LUISS

Department of Business and Management

MSc in Corporate Finance

ECOWAS Single Currency Project: a Gravity Model approach

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Academic Year 2019/2020

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Introduction

The issue of monetary union has always been a fascinating topic that has involved various scholars and academics since the 1950s. Many contributions in this sense have been made to understand what are the main characteristics that a given area must have in order to be considered an optimal currency area and therefore an area where countries would benefit from adopting a common currency.

The aim of this paper is to investigate this phenomenon through the real case of the future ECOWAS Monetary Union. The analysis of a real case gives us the opportunity to understand what are the advantages and disadvantages of creating a common currency, the opportunities it brings and the necessary conditions that countries must respect. The area studied in this thesis includes fifteen West African countries that will form a common monetary area in 2020. Eight of them (Benin, Burkina Faso, Guinea-Bisseau, Ivory Coast, Mali, Niger, Senegal and Togo) are already part of a monetary union with a single currency, the CFA Franc, pegged with a fixed exchange rate with the Euro. The other 7 countries (Cabo Verde, Gambia, Ghana, Guinea, Liberia, Nigeria, Sierra Leone) are neighbouring countries of the CFA area with their own currency.

As most of the recent contributions on the study of Monetary Union use the European Monetary Union as a reference, the study of the thesis topic comes from the idea of using this monetary union to investigate the existing literature applying these concepts to the ECOWAS area which is preparing to join a common monetary zone.

In the first chapter the ECOWAS area is presented. This part describes the economic characteristics of this area, its strengths and weaknesses, its link with France and the Euro, as well as its trade relations with other African countries and with the rest of the world.

The second chapter deals with the major contributions that have been made in the literature of monetary unions. Initially, contributions from the classical theory of Mundell, McKinon and Kenen are studied. Subsequently, modern theory is taken into consideration, mainly by De Grauwe and Krugman, which is able to give an empirical view through the observation of developments in the European Monetary Union.

In the third chapter is introduced the gravity model of international trade. Thanks to this model it is possible to study empirically what are the determinants of trade flows. My empirical analysis therefore aims to understand what are the main determinants that influence international trade between the countries of the Ecowas area.

CHAPTER 1 – 2020 ECOWAS Common Currency project

There have been several monetary unions in the economic history. The one that has attracted more attentions than the others is certainly Euro. The European Monetary Union (EMU) is one of the few monetary unifications where countries do not speak the same language, do not have a federal structure with fiscal discretion or homogeneity in pension and healthcare issues. To do that, EMU countries have followed the Maastricht criteria with the aim of homogenizing the participating countries and making them more stable in the economic and financial issues.

One of the organizations that wants to follow these steps is ECOWAS. The objective[1] of the Economic Community of West African States is to create a monetary unification in 2020 among the 15 participating countries: Benin, Burkina Faso, Cabo Verde, Gambia, Ghana, Guinea, Guinea Bisseau, Ivory Coast, Liberia, Niger, Nigeria, Mali, Senegal, Sierra Leone and Togo. Similar to Euro zone, these countries have different economic and cultural characteristics. They speak different languages (official languages are French, English and Portuguese but there are more than thousands local languages), they have different cultural traditions and their size, both population and area, could be highly disparate.

1.1 Background

The Economic Community of West African States (ECOWAS) is a regional group of fifteen countries founded in 1975 with the Treaty of Lagos. Its mission is to promote economic integration in "all fields of economic activity, particularly industry, transport, telecommunications, energy, agriculture, natural resources, commerce, monetary and financial questions, social and

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[1] ECOWAS COMMISSION, et al. ECOWAS vision 2020: towards a democratic and prosperous community. *ECOWAS Commission, Abuja*, 2011.

cultural matters...".[2] The objective of a monetary union began with the establishment of this regional body.

The idea behind the creation of ECOWAS was born to make any member states, especially countries with a very small and undeveloped domestic market, more competitive. This can be seen in the broader project of raising the population's living standards and maintaining a certain economic stability that has failed in recent years. The vision of the project aims to build strong relationships between member states to contribute the progress and common development. The common area of the ECOWAS aims therefore to help states to emerge with policies aimed at eliminating custom duties and related taxes, establishing a common external tariff, harmonizing economic and financial policies and, what will be the object of the thesis, with the creation of a single monetary zone.

Hence, the priority of ECOWAS is to create a common market for member countries, where goods can freely circulate without taxes and limitations. Another very important aspect is the promotion of private sector. In particular, governments want to increase incentives and facilities for the development of SMEs within the territory. Last point of the program is the creation of transnational companies and joint ventures to share capital and "knowledge" in order to be more competitive outside the common area.[3]

1.1.1 ECO highlights

Head of governments started to talk concretely about the introduction of the single currency and the creation of a common monetary zone for the countries of West Africa, in 1991 when they had a meeting to revise the Treaty of Lagos. They decided to call the new currency "ECO". In 2001 the West African Monetary Institute (WAMI) was created to help set up a single currency and a Central Bank for the new West African Monetary Zone. The

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[2] ECOWAS Commission (1993), ECOWAS Revised Treaty. Abuja, Nigeria
[3] ECOWAS Commission (2012), Ecowas community development programme (CDP).

project is to constitute a common Central Bank with federal model and flexible exchange rate.

Currently there is already a single currency called CFA, adopted by fourteen states. Eight of these states are part of West Africa, also known as West African Economic and Monetary Union (WAEMU). The remaining six are members of the Central African Economic and Monetary Community (CEMAC) organization and they are Central African States. CEMAC is not involved in the ECOWAS project so they will remain the only countries with the CFA Franc after the introduction of ECO. Both areas are linked to the Euro and supported by France, but by two different central banks.

Therefore, the monetary union will involve the 8 countries that are part of the WAEMU zone (Benin, Burkina Faso, Guineas-Bisseau, Ivory Coast, Mali, Niger, Senegal, Togo) and 7 states that now have an independent currency (Cabo Verde, The Gambia, Ghana, Guinea, Liberia, Nigeria, Sierra Leone) not pegged to any foreign currency, with the exception of Liberia pegged to the US dollar.

The original project was to create the single ECO currency in two distinct phases: the first phase would have seen the creation of a monetary zone called West Africa Monetary Zone (WAMZ) with a single parallel currency for the seven states outside the CFA zone. Subsequently the two zones would be joined, WAEMU and WAMZ, with the creation of ECO.

Trying to deal with the difficulty in meeting deadlines set for the introduction of ECO, scheduled for the first time in 2005 then 2009 and finally 2015, Head of Governments decided to overcome the two-stage approach deemed too slow. At the Freetown meeting in July 2007, it was decided to abort the two-stage approach to move to the direct creation of the single ECO currency. Some countries didn't reach the convergence criteria required for the unification, and some of them were very far to hit, so the council decided for the last time to postpone the introduction of ECO to 2020.

On 29th June 2019, during the 55th ordinary meeting of ECOWAS hold in Nigeria, Heads of State advised member states to be ready for the period March/July 2020, reiterating the will to introduce ECO.

1.1.2 Why do countries want to leave CFA zone?

The desire to create a new monetary area is driven by the criticism of the WAEMU countries against their current currency, the CFA franc. It is a currency established in 1945 at the time of the French colonization and it is still printed in France. Until 1999 it was pegged to the French Franc, subsequently with the introduction of the Euro, it was pegged to the new currency and it is guaranteed both by the European Central Bank and by the French Treasury. However, the amount of money to be printed is decided by the Central Bank of WAEMU and the Central Bank of the CAEMC (Economic and Monetary Community of Central Africa). The use of the CFA Franc is voluntary but countries involved must deposit 50% of their foreign currency reserves to the French Treasury to compensate the exchange rate fluctuations. It is about 7 trillion CFA francs, 10 billion in euros. The agreement includes also to get into privileged commercial trade exchanges with France. Countries from the CFA Franc area, in fact, import most of the industrial products and services from France, which is the country where they mainly export their raw materials[4].

This tool seems to be a good way to keep inflation under control thanks to the fixed exchange rate with the Euro and there is no empirical evidence that the CFA Franc is responsible for the economic stagnation of the WAEMU and CAEMC countries.

