the theory and criteria of the OCA. This research describes the background and origins of the OCA theory. The study of the theory gives a background on how this theory is useful and what factors create benefits in the fields of trade, labor, and production. Additionally, this paper studies and clarifies the criteria that make the euro area an optimum currency area to use the single currency. The OCA theory has created and established criteria for regions interested in economic and monetary integration in order to study whether each country is suitable for a single currency area. This research begins with describing and analyzing the OCA theory. Further, it describes and assesses the criteria of the optimum currency area theory. Moreover, the paper examines whether the euro area is an optimum currency area by analyzing the criteria of the OCA theory. Hence, this research fills the gaps in the study of the theory of optimum currency areas by using new approaches and new data in order to analyze whether the Euro area is an optimum currency area. The paper contributes to the existing literature by analyzing whether the Euro area fulfills all criteria given by the OCA theory. There are three important objectives:

1. To describe the optimum currency area theory as a whole.
2. To describe the seven criteria of the optimum currency area theory in detail.
3. To examine whether the Euro area is an optimum currency area.

Although economic integration by the usage of a single currency area has many benefits, it cannot be achieved easily. Therefore, it is necessary to study the criteria of theory and its fulfillment by the Euro area. There are seven main criteria of the OCA theory. It is important to describe and explain the OCA theory and its criteria first. It gives the essential foundation. Then, the theory and criteria can be applied to the Euro area in order to examine whether the Euro area can be considered as an OCA. The application of the OCA theory to the Euro area is the analysis of the degree of fulfillment of the criteria by the Euro zone. The theory is applied to the data of the Euro area. The main research question is whether the Euro area fulfills the criteria of the optimum currency area theory.

"Does the Euro area fulfill the criteria of the Optimum Currency Area theory?"

3 LITERATURE REVIEW

3.1 The Theory of Optimum Currency Areas

The Theory of Optimum Currency Areas was an idea invented by Mundell (1961), which was later developed and enhanced by McKinnon (1963) and Kenen (1969). This theory addresses the benefit of the incorporation of members into a currency union. Members of the currency union must also undertake membership considerations prior to inclusion, which include balancing the loss of economic independence and having the ability to optimize monetary efficiencies when dealing with greater competition (Coenen, 2013). The Stability and Growth Pact (SGP) is a multilateral agreement that aims to maintain economic stability. It helps to ensure that all countries in the Eurozone adhere to the agreed-upon treaty conditions, and to bring the economies of all countries that will join the Eurozone together prior to the introduction of the common currency (Hafner and Jager, 2012). As the result from Fururter (2012) clarify that these goals are intended to help Eurozone members improve their economies, although some members breach the rules or the SGP. Mongelli (2002) described an optimum currency area as a region of a single currency or of several currencies, where the exchange rates are fixed.

3.1.1 Mundell

Economists who stressed the relevance of factor and labor mobility requirements embraced Robert Mundell's OCA theory, which was first proposed in 1961. The major one is labor mobility, which Mundell provides as a criterion for determining the suitability of labor. The labor movement will be streamlined, resulting in lower unemployment and inflation protection in nations with lower demand. However, member regions are satisfied with using a common monetary policy, leading to the need for their own exchange rate. The OCA theory has been debated by Mundell, who argues that inflation is a way to address unemployment when the exchange rate system causes unemployment within each region. If there is a stable and flexible exchange rate with foreign countries, this will result in a high level of labor migration and other factors in the region. Mundell has hypothesized for consideration that those regions tend to form a common currency area. In conclusion, when a region encounters a supply or demand imbalance problem, member states will respond and help effectively. Additionally, Mundell argues that labor mobility can be balanced during times of economic imbalance. In 1973, Mundell (1973), supported and developed mobility factors. Regional countries would not experience large asymmetric shocks if factors and labor can move freely across countries.

3.1.2 McKinnon

McKinnon (1963) was the second protagonist of the OCA theory to emphasize and develop the theory into a critical criterion by increasing the level of openness in the economy. This is a crucial criterion for clarifying the theory that domestic production and consumption are split into tradable and non-tradable goods. Therefore, an open economy would be of great benefit to forming a monetary union. Similarly, a closed economy that does not join the currency zone is less useful. He also argues that the more open an economy is, the more volatile the exchange rate becomes. In a closed economy, the use of flexible exchange rates has a greater advantage. For economies with higher levels of openness, it is more likely that

foreign trading prices will be directed at the higher cost of living in the country. Furthermore, economic fluctuations and exchange rate changes have a significant impact on goods and the price at which they can be traded. Moreover, smaller open economies benefit more when joining the currency area because smaller open economies have balance of payments issues. To counter this problem, McKinnon suggested that smaller open economies should rely more on fiscal policy to adjust.

3.1.3 Kenen

In 1969, Kenen (1969) was the last person to contribute to the traditional OCA criteria. Kenen has supported three OCA criteria, which consist of production diversification, financial integration, and similar inflation rates. Production diversification is a new criterion for determining a fixed and flexible exchange rate. He also stated that production diversity will result in increased exports. Furthermore, if the country does not have diversified products, it will cause low export demand, resulting in lower export income. This problem can be mitigated by using flexible exchange rates. When a country's economy suffers a negative shock, the need to change the mechanism may be eliminated if the country's domestic industry suffers a positive shock. Therefore, a highly diversified economy is a better option for economically integrated areas. The second is that financial integration is an important criterion for determining suitability. Monetary policy oversees balancing inequalities and reducing regional disparities, resulting in successful economic integration. Finally, the similar inflation rates are similar between the two or more countries. The reason for this criterion is to reduce future conflicts that may arise due to different economic structures. Some regions experience inflation or deflation, forcing the local regions to bear the inevitable risks of helping each other.

3.2 The criteria of the optimum currency areas theory

3.2.1 Labor mobility and factor mobility (Mundell 1961)

Mundell (1961) stated that labor and factor mobility is an integral feature of optimum currency areas. This criterion is a key consideration in determining a country's suitability to join the Eurozone. The principal stabilization between monetary unions can be maintained via factors and labor mobility (Kunroo, 2015). This provides workers the option to change production plans or even relocate, in addition to having an integrated labor market. Labor and factors mobility is the main mechanism by which monetary unions need the physical ability to travel for both labor rights and visas (Kenen, 1969). In addition, the languages of different monetary unions lack cultural barriers to free movement. Mundell stressed that migration could help to stabilize. When a country experiences a negative shock, overall productivity falls, resulting in increased unemployment. If immigration is simple to implement, it will allow unemployed employees to relocate to member nations, resulting in lower unemployment (Mundell, 1961). The results of the studies show that labor mobility and the movement of factors are low.

3.2.2 Price and wage flexibility (Friedman 1953)

It is known that the price flexibility is relatively lower in countries in Europe. The OECD and EU Commission found that there were several factors that hinder price flexibility. For instance, Eppler, Anders, and Tuntschew (2016) suggested that market competition and hence price flexibility is quite low. Furthermore, previous research stated that the key factor that leads to low price flexibility is low wage flexibility. Product market reforms can be utilized to loosen restrictive employee protection legislation, allowing for more competition and timely price adjustments (Friedman, 1953).

3.2.3 Similar inflation rates (Fleming 1971)

According to the paper by Koziara (2013), the similarity in inflation rates of monetary union countries is a criterion that is strongly emphasized by the OCA theory. Previous research has suggested that economic integration challenges are influenced by some differences in macroeconomic variables. Previous research has shown that some regions may face low inflation and high levels of unemployment, which the region would not consider a problem as they favor short-term increases in unemployment in exchange for economic growth. However, when economic downturns occur, those regions will maintain stability by adjusting monetary policy and supporting accelerated inflation. The terms of trade are stable when the level of inflation is in the same direction during the same period (Fleming, 1971). Inflation is increasing and falling due to high short-term unemployment in return for strong economic development in their respective regions.

3.2.4 Fiscal integration (Petreski 2007)

Petreski (2007) argues that fiscal integration is another important criterion. If the monetary integration is followed by an integration of the fiscal transfer system, then the need for exchange rate adjustment is reduced. Fiscal integration is a criterion that is emphasized and supported in the euro area, where fiscal stability is maintained and income distribution among monetary union countries, including taxes and transfers, is improved. In addition, monetary convergence can help reduce the vulnerability of monetary unions to individual member states. Financial integration often arises from the distribution of income or taxes to developed countries. Since high-income countries do not want to distribute their income to those areas, this policy is difficult to implement. Furthermore, financial integration through the allocation of international income is required to be an appropriate environment for a single currency.

However, this reform does not appear to be happening due to the lack of federal fiscal support in the euro areas. As a result of Alesina and Barro (2002), financial integration through income distribution is not in the euro area's future. Instead of focusing on income equality, the eurozone needs to develop new ways to improve ideas and face new macroeconomic stability. Regardless, this would necessitate a high level of political integration and full compliance with risk-sharing conditions (Handler, 2013). Aizenman (2018) stated that financial integration is important for currency unions, but unions with low financial integration of the members may be more stable.

3.2.5 Degree of production diversification (Kenen 1969)

According to Kenen (1969), most countries have a high level of diversification in production. The gap between regional production structures is far bigger in EU countries than in the United States in the manufacturing sector. This includes the diversification of the productive structure of each country. In addition, the fact that the variance in the composition of output in the United States is found to be two times larger than in Europe. Furthermore, the degree of similarity in the structure of consumption is determined across European countries, including Germany, France, Italy, and Spain. The euro area average is used as the benchmark in the European countries. As a result, it is found that most countries in Europe share a high level of similarities with one another. Moreover, there was an increase in similarity in the structure of consumption among the countries (Handler, 2013).

3.2.6 Political integration (Haberler 1970)

Another important criterion for OCA theory is to be a suitable area for economic integration and a single currency in the euro area. Previous studies have shown that the eurozone is behind in terms of political integration. Political integration has been operationalized in a variety of ways. De Lucia (2011) counted the number of policy decisions made at the national and European levels to measure the level of integration. A successful currency must have an acceptable level of compatibility to fulfill growth, reduce unemployment, and to trade between countries. Political integration will help to strengthen this growth. Policymakers must exchange goals to succeed (Kozziara, 2013). Tower and Willet (1976) stated that a successful currency area needs a reasonable degree of compatibility towards growth, inflation and unemployment by policy-makers.