The aim of the CFA franc was to ensure that Africa developed a stable monetary economy, that was credible respect to other states, and that it

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[4] ECOWAS mainly exports fuels from extractive industries (75% of export), cocoa and cocoa food preparations (5%) , precious stones (3%) and cotton , edible fruit, rubber , plastics , wood and wood products , fish and shellfish (about 1% each). Data source: Trade regional statistics https://www.ecowas.int/doing-business-in-ecowas/import-and-export/regional-trade-statisrics/

was able to avoid financial collapses or economic crises caused by government instability. It can be said that these countries holding the CFA franc enjoyed very low inflation, compared to countries where the currency was not pegged to a stronger foreign currency.

Motivations of countries that do not have a currency pegged to the euro are different. The former British colonies want to join the ECOWAS monetary union because they see it as an opportunity for price stability, greater security and more opportunities for businesses and markets, greater economic stability and growth as well as more integrated markets.

1.1.3 Africa-China relations

As mentioned in the previous paragraph, countries of the WAEMU area are happy to create a new currency to distance themselves from the CFA Franc and France itself. However these countries may not be completely independent as there is a possibility that the new ECO currency may be pegged to the Chinese yuan. Countries of West Africa show the feeling of moving away from France to embark on a new road with China. In fact one of the most determined countries for leaving CFA was Ghana, one of China's major trading partners[5].

Some African states have already introduced the yuan as the second official national exchange currency. This partnership was sealed in 2018, when Nigeria signed an historical agreement with Beijing. Negotiations between Nigeria and Beijing lasted two years. On 3 May, the Central Bank of Nigeria (CBN) and the People's Bank of China signed a currency exchange agreement for 2.5 billion dollars, with the aim of facilitating bilateral trade and investments, improving reliability and financial commitment of both parties. The agreement allows the two countries to exchange the same amount of money in one or the other currency, without liquidity risk

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[5] OSEI-KYEI, Robert, et al. Root causes of conflict and conflict resolution mechanisms in public-private partnerships: Comparative study between Ghana and China. Cities, 2019, 87: 185-195.

problems on the respective stock exchanges. The Currency Swap Agreement seeks to create a platform that provides Naira liquidity to Chinese firms and investors looking to do business with Nigeria on the one hand; and also provides Chinese Yuan liquidity to Nigerian firms and investors looking to do business with China on the other hand[6].

Since the 2000s, China started to increase trade with the African continent and in particular with West Africa. China has also substantially invested in these countries. From 2005 to now, only in the ECOWAS area, China has invested more than 90 billion dollars (distributed mainly in Nigeria: $ 44.6 B, Ghana $ 10.88B and Guinea $ 9.24B).[7]

The International Monetary Fund and the World Bank have expressed their full concern as Chinese loans continue to increase African debt[8]. From 2014 to now, African debt has doubled and it is expected to fall into the debt trap.

Nigeria did the most important agreement for size and relevance but it was not the first one. In August 2015, in fact, Angola had made a similar agreement, joining the yuan with kwanza. Southern Africa, the first Chinese trading partner in Africa, adopted a similar measure in April of that year, followed by Zimbabwe. It should be noted that on March 2018 some African countries came together to study the possibility of adopting such a measure.

1.2 Convergence criteria

Macroeconomic convergence programs are often used to bring domestic policies closer and reinforce the monetary integration process. This is a characteristic of existing or future monetary zones. All monetary unification establish a set of criteria and target to join before entering in the union.

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[6] OLAYIWOLA, Abiodun Sunday; FASOYE, Kazeem. Does China's Currency Swap Agreements have Impact on the US dollar's Exchange Rate in Nigeria. *Global Journal of Human-Social Science*, 2019, 19.3: 31-38.

[7] Data from China Investment Tracker, https://www.aei.org/china-global-investment-tracker/

[8] In 2018 the total African debt owned by China was $83,4bn. https://www.bbc.com/news/world-africa-45916060

Sometimes these criteria are mandatory requirements for joining the monetary zone.[9]

ECOWAS decided to establish six macroeconomic criteria, known as entry requirement, that countries have to follow as a goal for 2020. These criteria are called "Maastricht type" criteria because they are similar, as typology and intentions, to the criteria used by European Union to create the euro zone. The criteria aim to guarantee the credibility, sustainability and stability of the union.

This requires setting up certain appropriate macroeconomic targets (otherwise, known as entry requirements) that must be gradually satisfied by all members prior to the formation of a monetary union. One of the reason to set up criteria convergence is to avoid the spillover effect among countries of the same union[10].

Despite the convergence criteria should guarantee stability, there are opponents of this method who think that the criteria, since they are nominal, are useless and insufficient for the creation of a monetary union. They also underline that these criteria, above all if not respected, have led to the current European double crisis , the European debt crisis and Euro area instability

At the beginning ECOWAS countries decided to establish four primary and six secondary convergence criteria to be satisfied by all member countries. As the name suggests, primary criteria were more important than secondary and they were decisive for the creation of the union. Primary criteria included: a single-digit inflation rate at the end of each year; a fiscal deficit of no more than 4% of the GDP by the year 2000; a central bank deficit-financing of no more than 10% of the previous year's tax revenues;

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[9] TAPSOBA, Sampawende J.-A., et al. Fiscal Convergence in Africa. Journal of Economic Integration, 2019, 34.2: 214-235

[10] NKWATOH, Louis S. Does ECOWAS Macroeconomic Convergence Criteria Satisfy an Optimum Currency Area?. Journal of Economics and Management Sciences, 2018, 1.2: p61-p61.

and a gross external reserves that can give import cover for a minimum of three months.

Six secondary criteria focused on monetary policies, exchange rate and structure of public accounts. These were: prohibition of new domestic default payments and liquidation of existing ones; tax revenue should be equal to or greater than 20 percent of the GDP; wage bill to tax revenue equal to or less than 35 percent; public investment to tax revenue equal to or greater than 20 percent; a stable real exchange rate; and a positive real interest rate.

After many countries had problems reaching the targets set, the monetary union was postponed over time. In 2015 it was decided the last date for the introduction of ECO in March / July 2020. Governors of the Central Banks reduced the convergence criteria to six. The new criteria are very similar to the previous ones but they provide more flexibility.

The new convergence criteria are divided into three primary and three secondary.

Primary criteria:

- every member-country's budget deficit should not be more than 3% of gross domestic product (GDP);
- the average annual inflation should be single-digit of not more than 5% by 2019;
- gross reserves should not be less than three months of imports;

Secondary criteria:

- public debt to GDP ratio should not be more than 70%;
- Central Bank financing of budget deficit should not exceed 10% of previous year's tax revenue;
- nominal exchange rate variation should be within +/-10%[11];

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[11] Nominal exchange variation prior the formation of the monetary union between all countries involved

1.3 GDP and size overview

It should be noted that there is a great heterogeneity among countries regarding territorial, population and GDP dimensions. The figure that immediately catches the eye is the enormous divergence of Nigeria's GDP compared to other ECOWAS countries. Data of Nigeria are much sizable than other countries of the area. The 15 countries in 2018 had a total of US $ 682,14 bn of GDP. Nigeria alone contributed for US $ 469,6 bn, almost 69% of the total GDP of the area. Nigeria has an extremely larger size than the other 14 states. After Nigeria, the second State with highest GDP is Ghana, but it is only 10% of the total.

For sure, GDP is a data we have to study in our analysis but it is not the only one. Considering Nigeria is much sizeable than other countries it is fine it has a much larger GDP.

Second data we need to take into examination is GDP per capita. Considering GDP per capita Nigeria loses its dominant position resulting the third States after Cabo Verde, first with $ 3654.00 and Ghana, second with $ 2202.00.

As seen in macro convergence criteria's paragraph, one of the objectives of the ECOWAS common project is to converge countries together.

From the tables below it can be seen that after the boom of the past years, GDP of Nigeria grows less than the GDP of the other 14 countries. We cannot talk about convergence because Nigeria very large respect to others, but there is a recovery of the others 14 countries, especially those in the CFA area after they had a smaller average growth over the last 20 years. GDP is certainly not the most relevant factor in the analysis of the convergence criteria. However, it is important to understand the trend of recent years, with their respective growth rates, because it will be useful in the analysis that will be made in the third chapter.