3.2.7 Degree of economic openness (McKinnon 1963)

The OCA theory highlights economic openness as a critical component in assessing whether a country should join the monetary union. A country can combine a strong and stable economy only when its economy is very open to nations. In addition, economic openness requires a fixed exchange rate to benefit more than a flexible exchange rate. In fact, in the case of intensive trade, there is no longer any need to distinguish between foreign and local items, since competition will eventually equalize the absolute and relative prices of tradable commodities sooner or later. The rule of one price is the term used to describe this occurrence (Crowley, 2013). McKinnon (1963) distinguished between tradable and non-tradable commodities in his model of the economy. Whereas the domestic prices of the former are strongly connected to the level of the international price, there is no such strong connection between the domestic prices of the latter. The impact of a devaluation, according to his premise, can never be considered insignificant in an open economy. In the case of tradable commodities, local prices will rapidly catch up with the levels of international prices. There is no such automatism in place for non-tradable commodities, or it takes a significantly longer period for the prices of non-tradable goods to stabilize. According to McKinnon (1963), the imbalance can only be repaired if the deficit country is ready to restrict its own domestic absorption of foreign capital. The greater the degree of openness, the greater the speed with which foreign prices are transmitted to the local financial scene. As a result, the exchange rate becomes less helpful

during the adjustment procedure (Geza and Vasilescu, 2011).

3.2.8 The Euro Area as an Optimum Currency Area

Most of the literature comes to the same conclusion: The Euro area is not an Optimum Currency Area. According to the paper by Koziara (2013), labor and factor mobility in the euro area are relatively low. The impact may be due to several factors, such as differences in consumption, language, livelihood, and culture, among others. Furthermore, he also emphasized that the price and wage thresholds are very flexible in the euro area. However, the euro area has a very low rate of labor mobility between monetary unions and there is instability in prices and wages. Labor mobility is significantly influenced by variable and flexible labor costs. Later, Baldwin and Wyplosz (2006) argued that the euro area was not a suitable monetary region due to its radical differences in inflation rates, and fiscal integration was limited, such as the transfer of limited financial resources. In addition, Bartusková (2013) clarified and supported the two criteria that are fulfilled by the euro area, consisting of economic openness and diversification in production. Petreski (2007) found out that the Eurozone is not an optimum currency area. Efforts are needed on several fronts to attain an optimal solution for every OCA criterion. He clarified that wages are fixed, labor mobility is low, and little is done to improve fiscal integration and political integration. Koziara (2013) argued that the Euro area should improve monetary policy to develop into a more integrated economic region. According to Koziara (2013), the euro area is not an OCA. Lane (2006) stated the Euro area lacks fiscal transfer mechanisms and there is not enough symmetry between growth and inflation between its members for a single monetary policy to work. Crowley (2013) stressed that the productivity gap and the imbalance between member economies have been highly disadvantageous. According to several studies, the Eurozone does not meet the criteria to adopt the same currency. McKinnon (2002) stated that the European monetary union with a single currency has significant macroeconomic risks. Chari, et. al (2020) argued that countries with similar shocks should form monetary unions. Previous research conclude that the euro area does not meet the OCA conditions (Krugman (2012), Pisani-Ferry (2013) and Gibson et al. (2014)).

Based on the seven main criteria and the existing literature, I can derive the following hypotheses.

Hypothesis 1: Labor and factor mobility is low in the Euro area.

Hypothesis 2: Price and wage flexibility is high in the Euro area.

Hypothesis 3: Inflation rates differ across countries in the Euro area.

Hypothesis 4: The degree of fiscal integration is low in the Euro area.

Hypothesis 5: The degree of production diversification is high in the Euro area.

Hypothesis 6: Political integration is low in the Euro area.

Hypothesis 7: The degree of economic openness is high in the Euro area.

4 RESEARCH METHODOLOGY

This paper collects and analyzes monthly and yearly data of the Euro area for the past years. Specific data is collected for each hypothesis. Specific methods are used for each hypothesis. Multiple regressions, graphs and tables are used to analyze the data and to

test the hypotheses. The data source is the Thomson Reuters Datastream, Eurostat and the European Central Bank database. The data is statistically analyzed using SPSS 28 and STATA.

Labor mobility and factor mobility is the first hypothesis. The data used is the total number and percentage of EU foreigners living in the Euro area. The total number of immigrants residing in the euro area and the percentages of European and foreigners living in the euro area was used to collect annual data. I use this data as it demonstrates labor mobility. The second hypothesis is that *prices and wages* are flexible. This study uses monthly data of unemployment rates and wages of the Euro area from 2001 to 2020. If wages are flexible, then they should adjust to changing unemployment rates. Furthermore, the *similarity in inflation rates* will be used to determine overall and percentage inflation rates across countries in the euro area. Overall inflation rates of each country in Euro area between 2010 and 2021 are used. The fourth hypothesis is the *fiscal integration*. The data used is divided into comparisons and studies from percentages of GDP in general government debt between 2000 and 2020. Government spending in each country will show that fiscal integration has been successful. The data used for *production diversification* is the overall of exports and import for different categories of production in Euro area trade. The data used is a monthly frequency data collection with the most recent data showing for the 2000 and 2021. The trade data shows the diversification of the production of goods for import and export. The hypothesis *political integration* is not tested by data as there is no proper data available. The degree of *economic openness* is examined by data of intra and extra EU of export goods in 2020 in the form of percentages of each country in the euro area. If imports/exports between Euro countries are large, it can be concluded that the Euro area has a lot of internal trade, leading to an open economy.

5 RESULTS

5.1 Hypothesis 1:

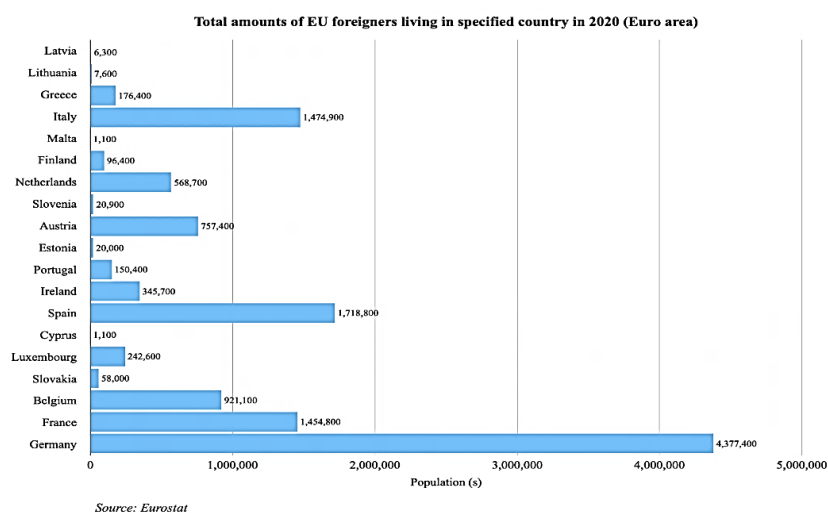
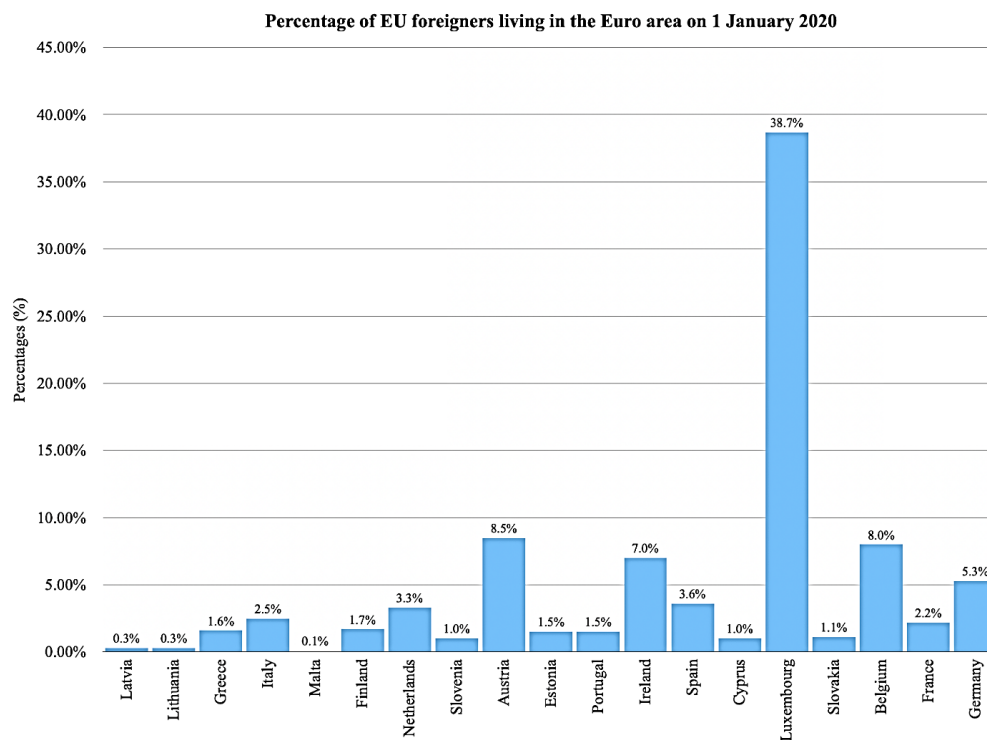


Figure 1: The overall number of EU foreigners living in the euro area in 2020
 Source: Eurostat

The first hypothesis is the labor mobility. In general, labor mobility across Euro countries is limited, resulting in high unemployment in some Euro nations, as well as adjustment difficulties to economic shocks.

The first figure shows that Germany is the country with the largest number of EU foreigners in the euro area. In 2020, a total of 4,377,400 EU foreigners migrated to Germany. Other countries have few EU foreigners such as Latvia, Lithuania, Estonia, Slovenia, Slovakia, and Finland. This demonstrates the inconsistency.



Source: Eurostat

Figure 2: Percentages of EU foreigners living in the euro area in 2020
Source: Eurostat

Figure 2 shows the percentages of EU foreigners compared to the total population. Only five of the 19 countries in the euro area have a percentage greater than 5 percent. From the data shown in graphs 1 and 2, it is clear that labor mobility and factors mobility in the euro area are relatively low. As a result, it is seen that the factor mobility and labor mobility criteria are not fulfilled by the EU area because, in theory, the labor mobility within the OCA should allow European workers to move from one country to another to reduce unemployment in countries with high unemployment rates and to provide a new labor force in countries with low unemployment rates.

5.2 Hypothesis 2:

The second hypothesis is the price and wage flexibility. I use monthly data of unemployment rates and wages of the Euro area. If wages are flexible, then they should adjust to

changing unemployment rates. It is tested by the following regression.

$$w_t = \alpha + 1u_t + t \quad (1)$$

where

w_t is the monthly wage in month t

u_t is the monthly unemployment rate in month t

and t is the error term for month t.

Table 1: Regression of wages against unemployment rates

Regression Statistics	
Multiple R	0.6100
R Square	0.4325
Adjusted R Square	0.4032
Standard Error	0.3170
Observations	240

	Coefficients	Standard Error	t Stat	P-value
Intercept	-1.1450***	0.1689	-3.2433	0.0019
Unemployment rate	-0.7483***	0.1164	-2.9613	0.0044

*, **, *** indicate that the coefficient is statistically significant at 10%, 5% and 1% levels, respectively.