	2010	2011	2012	2013	2014	2015	2016	2017	2018
Benin	2,11	2,96	4,82	7,19	6,35	2,10	3,96	5,84	6,86
Burkina Faso	5,37	6,63	6,45	5,79	4,33	3,89	5,93	6,30	6,51
Cote d'Ivoire	2,02	-4,39	10,71	8,89	8,79	8,84	7,97	7,70	7,43
Cabo Verde	1,47	3,97	1,08	0,80	0,61	1,01	4,71	4,01	5,52
Ghana	7,90	14,05	9,29	7,31	2,90	2,18	3,45	8,14	6,26
Guinea	4,82	5,61	5,92	3,93	3,71	3,81	10,83	13,36	8,66
Gambia, The	6,53	-4,30	5,60	4,79	-0,94	5,87	0,41	4,56	6,60
Guinea-Bissau	4,61	8,08	-1,71	3,26	0,96	6,13	6,26	5,92	3,80
Liberia	6,10	8,20	7,99	8,70	0,70	0,00	-1,60	2,47	1,22
Mali	5,41	3,24	-0,84	2,30	7,04	5,96	5,80	5,40	4,90
Niger	8,36	2,28	11,85	5,27	7,53	4,34	4,93	4,89	5,17
Nigeria	8,01	5,31	4,23	6,67	6,31	2,65	-1,62	0,81	1,94
Senegal	3,56	1,46	5,12	2,82	6,61	6,37	6,36	7,08	6,77
Sierra Leone	5,35	6,32	15,18	20,72	4,56	-20,60	6,06	4,21	3,73
Togo	6,10	6,40	6,54	6,11	5,92	5,74	4,92	4,45	4,88

Tab 1: GDP growth rate (in percentage). Data from: World Bank Open Data

From table 4 we can see that all countries presented a positive GDP growth rate. The interesting thing is that the countries that show the greatest growth rate are the smaller ones. In 2018 every States, except Liberia, had a greatest growth rate than Nigeria. Data of 2018 reflects the trend begun in 2000s.

	2010	2011	2012	2013	2014	2015	2016	2017	2018
Benin	-0,72	0,12	1,92	4,24	3,43	-0,70	1,13	2,97	3,98
Burkina Faso	2,24	3,47	3,31	2,68	1,28	0,89	2,89	3,27	3,50
Cote d'Ivoire	-0,34	-6,64	8,04	6,23	6,10	6,13	5,27	4,99	4,73
Cabo Verde	0,23	2,68	-0,19	-0,48	-0,65	-0,24	3,44	2,78	4,30
Ghana	5,25	11,32	6,73	4,85	0,57	-0,11	1,15	5,77	3,96
Gambia, The	3,38	-7,14	2,45	1,66	-3,89	2,73	-2,55	1,50	3,50
Guinea	2,48	3,30	3,61	1,64	1,31	1,26	7,94	10,27	5,62
Guinea-Bissau	1,95	5,29	-4,28	0,54	-1,67	3,40	3,57	3,27	1,24
Liberia	2,36	4,80	4,91	5,82	-1,87	-2,52	-4,06	-0,05	-1,23
Mali	2,14	0,14	-3,72	-0,62	3,98	2,90	2,70	2,29	1,79
Niger	4,28	-1,61	7,57	1,23	3,42	0,36	0,95	0,94	1,23
Nigeria	5,16	2,53	1,47	3,85	3,51	-0,03	-4,17	-1,79	-0,67
Senegal	0,76	-1,31	2,23	-0,02	3,66	3,42	3,41	4,13	3,84
Sierra Leone	3,00	3,92	12,62	18,05	2,27	-22,31	3,78	1,99	1,54
Togo	3,28	3,59	3,75	3,35	3,20	3,07	2,31	1,89	2,35

Tab 2: GDP per capita growth rate (in percentage). Data from: World Bank Open Data

In table 5 we find the last trend of GDP per capita growth rate. As before, Liberia had the lowest and negative growth rate in the last year followed by Nigeria. The other 13 countries have all a positive growth rate following the general trend of the last 10 years.

1.4 Economic characteristics of countries involved

The new common monetary area will involve 15 countries. These countries are different by each other in sizes, economies, population and politics. In the previous section there was a general overview of the GDP and GDP per capita of the countries involved. Now it will be explained the main characteristics of each one to fully understand qualities and problems of this area[12].

Benin

Benin is a member of the CFA Franc Zone. The population has exponentially grown from 2,5 to 11,2 million since the independence from France in 1960. It is an underdeveloped country with a real GDP of US$ 9,27 bn. The prevailing sector is the services sector but it is still dependent from agriculture and cotton. Benin exports most of the goods in France, but it has also relationship with Asian countries such China, Japan and India. The commercial balance is negative, Benin imports more than how it exports cause an industrial sector deeply underdeveloped.

Cape Verde

Cape Verde is a very small country of ten islands populated by only 550 000 inhabitants. Cape Verde has a deep connection with Portugal. Its own currency (Cape Verdean escudo) was pegged with Portuguese escudo and now with Euro. Portugal is also the main commercial partner: Cape Verde exports 40,3% of total exports and it imports 43% of total from Portugal. The economy is service-oriented that provides 70% of the GDP.

Burkina Faso

Burkina Faso is a member of the WAEMU countries and it has CFA as its national currency. The economy is showing a positive trend in recent years. The Real GDP grew on average by 5,7% every year from 2008 to 2018 and it is forecast to grow by 5,9% per year until 2023. Population increased by

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[12] Data in this paragraph from T. Mälkki, O. Sánchez, V. Staffa, M. Mesloh, Statista Country Report, April 2019

2.9%, which is above regional average, to a total of 19,751,651 in 2018. Until 2012 almost the half of the workers were employees of the primary sector. From 2012 most of the workers moved to secondary and tertiary sector. Now most of the employees work in services sector. The biggest problem of Burkina Faso is the lack of education, more than 60% of the population has no education.

Gambia

The Gambia is one of English speaking countries of ECOWAS. It is a small country with 2,16 millions in population. It has its own currency called Dalasis (GMD). The Real GDP was US $ 1,5 bn in 2018, It grew by 3,2% per year from 2008 to 2018 and it is forecast to grow by 5,9 % per year until 2023. The unemployment rate is almost 10% and it has increased in recent years. The main sector is tertiary sector, half of the workers work in services sector. The inflation rate is under control, in 2019 is 5,3 % and it is expected to fall below the threshold of 5 % in the next years. One of the data of Gambia we take under examination is the low development of the industrial sector. Only 1/10 of employees work in the secondary sector. Probably this condition is not helped by interest rates. Gambia has very high interest rate around 15% on average. In 2015 and 2016 it was 23%. This is probably a limit for entrepreneurs who would like to invest in the industrial sector but need capital that they cannot repay at such an high rate.

Ghana

Ghana is the second biggest and one of the most developed country of ECOWAS area with 29,5 millions of population. Ghana's official language is English and it has his own currency called Cedis (GHS). The last data of the official real GDP was US$ 45,3 bn, it grew on average 6,9% per year from 2008 to 2018 and it is forecast to grow by 5,3% the next 5 years. The country's economy is driven by the services sector which represents more

than half of the added value of the GDP. The unemployment rate is around 2,5%.

Guinea

Guinea is a French-speaking country with 14 million of population. The economic conditions of Guinea are very precarious, despite that it is the country with the richest subsoil of Africa with deposits of oil, gold, iron and platinum etc. It has never been able to use these advantages to develop the economy. Thus in the nineties the government decided to reduce the weight of the state on the economy, until that moment almost entirely nationalized, especially for commercial activities. Government decided to launch many measures to increase foreign investment, attracted above all for the mining sector. Unlike the other countries of the ECOWAS area, Guinea is driven by the secondary sector that provides 40% of the GDP.

Guinea Bissau

Guinea Bissau is the smallest country in term of GDP of the area. Real GDP in 2018 was US $ 1,45 bn. It is the only country in the CFA Franc area not French-speaking. The official language is Portuguese from the colonialism period. The economy is mainly based on agriculture.

Ivory Coast

The Ivory Coast is a French-speaking country with a population of almost 25 million. It is in CFA monetary zone. The total real GDP was US $ 42,4 bn un 2018 thanks to an average annual growth of 6,1 %. Ivory Coast has a low inflation (1,7%) following the trend of low inflation of the past years where it was close to zero. The lack of education for everyone is a problem for Ivory Coast and the condition does not seem to be improving. 34,6% of population has no education and 20% has an incomplete primary education.