The tables above show the relation between unemployment rates and wages. R square of 0.4325 tells that unemployment can explain about 43% of the wages. The P-value is lower than 0.01, so the coefficient is statistically significant. The data shows a significant negative relation between unemployment rates and wages. The results show that increasing unemployment rates lead to decreasing wages. If unemployment is high, employees accept lower wages and firms can pay lower wages. The data indicates that wages adjust to changing unemployment rates, i.e. wages are relatively flexible in the Euro area. The euro area fulfills the criterion of wage and price flexibility.

5.3 Hypothesis 3:

The third hypothesis is the test of the inflation rates. The following table shows the inflation rates across countries for 12 years.

Similar inflation rates is the criterion that the Optimum Currency Area attaches great importance to the fact that the monetary unions of different countries are similar to inflation rates. The similarity in inflation rates is strongly emphasized in OCA theory. In table 2, the inflation rates from 2010 to 2021 show that there are significant differences between the Euro countries. Furthermore, the individual inflation rates differ significantly from the overall Euro area inflation rate. Based on the data, it can be concluded that the similar inflation rate criterion is not fulfilled by the Euro area, as the euro area experiences very unstable and different inflation rates from year to year and from country to country in the Euro zone.

Table 2: Inflation rates in percent of each country in the Euro area and of the Euro area

Country	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Euro area	1.6	2.7	2.5	1.3	0.4	0.2	0.2	1.5	1.8	1.2	0.3	2.6
Belgium	2.3	3.4	2.6	1.2	0.5	0.6	1.8	2.2	2.3	1.2	0.4	3.2
Germany	1.1	2.5	2.2	1.6	0.8	0.7	0.4	1.7	1.9	1.4	0.4	3.2
Estonia	2.7	5.1	4.2	3.2	0.5	0.1	0.8	3.7	3.4	2.3	-0.6	4.5
Ireland	-1.6	1.2	1.9	0.5	0.3	0.0	-0.2	0.3	0.7	0.9	-0.5	2.4
Greece	4.7	3.1	1.0	-0.9	-1.4	-1.1	0.0	1.1	0.8	0.5	-1.3	0.6
Spain	2.0	3.0	2.4	1.5	-0.2	-0.6	-0.3	2.0	1.7	0.8	-0.3	3.0
France	1.7	2.3	2.2	1.0	0.6	0.1	0.3	1.2	2.1	1.3	0.5	2.1
Italy	1.6	2.9	3.3	1.2	0.2	0.1	-0.1	1.3	1.2	0.6	-0.1	1.9
Cyprus	2.6	3.5	3.1	0.4	-0.3	-1.5	-1.2	0.7	0.8	0.5	-1.1	2.3
Latvia	-1.2	4.2	2.3	0.0	0.7	0.2	0.1	2.9	2.6	2.7	0.1	3.2
Lithuania	1.2	4.1	3.2	1.2	0.2	-0.7	0.7	3.7	2.5	2.2	1.1	4.6
Luxembourg	2.8	3.7	2.9	1.7	0.7	0.1	0.0	2.1	2.0	1.6	0.0	3.5
Malta	2.0	2.5	3.2	1.0	0.8	1.2	0.9	1.3	1.7	1.5	0.8	0.7
Netherlands	0.9	2.5	2.8	2.6	0.3	0.2	0.1	1.3	1.6	2.7	1.1	2.8
Austria	1.7	3.6	2.6	2.1	1.5	0.8	1.0	2.2	2.1	1.5	1.4	2.8
Portugal	1.4	3.6	2.8	0.4	-0.2	0.5	0.6	1.6	1.2	0.3	-0.1	0.9
Slovenia	2.1	2.1	2.8	1.9	0.4	-0.8	-0.2	1.6	1.9	1.7	-0.3	2.0
Slovakia	0.7	4.1	3.7	1.5	-0.1	-0.3	-0.5	1.4	2.5	2.8	2.0	2.8
Finland	1.7	3.3	3.2	2.2	1.2	-0.2	0.4	0.8	1.2	1.1	0.4	2.1

Source: Eurostat

5.4 Hypothesis 4:

The fourth hypothesis is the fiscal integration. The following table shows the government debt as a percentage of the gross domestic product (GDP).

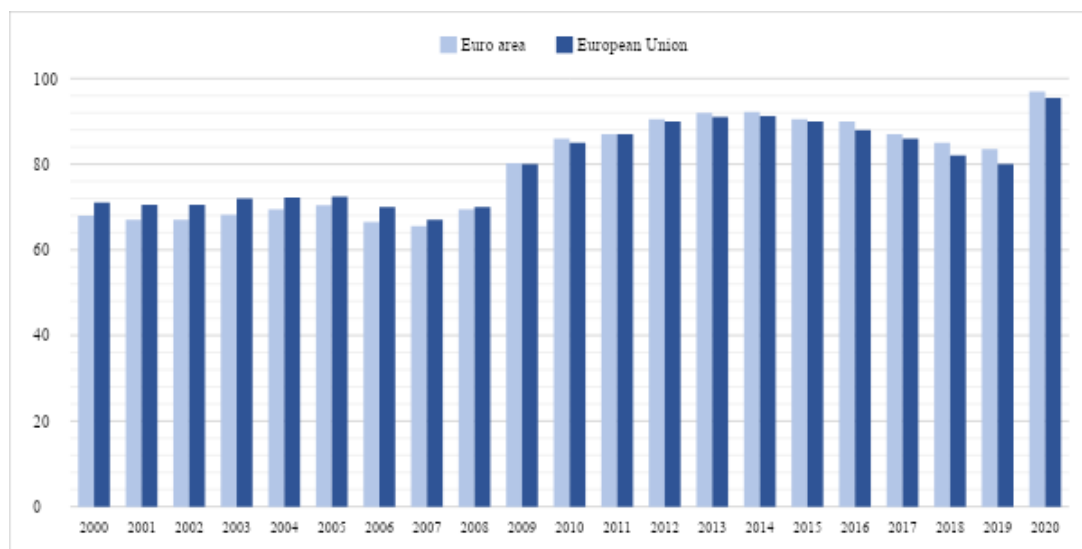


Figure 3: Government debt in percent of GDP between 2000 and 2020

Source: Eurostat

Fiscal integration is a characteristic that is stressed and encouraged in the Euro zone and fiscal stability is maintained. To be an appropriate environment for a single currency, financial integration through the allocation of national incomes is also essential. However, due to the lack of government financial assistance in the Euro zone, this transformation does not appear to be taking place. In 1997, the European Monetary Union (EMU) countries developed a 'Stability and Growth Pact' to coordinate fiscal discipline and avoid excessive government deficits and public budgets. This pact is an agreement between euro area countries about the coordination of budgetary strategies in order to protect the euro's stability and prevent inflation in the euro area. The Stability and Growth Pact is intended to balance the budget to facilitate financial integration and cooperation. According to the agreement, government debt cannot exceed 60% of GDP. Based on the data, the government debt of the Euro area exceeds the limit of 60%, which diminishes financial stability.

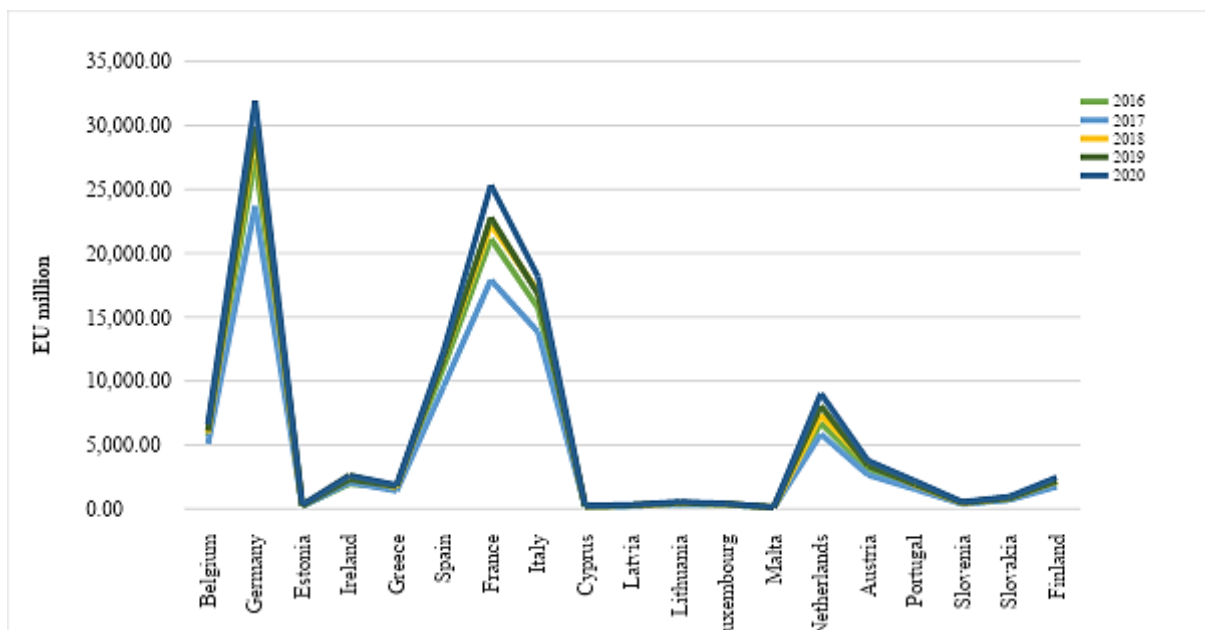


Figure 4: Amount contributed to the budget of the European Union (EU) between 2016 and 2020 by member state

Source: Eurostat

Figure 4 shows the contribution of each country in Euro area to the EU budget. The fiscal integration criterion is fulfilled when all countries have similar spending to the EU budget in percent of GDP. The criterion of fiscal integration is not fulfilled as most countries contribute only small portions of their national budget to the EU budget and contribution differs significantly across Euro countries. The degree of fiscal integration is low in the Euro area.

5.5 Hypothesis 5:

The fifth hypothesis is the production diversification.

It can be seen that the euro area produces a wide range of goods for both export and import purposes. The graph demonstrates that production in euro area is diversified. A large