Liberia

Liberia is a small country with 4 million people. Its currency is the Liberian Dollar and it is pegged to US dollar due to the colonialism period (they

gained independence on 1847). Liberia was one of the most developed country of the Sub-Saharan Africa until the crisis of 1980s. The civil war brought loss of capital and human capital, many of the infrastructures were destroyed and the whole economy suffered.

Mali

Mali is a French-speaking country in the CFA zone. It is a large country with 124 million hectares of land area but the Sahara desert constitutes 55%, and this is the reason that a so large land has only 19 millions of population. The total Real GDP was US$ 8,5 bn in 2018 and it is forecast to increase by 4,7% per year in the next 5 years. Mali is a very large country and it based his economy on the primary sector. In 2017 the 38,3% of the value added in % of GDP was given by agriculture. The industrial sector is still underdeveloped in this country and it contributes only to 16 % of the GDP.

Niger

Niger is one of the poorest countries in the ECOWAS area despite is part of the CFA Area. With a population of 22 million it has a real GDP of only US $ 4.4 bn. In the ranking of the per capita GDP drawn up by International Monetary Fund, World Economic Outlook Database 2018, Niger is at the last position of the 145 countries examined. The most interesting data is the unemployment rate and where people works. Niger has only 0,4 % of unemployment rate and almost 80% of population are employed in the primary sector.

Nigeria

Nigeria is the biggest country of ECOWAS area. According to the last census it has a population of 196 million with a real GDP in 2018 of US $ 469,6 bn. It is an English speaking country and it is not a member of CFA. Nigeria has his own currency called Nairas (NGN). It is ranked as the 31th-largest economy in the world in terms of nominal GDP and the 22nd-largest in terms of purchasing power parity. Despite being considered one of the major oil exporters, Nigeria generates only 2.7% of world production and

the oil sector represents only 9% of GDP. On the other hand, the tertiary sector, which has reached 55,8% of value added by sector in % of GDP, is growing rapidly: it has been observed a significant development in the area of telecommunications, followed by banking and cinema sectors.

Senegal

Senegal is a French-speaking country of the CFA area. It has a real GDP of US $ 13,4 bn. Senegal did various reform in 1990s. In January 1994 started structural and adjustment programs supported by the International Monetary Fund (IMF), the World Bank, and other multilateral and creditors. The objective was reducing the role of government in the economy enhancing incentives for the private sector and improving public sector management to facilitate growth and development. Now the economy of Senegal is based on the services sector, in particular tourism and telecommunications.

Sierra Leone

Sierra Leone is a small English speaking country with 7,7 million of population and a real GDP of US$ 3,3 bn. Sierra Leone's economy is based on the primary sector. One of the strengths of Sierra Leone is that it is a country that exports a lot to the rest of the continent. If in the past it mainly exported products from the agricultural sector, in recent years it has also been exporting good-related services (From 2010 commercial services export grew by 21,3 %).

Togo

The last country of this area is Togo. It belongs to the CFA Franc zone. Togo has almost doubled its population since 2010 to reach 8,13 million by the last census in 2018. Most of the labor force are employed in the primary sector but half of the GDP is provided by the services sector. Trade for Togo is very important so the government opened to foreign investment and tried to eliminate most of the tariff barriers. Now the level of openness is one of the highest in Africa.

1.5 Monetary policy

The most interesting monetary policies to analyze are the ones of the common area of the CFA. The CFA Franc, as already mentioned, is a common currency of 8 countries that will form the common ECOWAS zone (Benin, Burkina Faso, Guinea-Bissau, Ivory Coast, Mali, Niger, Senegal, Togo) and 6 Central African countries (Cameroon, Central African Republic, Chad, Congo-Brazzaville, Equatorial Guinea, Gabon) that will continue to have this currency. The CFA Franc has been pegged to the French Franc in the past and is now pegged to the Euro. There are two main lines of thinking about this currency. Some people criticize the CFA Franc because they believe that since they cannot decide the monetary policies, which are decided by the European Central Bank, the developing African countries cannot fully exploit all the instruments useful for their growth. The fact that they cannot decide monetary policy leads to measures that are not entirely suitable for them (Kirshner, 2003). Others disagree with this view of dependence on the euro and they believe that benefits are considerable from the point of view of macroeconomic and financial stability. The currency pegged to the euro attracts more investors because it makes it more reliable than other currencies of the African continent (H Kyambalesa, MC Houngnikpo, 2006).

When the fixed exchange rate between the CFA Franc and the French Franc was established, the exchange rate was set at 50 CFA for 1 French Franc. This exchange rate was artificially high and the goods produced in the CFA area were too expensive to sell abroad[13]. This is one of the reasons why the economies of these countries grew little between the 80s and 90s. Faced with this situation in January 1994, the CFA area countries, France and the International Monetary Fund, decided to devalue the CFA against the French Franc by 50%. In January 1994 100 CFA were worth 1 French Franc (compared to the initial valuation of 50 CFA for 1 French Franc). The change

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[13] VAN DEN BOOGAERDE, Mr Pierre; TSANGARIDES, Mr Charalambos G. Ten years after the CFA franc devaluation: progress toward regional integration in the WAEMU. International Monetary Fund, 2005.

remained at 100 to 1 until France adopted the euro in 1999. At that point, the French franc was converted to the euro at 6.55957 to 1. The CFA franc's currency exchange rate thus became 655.957 to 1 euro, where it remains pegged to this day[14]. The devaluation aimed to bring these countries to sustainable growth in order to regain competitiveness in the world market[15]. Thanks to the devaluation, products in the CFA area could be sold at half the price and this increased exports. The International Monetary Fund recommended combining devaluation with some macroeconomic and structural adjustment policies. The former included prudent fiscal and monetary policies and an appropriate exchange rate regime. The latter includes trade liberalization, elimination of price controls, diversification of agriculture, reduction of the government's labour force and expenditure, and privatization of state-owned industries[16]. Countries in the CFA area were not able to follow all these advice. The most significant progresses were made in the privatization of state-owned enterprises. Since 1980s, a series of reforms began to bring nationalized enterprises back to the private sector. However, despite the devaluation and the advice partly followed by the CFA countries, the area did not manage to significantly improve its economic situation.

However, these countries are still growing and the new ECOWAS monetary union is expected to contribute to growth and stabilisation of the area.

Countries of the CFA area are not the only ones to have a currency pegged with a fixed rate regime to the euro. Cape Verde has its own currency (Escudo) pegged to the euro from the Portuguese colonialist period. The Escudo became the currency of Cape Verde in 1914. Until independence in 1976 the Cape Verde escudo had the same value as the Portuguese escudo. It was subsequently depreciated to 30% in 1977-78 and another 40% in

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[14] HALLET, Martin, et al. The role of the euro in Sub-Saharan Africa and in the CFA franc zone. Directorate General Economic and Financial Affairs (DG ECFIN), European Commission, 2008.
[15] COSSÉ, Mr Stéphane, et al. Aftermath of the CFA franc devaluation. International Monetary Fund, 1996.
[16] International Monetary Fund, The Fabric of reforms, https://www.imf.org/external/pubs/ft/fabric/backgrnd.htm

1982-84. In 1998 there was a depreciation similar to that experienced four years earlier by the CFA Franc. The exchange rate after the devaluation was 1 Portuguese Escudo to 0.55 Cape Verde Escudo[17].

After the Portuguese Escudo was replaced by the Euro, the Cape Verde Escudo was pegged to the Euro at 110,265 Escudos to 1 Euro[18].

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[17] LOUREIRO, Joao; MARTINS, Manuel Mf; RIBEIRO, Ana Paula. Cape Verde: the case for euroisation. *South African Journal of Economics*, 2010, 78.3: 248-268.
[18] UNIT, Economist Intelligence. Cape Verde. *Economist*, 2011.

CHAPTER 2 – Literature

In this chapter we want to give an overview of the literature useful to understand the work of this thesis. The most important and significant contribute to the study of the monetary union is the Optimum Currency Area theory. An Optimum Currency Area (hereinafter referred as "OCA") is defined as "the optimal geographic domain of a single currency, or of several currencies, whose exchange rates are irrevocably pegged and might be unified. The single currency, or the pegged currencies, can fluctuate only in unison against the rest of the world" (Mongelli, 2002). The pioneer of the OCA theory was Mundell (1961) and later revised by McKinnon (1963) and Kenen (1969). The aim of this chapter is to understand when it is convenient forming a common currency area for a group of countries. Each author of the literature here focuses his studies on specific characteristics we need to investigate to figure out if ECOWAS area is an Optimum Currency Area. An important contribution was by Frankel and Rose (1998). They have summarized all the literature up to that time and they argued that to find an OCA we need to study four specific interrelation between the members of a potential OCA:

1. The extent of trade
2. The similarity of shocks and cycles
3. The degree of labor mobility
4. The system of risk-sharing, usually through fiscal transfers

This is useful to have a general idea of the theory before starting the research.

2.1 OCA Theory

All the literature and various approaches about the optimum currency area have been inspired by Mundell's paper. This theory aims to find answers on

how to choose the optimum exchange rate regime. The theory arose in the 1950s as a response to the debate on the type of exchange rate to be chosen with the publication of the paper "The Case for Flexible Exchange Rates" (Friedman, 1953). In the paper pros and cons of flexible exchange rate regimes were analyzed. The first time the debate of the best exchange rate regime has expanded to the choice of the common area occurred with the publication of "Theory of Optimum Currency Areas" in 1961 by Mundell. He tried to answer questions about when countries should have their own currencies and what is the appropriate domain of a common currency area. At that time, this was only an academic question and it was difficult to imagine that the national currency would be abandoned in favor of some other regime. But nowadays, especially after the process of monetary unification of the European Union, the OCA theory has had more relevance than before when it was only an academic subject.

2.1.1 Friedman

Friedman started the debate of flexible exchange rates focusing on three advantages of this system (Friedman, 1953):

1) In a real world where prices and wages find resistance to increase and decrease and where the balance of payments crises derive from the Bretton-Woods system[19], the flexible exchange rates would guarantee a balanced system where market actors act to reach a balance equilibrium[20];

2) The flexibility of rates would guarantee the independence of monetary policy so that each country can protect itself from errors of other nations;

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[19] Friedman refers to Bretton-Woods for the agreement where countries promised that their central banks would maintain fixed exchange rates between their currencies and the dollar.
[20] In the IS-LM model of an open economy is the meeting of the balance of payment straight line

Friedman argues that in a world characterized by the stickiness of prices and wages it is preferable to adopt a floating exchange rate regime. Thanks to the adjustment of the exchange rate is easier achieves the domestic target (full employment, price stability, etc.) and international target (balance of payments equilibrium with foreign countries).

Consider an economy where the prices of goods are fixed before the value of certain variables, such as business productivity. Now, if the economy is hit by an aggregate shock, for example a shock to the total factor productivity, these prices will remain unchanged. In this case it will not be possible to obtain an efficient allocation of resources if you are part of a monetary union. With a floating exchange rate regime there could have been an automatic variation of the exchange rate. The market will respond changing the prices of domestic producers compared to foreign ones, guaranteeing a more efficient allocation.

Friedman starts the debate on the emerging theory of optimal currency areas, understanding that, in an imperfect world, the adjustment between the monetary areas would be simpler with multiple different currencies and flexible exchange rates.

2.1.2 Mundell

Mundell's paper (1961) incorporates the previous Friedman's work to introduce the new theory on monetary union. Mundell shows how the characteristics of an economy are decisive for the choice of the exchange rate regime to be adopted. In particular he identifies those conditions for which, under determined assumptions, having different currencies with a floating exchange rate is not the best choice. About the flexible exchange rate Mundell takes up the traditional standard academic literature, according to which, with budget in deficit, there would be a depreciation instead of unemployment, while, in conditions of surplus, inflation would be

replaced by appreciation. Consequently, he wonders whether the fluctuation of each currency is better or whether a monetary union is preferable, i.e. an area with fixed exchange rates.

Mundell focuses his attention on the main problem of the OCA theory: to determine the geographical region that coincides with an optimal currency area, in which low inflation, full employment and balance of payments sustainability can easily be obtained. In particular, he emphasizes the significant differences, in terms of adjustments, between the single currency and an area with more than one currency.

Mundell uses a two countries model to explain the difference of a monetary union with single currency and a zone with many currencies. The model starts from an initial equilibrium where countries are in full employment and there is an equilibrium in the balance of payments. Then we will see what happens after a shift in demand from the goods of country B to the goods of the country A in two different scenarios:

1) In the context of a monetary union (OCA Theory)

2) In the context of floating exchange rate when two countries have their national currencies

2.1.3 Adjustments in a monetary union

In the case of symmetrical shocks, the central bank of countries in a monetary union will have a rather simple job. The Central Bank will be able to devalue the currency of the union compared to the rest of the world[21]. The situation becomes more complicated when the countries of the union are subjected to asymmetric shocks. A shock is defined "asymmetric" when

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[21] In this scenario we have a model of three countries. The third country is represented by the rest of the world

it does not affect all sectors or regions uniformly but only one country or a small area in a geographical region.

Suppose the two countries form a monetary union. In this scenario they renounce their respective national currencies in favor of a common currency. We also assume that consumers change preferences, moving from goods of country B to goods of country A. The effects of this shock on the demand curve are shown in figure 1.
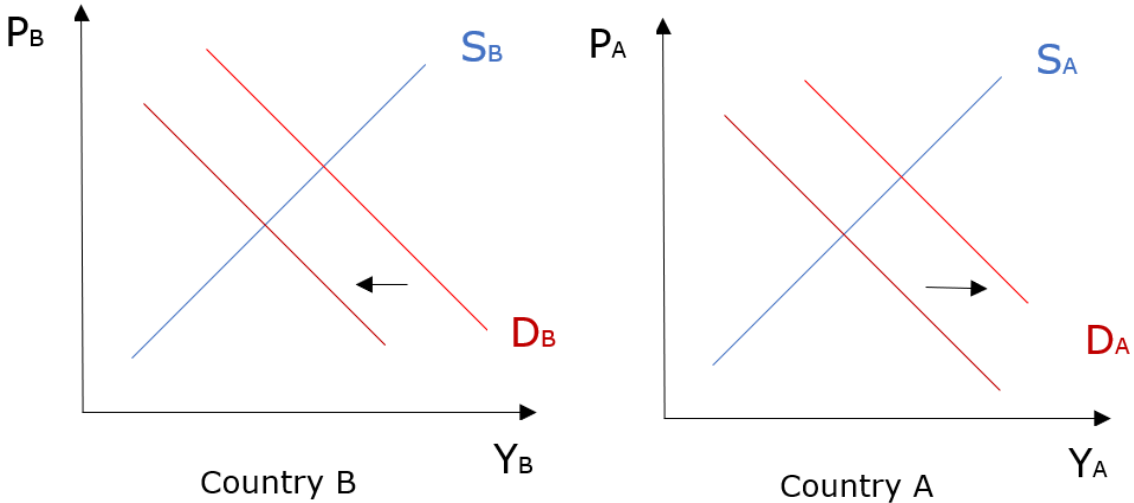

Figure 1: Aggregate demand and supply of countries A and B

The demand curve is the one negatively inclined, which indicates that as domestic prices rise the demand for the domestic good decreases. The supply curve, on the other hand, represents the supply of companies. As prices rise, companies will increase their offer to make more profit. The shift in demand is represented by an upward movement of the demand curve of country A and inverse in country B. Therefore as a result there will be a decrease of the goods in B and an increase in A and almost certainly an increase in unemployment in B and a decrease in A.

The situation after the shock is the following:

Country A - expansion phase, rising price level, accumulation of current account surpluses

Country B - production is lower, unemployment is higher

Both countries will face an adjustment problem. Mundell emphasizes two main mechanisms that will automatically restore balance in the two countries: one is based on wage flexibility and the other one on labor mobility.