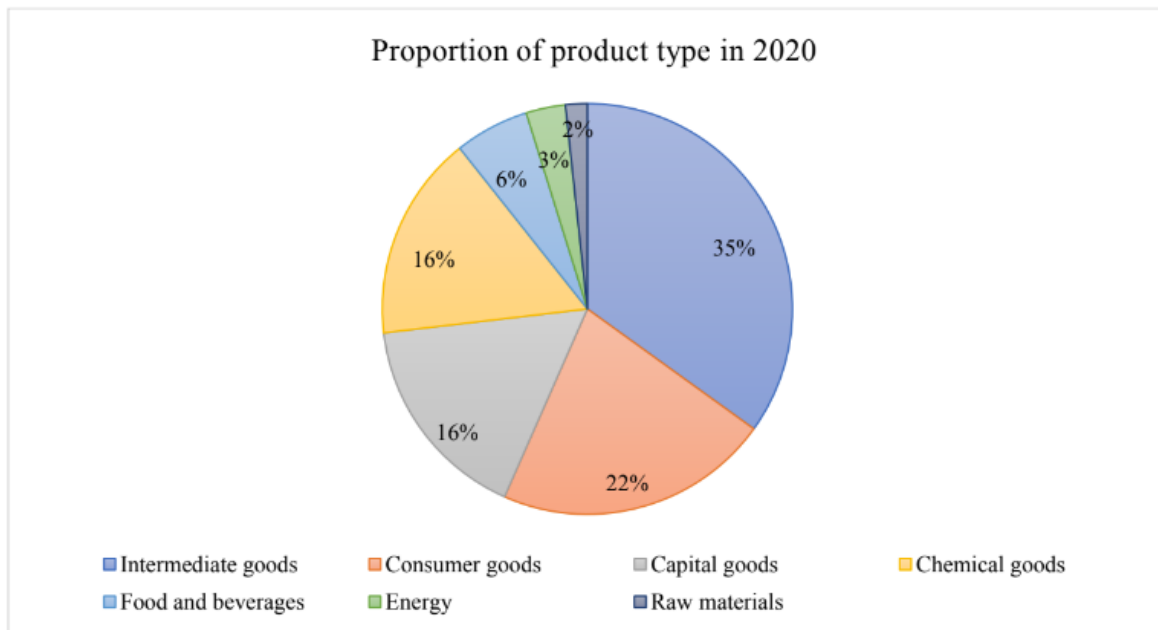


Figure 5: *Proportion of product type in Euro area in 2020*
 Source: Eurostat

fraction of the total production is intermediate goods, consumer goods and capital goods. The production is further diversified by chemical goods, food and beverages, energy and raw materials. In 2020, Intermediate goods exported are 35% of total exports, and consumer goods came in second place 22% of the total, capital goods exports equal to chemicals with 16% exports, although foods and beverages exports have increased but are still low at 6% and energy and raw materials are only 2% and 3% of total exports, respectively. The approach of product diversification is popular in a variety of areas, including product distribution, manufacturing, investment, and consumption. Diversification lowers the likelihood of and increases resistance to risks that arise as a result of the use of a similar currency. Most EU member nations had a high degree of diversity in their manufacturing operations. In the manufacturing sector, the disparity in regional production structures in EU nations is much greater than the disparity in the United States and this involves the diversification of the productive structures of each country's industries and businesses. Furthermore, the degree of similarity in the structure of consumption among the euro area, including Germany, France, Italy, and Spain, is influenced by the degree of similarity in the structure of consumption. There was also an increase in the degree to which the consumption structures of the nations were comparable to one another. The degree of production diversification has fulfilled the criteria in the euro area due to a growing diversity of exports production in each Euro zone. The production diversification can be analyzing through trade between monetary union countries by export Moreover, product diversification is favored worldwide attributed to the reason that niche markets have lower levels of competition. Diversification serves as a protective channel. The criterion of degree of production diversification is fulfilled by the euro area due to a large variety of production. The degree of production diversification is high in the Euro area.

5.6 Hypothesis 6:

The next hypothesis is political integration. The previous research has assessed that the euro area does not meet the criteria for political integration as it requires further development. Some researchers believe that the euro area will be able to achieve significant political integration in the future. However, the euro area must continue to develop and adjust its system to become an optimum currency area. Data on political integration does not utilize quantitative data, but rather qualitative data to describe how it came to this idea through locating and gathering research. Based on previous studies, the Euro area lacks political integration. Countries of the Euro area should follow the same rules and policies including laws, taxes, and governmental regulations in order to have a full political integration. It can be concluded that the political integration criterion is not fulfilled by the Euro area. Political integration is low in the Euro area.

5.7 Hypothesis 7:

The last hypothesis is the economic openness. The following table shows the intra and extra EU trade.