Wage Flexibility

If wages in the two countries are flexible, unemployed workers in country B will reduce their wage demands. The opposite will occur in country A where excess demand will push up wages.
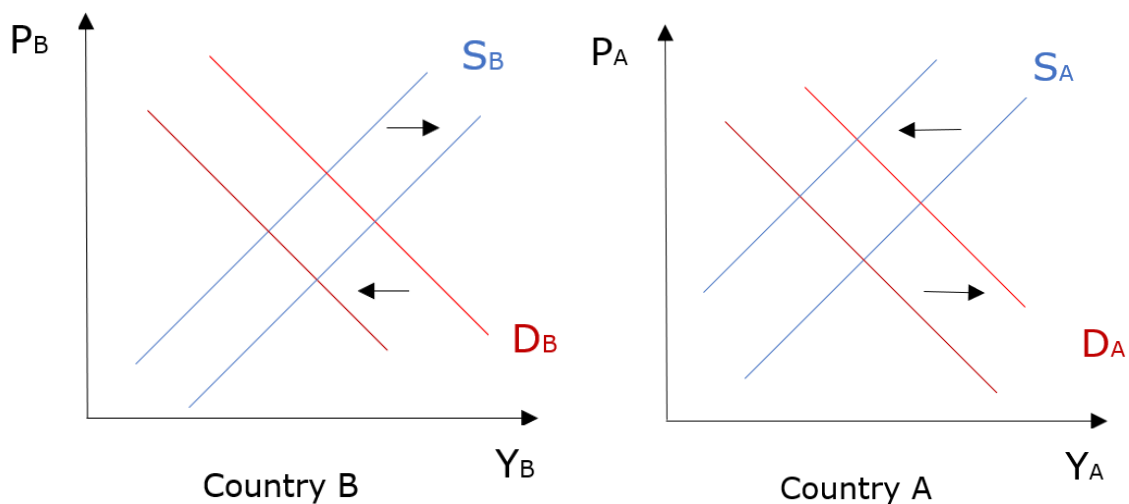

Figure 2: Adjustment mechanism

In Figure 2 we see how the decrease of wages in B shifts the supply curve downwards and in A the same curve moves upwards. The shifts tend to bring the equilibrium back to the initial position. In B, prices' decrease stimulates the demand and it makes products of the country more competitive. The opposite happens in A.

Work mobility

If the two countries have no barriers on work mobility, i.e. workers can freely move from a country to another, workers will move to the country with an excess of labor demand (in this case country A). This eliminates the problem of the reduction and increase of wages, in B the transfer of workers will not decrease the level of wages and in A the inflationary pressures we have seen in the first case disappear. In theory, if wage flexibility and labor mobility are high enough in a monetary union, there is no adjustment problem because despite external factors and changes in consumer preferences, it will automatically come back to the equilibrium point.

2.1.4 Adjustments without monetary union

Now we analyze the situation when the two countries do not form a monetary union, so they have monetary autonomy and they are free to use national monetary policy instruments. There are two main types of monetary policies to be adopted depending on the exchange rate used.

If a flexible exchange rate is adopted, countries can freely decide to raise or decrease the domestic interest rate. In the case analyzed above, country B may decide to decrease its interest rate to stimulate aggregate demand and A may raise it by obtaining opposite effects. This would lead to a depreciation of the currency of B and an appreciation of the currency of A. The simultaneous variation of the interest rate and the exchange rate makes B's goods more attractive and low cost in country A. In the event that the two countries peg the exchange rate, country B could obtain the same effects seen with the flexible exchange rate by devaluing its currency against the currency of A.
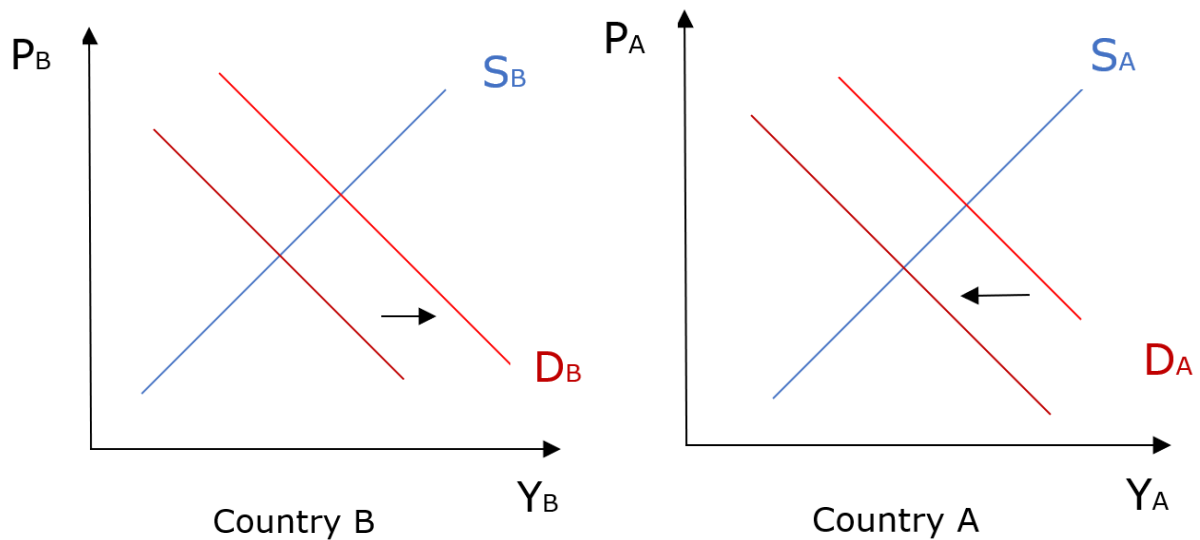
The devaluation of B's currency leads to greater competitiveness of that country's products and stimulates demand from A. In A restrictive monetary policy will shift the demand curve downwards.

2.1.5 Insurance Mechanisms against Asymmetric Shocks

When countries are facing with asymmetric shocks it is important not only that there is flexibility in wages and labor mobility, but also that income transfer mechanisms is fully and properly implemented to mitigate the negative effect of shocks[22]. The problem is how this transfer should be organized. The answer is not obvious, because even the country that must transfer the resources (in this case the country A) must be interested in this transfer. It cannot be taken for granted that A voluntarily transfers resources to B. We can distinguish two insurance systems that help alleviate

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[22] KLETZER, Kenneth M. Monetary union, asymmetric productivity shocks and fiscal insurance: an analytical discussion of welfare issues. In: *Fiscal Aspects of European Monetary Integration.* Cambridge University Press London, 1999.

the problems of countries that are affected by asymmetric shocks. The first is carried out by the public system, the second by the market.

Public insurance system

There are two different public insurance systems. In the first case, there is a government with a centralized budget of the monetary union that automatically redistributes income from surplus countries to deficit countries. The government must have the capacity to impose taxes directly both in A and in B and to redistribute them in the form of public expenditure to residents of the two countries. In this way the private consumption of the two countries remains stable and it can mitigate the effects of asymmetric shocks. In the second case budgets of the countries are not centralized. Here the reduction of aggregate demand generates a reduction in the domestic product that reduces tax revenue; so Country B will increase public expenditure to face the growing unemployment. The opposite occurs in A where it has a budget surplus. This system cannot be used by countries that already have a high public debt cause the repeated asymmetric shocks could induce into a sovereign debt crisis.

Private insurance system

In this system we must assume that the financial market between the two countries is perfectly integrated. It is necessary there is a single risk capital market, a single credit capital market, and the same banking system. In this way, when B's companies are hit by the negative shock, the loss of value of the shares/bonds is also shared with A shareholders/bondholders. On the opposite, A's companies, and therefore their shares / bonds, have an increase in value that is also shared with B shareholders/bondholders. So the negative impact of a shock on the income of B residents is mitigated by the positive impact of the income shock on A residents. In this system

the risk of a negative shock in a nation is shared between all the nations belonging to the union.

2.1.6 McKinnon: openness

McKinnon gives an important contribution to the OCA theory with the publication of his paper "Optimum currency areas" in 1963[23]. McKinnon relates to Mundell's theory by emphasizing the importance of internal and external balances, the need for stability of domestic prices and focusing on the strong influence of the degree of openness. The degree of openness is defined as the ratio of tradeable to nontradeable goods in domestic production and consumption.

$$\text{Openness of Economy} = \frac{\text{tradeable}}{\text{nontradeable}}$$

McKinnon contributes to the OCA theory trying to answer the following questions:

when is the currency devaluation a good policy option? When the devaluation turns out to be ineffective and therefore it is better to have flexible exchange rates?

McKinnon hypothesizes two scenarios. Two distinct currency areas are considered, one of small dimensions in which it is necessary to decide which regime of exchange rates to adopt and the other constituted by the rest of the world. In this case the rest of the world have a single currency. The small currency area has to decide if it is better to peg its currency to the rest of the world or to keep the exchange rate floating. In the first scenario, there is a system of flexible exchange rates where a large portion of domestic consumption is represented by tradable goods (exportable and

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[23] MCKINNON, Ronald I. Optimum currency areas. *The American economic review*, 1963, 53.4: 717-725.

importable), and the prices of non-tradable goods are kept constant in terms of domestic currency. In this way a fluctuation in the domestic exchange rate would lead to a strong variability in the price index, making the currency lose the functions of unit of account and value reserve. With a depreciation of the domestic currency and a consequent increase in prices for tradable goods, the authorities are forced to implement a restrictive monetary and fiscal policy to reduce demand, and to lower the price of non-tradeable goods [24]. In the second scenario McKinnon hypothesizes an opposite situation, in which domestic consumption is represented largely by non-tradable goods. Respect to the first scenario here we have a relatively closed economy, in which a change in exchange rates, which only affects the prices of tradable goods, would not have a great effect on the domestic price index. McKinnon therefore says that the more an economy is open, the greater the incentives to adopt a system of fixed exchange rates. On the opposite, in a closed economy a floating exchange rate system is more efficient because the non-tradeable goods will not be affected by monetary policies.

2.1.7 Kenen: product diversification

Kenen extends Mundell's theory in his paper in 1969.[25] He introduces another useful criterion to define an optimal currency area: product diversification. Kenen believes that the diversification of a country's economy must be relevant in choosing which exchange rate regime to adopt. To better explain the use of this criterion Kenen gives an example. If a country produces and exports only one good, when there is a negative shock to the demand that affects exports, the revenues from exports fall. In this case, if the country adopts a flexible exchange rate regime this effect

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[24] VISSER, Hans, et al. A guide to international monetary economics. *Books*, 1995.
[25] KENEN, Peter. The theory of optimum currency areas: an eclectic view. *Monetary problems of the international economy*, 1969, 45.3: 41-60.

could be mitigated, since a decline in the demand for exportable goods would also reduce the demand for domestic money, and consequently induce a depreciation of the exchange rate. If instead the economy has a system of fixed exchange rates, this mechanism could not be exploited and the adjustment would be a reduction in prices and wages or an increase in unemployment.

Kenen argued that a well-diversified economy also has a diversified export sector. In fact, every industry can be affected by some kind of shock. If these shocks are not correlated, a positive shock in one sector and a negative one in another would balance each other without any effect on total exports, making the economy more stable.[26] Kenen thinks that countries with greater product diversification are better candidates to be part of a monetary union. Instead, countries that have an economy based only on few productive factors must adopt the floating exchange rate to be ready to implement a monetary policy when shocks to aggregate demand occur.

2.2 Literature on benefits of a common currency

In this paragraph it will be shown some evidences on the benefits of a common currency. Authors studied before focus their studies to understand which area could be an optimum currency area. Here we want to further explore the real benefits of joining a common currency area.

2.2.1 Benefits of a common currency

Benefits of a common currency are mainly microeconomic. It can be expected that through the adoption of the common currency there will be a

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[26] LIU, Xiaohui; ZHANG, Jing. Export diversification and exchange-rate regimes: Evidences from 72 developing countries. 2015.

gain in economic efficiency. Efficiency gains are mainly associated with two benefits:

1) Elimination of transaction costs associated to national currencies

2) Elimination of the risk deriving from the uncertainty on future exchange rate movements

Elimination of transaction costs

A direct and tangible benefit from the creation of a monetary union is the elimination of exchange costs and commissions. This gain is relatively small for consumers but can be a good source of savings for companies that trade with neighbouring countries on a daily basis. The common currency makes it possible to carry out transactions between countries without having to change currency, reducing the costs of trade.

The elimination of transaction costs also leads to an indirect gain resulting from greater price transparency. Consumers will be able to make an immediate comparison of the prices of the same unit and they can decide where to make the purchase. This allows to favor the competition and consequently the consumers who will pay lower prices.

Benefits of less uncertainty

Uncertainty about changes in the future exchange rate introduces uncertainty about future business revenues. In a world of risk-adverse individuals this is a loss of welfare. Individuals, with the same expected return, will prefer a less uncertain future return than a more uncertain one. They will be willing to accept a riskier return only if they expect an higher return. Eliminating the exchange risk reduces the amount of uncertainty

and therefore it should increase welfare. There is another area where more substantial gains can be expected from the reduction of exchange rate risk. The uncertainty of the exchange rate introduces uncertainty about future prices of goods and services; economic agents base their production, investment and consumption decisions on the information that the price system provides: if prices become more uncertain the quality of these decisions is worst (Khamfula, Tesfayohannes, 2004). The classic example to explain this theoretical statement is the following. We consider that a company decides to invest in a foreign country. The company will base its decision on many variables including the expected future exchange rate. Suppose then that, after making the investment, it finds out that the exchange rate forecasted was wrong and that this forecast error makes the entire investment unprofitable. These errors are very expensive and it will be more frequent as the uncertainty about the future exchange rate is greater.

There is a second reason why greater price and exchange rate uncertainty can reduce the quality of information provided by the price mechanism.

An increase in risk, due to price uncertainty, will generally increase the real interest rate. This depends on the fact that, when the expected returns on investment projects become more uncertain, who make investments (and are risk-adverse) will demand a higher premium to be compensated for the increased risk of the project. Moreover, in a more risky economic environment, economic agents increase the rate at which future profits are discounted. Thus, the uncertainty of the exchange rate causes a kind of greater systemic risk that increases also the real interest rate. However, higher interest rates cause more problems in the efficient choice of investment projects related to moral hazard and adverse selection phenomena.

In conclusion it can be observed that a common currency can eliminate the exchange risk and consequently lead to a more efficient price mechanism.

2.2.2 Effects on trade

The two main benefits we studied before have also positive effects on trade. The elimination or reduction of transaction costs and the lower uncertainty of the exchange rate stimulates international trade. The empirical evidence for these statements comes directly from Rose (2000). By checking for a variety of other variables that influence trade flows (income, distance, exchange restrictions, linguistic factors), Rose discovered that the pairs of countries that belong to a monetary union record trade flows that are on average about twice the compared to those relating to countries that are not part of a monetary union.

Frankel and Rose (2002) also show that the elimination of transaction costs is a direct channel through which monetary union affects economic growth. Using cross-sectional data, they found that a 1% increase in cross-country trade in a monetary union leads to an increase about 1/3 of a point in per capita income.

2.3 Recent developments in the theory of Monetary Union

Several contributions have been written on the OCA theory and its implications over the last 20 years. After the classical theories of Mundell, McKinnon and Kenen that have been described earlier in this chapter there has been a period of disinterest on the part of scholars in the field. This interest has instead regained strongly when they started talking about European Monetary Union and especially since the successful introduction of the euro in the first twelve countries in January 2002. This Monetary Union has certainly been one of the most important in history for its size, importance and political weight. Therefore the interest of scholars in this field has been renewed and they have been able to evaluate empirically the theory of monetary unions, highlighting the pros and cons that have characterized the history of the Euro.

The theory of the optimum currency area was to be a warning to the European project.

Krugman (2013) makes an analysis of the European project, from how it started to how it was implemented, pointing out that some economists should have foreseen that the euro would be an economic trap.

Krugman tries to propose measures to the European single currency project to make the euro "workable" despite the fact that the area is not an optimal currency area. One answer would be full integration in order to create the United States of Europe. However, this does not seem feasible at least in the short term but could be an issue for future generations. Krugman therefore suggests that the euro could be more "workable" if European leaders committed themselves to the following issues:

1) Europe should provide full support to banks. This should lead to a kind of Europe- wide backing of bank. Krugman brings this example to make the concept clear: if, let's say, a Spanish bank is in trouble in a way that threatens the stability of the system, there should be a

capital injection in exchange for shareholdings by all European governments, rather than a loan to the Spanish government in order to provide the capital injection. The point is that bank bailouts must be separated from the issue of sovereign solvency.

2) Leave the ECB as lender to governments. This certainly creates a problem of moral hazard. However, the trade off is sustainable because eliminating the possibility for the ECB to lend money to governments could be painful and dangerous in case of crisis.