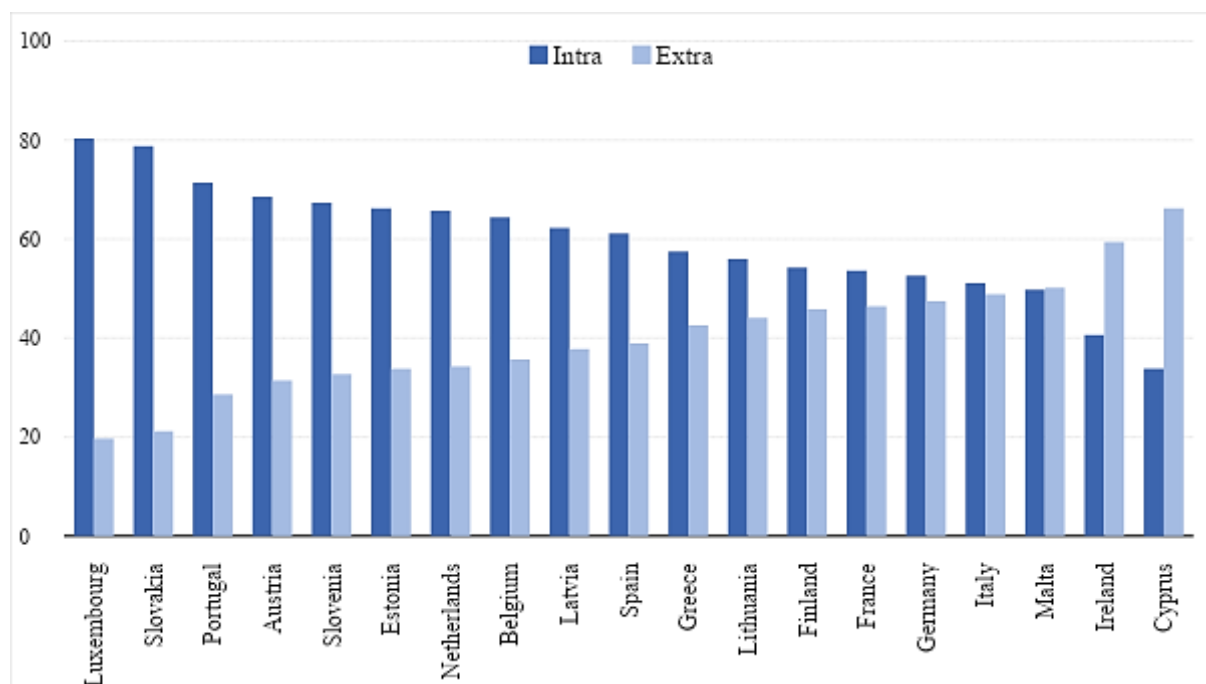


Figure 6: Intra and Extra EU trade in percent of total export in 2021
Source: Eurostat

Figure 6 shows Intra and Extra EU trade of the member states in 2021. Extra-EU trade is the trading of goods between a member state and a non-member country. Intra-EU trade is the trading of goods between member states. Economic openness within the Euro area means that there is a large amount of intra-EU trade, i.e. a large percentage of the total exports goes into other Euro member states. In terms of the Intra side, economic openness has the highest rated in Luxembourg with 80% and followed by Slovakia with approximately 78% and

from Portugal with 71% to the lowest point of Intra at Cyprus with around 34%. On the other hand, the Extra side has the highest rate at 65% of Cyprus to the lowest rate at 20% of Luxemburg. Intra is more than Extra trade and hence member states trade significantly with other member states. Based on the data, it can be concluded that the economic openness criterion is fulfilled by the euro area as the euro area has significant trade with other member states and significantly greater Intra than Extra trade. As the result, I can conclude that economic openness is supported by the data. The degree of economic openness is high in the Euro area. The following table summarizes the results.

Table 3: *Summary of the results*

Criterion of the OCA theory	Fulfilled by the Euro area	Level in the Euro area
Labor and factor mobility	No	Low
Price and wage flexibility	Yes	High
Similar inflation rates	No	-
Fiscal integration	No	Low
Degree of production diversification	Yes	High
Political integration	No	Low
Degree of economic openness	Yes	High

According to the table, only three criteria are fulfilled. Although significant changes in terms of suitability issues for the Eurozone has been made, the Eurozone cannot be considered as an optimum currency area. Since the adoption of the euro, significant advances have followed in the degree of production diversification, the degree of economic openness and wage and price flexibility. On the contrary, labor and factor mobility and fiscal integration are still low. In addition, each of the Euro countries has quite different inflation rates before and after the introduction of the Euro. Political integration has been improved but is still insufficient to fulfill this criterion. The Eurozone is not an optimum currency area and fails to meet the majority of OCA model criteria.

6 DISCUSSION AND CONCLUSIONS

The research question in this paper is whether the eurozone fulfils of the Optimum Currency Area (OCA) theory. Economic integration has several benefits for the use of the single currency area, including economic growth, labor, services, and production. The OCA theory is based on seven main criteria. I collect and analyze this data by selecting the most appropriate historical data. The core research question in this paper is whether the euro area meets the criteria of the Optimum Currency Area (OCA) theory. The majority of the literature agrees that the Eurozone is not an optimal currency area. Furthermore, the findings and analysis of this research verified that the results are close to the majority of previous research. The following are the results of the combined analysis and assessment for each hypothesis. The first result is that the euro area labor and mobility factor is relatively low because the overall number of foreign workers residing in the euro area differs. The movement to large countries has increased steadily compared to smaller countries, indicating that workers are more likely to move to wealthy and powerful countries than other countries. As a result, it is seen that

the factor mobility and labor mobility criterion is not fulfilled by the EU area. The second result is that price and wage flexibility in the Euro zone is high.

Wages adjust to changing unemployment rates. The Eurozone meets the price and wage flexibility criterion. The third result is that countries inflation rates are not similar and differ from the total Euro area inflation rate. According to this hypothesis, the similarity in inflation implies financial parity between the combined nations. The euro area is not similar in terms of inflation when comparing historical data for many years. As a result, I can conclude that the data does not support the similar inflation rate criterion. The fourth result is that the euro area's fiscal integration has yet to be completed. The results show that the amount contributed to the budget of the European Union by member state is neither similar nor high. As the result, I can conclude that a fiscal integration criterion is not supported by the data. The fifth result is the degree of production diversification. The euro area is successful in this area due to the huge variety of products manufactured for export. The high diversification of production shows that the euro area is able to cope with the changing demands in the customer market. As the result, I can conclude that the production diversification criterion is supported by the data. The sixth criterion is political integration. This hypothesis is the only criterion that numerical data cannot be used to draw conclusions. Based on this hypothesis, I use theory to draw conclusions. The euro area does not meet the criteria for political integration as it requires further development and alignment of laws, regulations, policies and taxes. The seventh result is that the euro area has a large economic openness. The economic openness of the euro area is large open due to the intra EU trade which is more than Extra EU trade. It can be seen from the data that each country in the euro area has significant intra and extra EU trades. As the result, I can conclude that the economic openness criterion is supported by the data. From the results of all the hypotheses, only three out of the seven criteria are fulfilled by euro area. Based on the results, the Euro area is not an Optimum Currency Area.

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