3) As a final point, Krugman argues that Europe must have a higher inflation target. This is because "internal devaluation" through deflation is extremely difficult, and risks political and economic failure. But it also means that the burden of adjustment could be substantially lower if the overall inflation rate of the Eurozone were higher, so that Spain and other peripheral nations could restore competitiveness simply by delaying inflation.

In his work, Krugman argues that the euro was essentially a wrong project but that there is no going back because it would entail huge "transaction costs" as well as all the political implications. The creation of the euro was achieved by ignoring years of theory about optimal currency areas, which proved to be right.

2.3.1 Studies on the European crisis

Paul De Grauwe and Yuemei Ji (2016) wondered whether the European Union is an optimal currency area. In their studies they analyzed how the eurozone crisis has highlighted the critical points of an apparently solid

union like the European one. According to De Grauwe and Yuemei Ji, the Eurozone is not an optimal currency area as it shows some criticalities that are not admissible according to the theory of the OCA. In particular, they highlight the main problem that does not make the European Union an optimal currrency area: The European monetary union lacks a mechanism that can deal with divergent economic developments (asymmetric shocks) between countries. Regarding the authors' explanation of asymmetric shocks, I refer to paragraph 2.1.3 on adjustments in a monetary union. De Grauwe (2011) believes that this fragility emerges from the fact that member countries issue debt in a currency that they cannot control. As a result, the governments of these countries can no longer guarantee that liquidity will always be available for the repayment of public debt. This lack of guarantee by Eurozone governments, in turn, can trigger self-starting liquidity crises (a sudden stop) that can degenerate into solvency problems. This dynamic can force countries into a bad balance characterised by rising interest rates that cause excessive austerity measures, which in turn lead to a deflationary spiral that aggravates the fiscal crisis. The response of the OCA theory to this problem is that member countries should increase flexibility through structural reforms to reduce the adjustment costs of asymmetric shocks. However, flexibility may be a solution in the short term but it becomes critical when it ends. It implies wage cuts, fewer unemployment benefits, lower minimum wages, easier layoffs.

Another reason why such structural reform may not be enough to restore the equilibrium is that the asymmetric shocks that Europe has experienced are different from the asymmetric shocks that we discussed in the OCA theory. From the figure in the below we can see that there was a boom in the period 2000-2007 followed by a negative period.
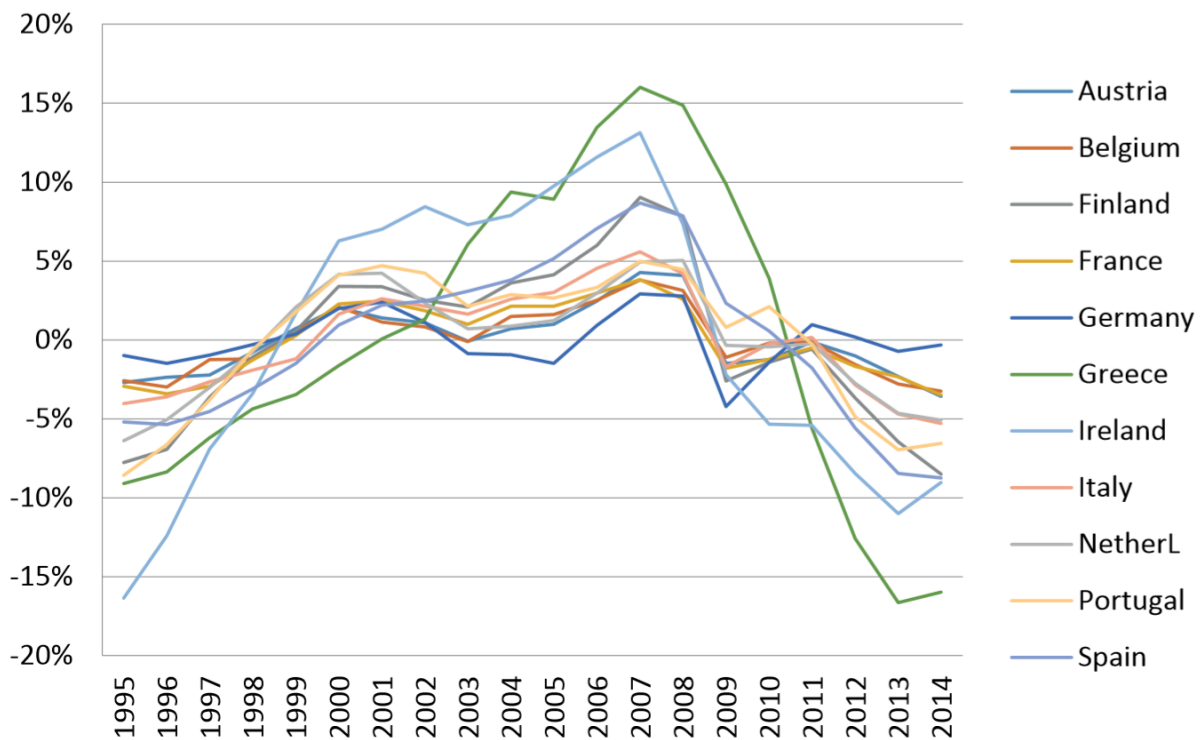
Figure 4: Business cycles in the Eurozone. Eurostat source

If there was asymmetry it was in the amplitudes of the same cycle. Some countries (Ireland, Spain and Greece) experienced a very strong boom and then a deep and prolonged recession. Other countries (Belgium, Germany, France, Italy and the Netherlands) experienced a much more moderate boom period, followed by periods of less intense recession.

De Grauwe and Yuemei Ji therefore propose that a fund should be created to provide stabilisation at European level. This fund could be the existing European Stability Mechanism (ESM). During recessions, the ESM would buy national government bonds and issue an equivalent amount of ESM bonds (Eurobonds) supported by participating member countries. During booms, the ESM would do the opposite, i.e. buy back ESM bonds and sell domestic bonds in bond markets. In this way, there would be no net accumulation of ESM bonds over the economic cycle.

The conclusion reached by De Grauwe and Yuemei ji is that the European Union thus formed is not only not an optimal currency area but is also at

risk of survival. Therefore they propose to follow a strategy of small steps to solve the fragility of Europe. These steps are essentially 2 :

- One is to create some fiscal space at the level of the Eurozone.
- Another small step is to start with a limited programme of debt consolidation.

CHAPTER 3 – Gravity Model of International Trade

3.1 Origin of the model

The gravity model is a method that has increased its popularity over the years to study and model trade flows in international economics. The use of gravity models for the estimation of international trade dates back to 1962, when the economist Jan Tinbergen, winner of the Nobel Prize for Economics in 1969, used his knowledge gained with his PhD in Physics, in the field of international economics. However, its origins date back to the universal gravitation law of physics developed by Isaac Newton in 1687. In physics the law of universal gravitation affirms that in the Universe two bodies attract each other in a way directly proportional to the product of their masses and inversely proportional to their high distance squared.

$$F_{ij} = G \frac{M_i M_j}{d^2_{ij}}$$

- F_{ij} is the attractive force;

- M_i and M_j are the masses of the two objects;

- d_{ij} is the distance between the two objects;

- G is a gravitational constant as a function of the units of mass and force.

This relationship is suitable in various contexts where flows or movements can be studied. The gravity model in international trade therefore brings the universal gravitational law into an economic context.

In 1962 Tinbergen took up the same formula, applying it to international trade flows. This new gravitational equation can be approximated in the following way:

$$F_{ij} = G \frac{M_i^\alpha M_j^\beta}{d^\gamma_{ij}}$$

- F_{ij} is the "flow" of trade from the country of origin i to the country of destination j. We define flow both imports and exports or alternatively, also the total volume of interactions between i and j;

- M_i and M_j are the economic dimensions of the two countries. If F is measured as monetary flow (e.g. export values), then M is usually the gross domestic product or gross national income of each country. If F considers flows of people, then it is more logical for M to indicate the populations;

- d_{ij} is the distance between the two countries (usually measured from capital to capital).

In its basic version, the gravitational model considers only distance and economic size to be relevant for trade. Tinbergen explains that the coefficients α, β and γ can assume values other than 1. This refers to the elasticity of the GDP of the importing country, GDP of the exporting country and the distance elasticity. In the case that α = β = 1 and γ = 2 the equation

used by Tinbergen will correspond to Isaac Newton's law of universal gravitation.

3.2 Model derivation

3.2.1 Anderson

The model proposed by Tinbergen is based on assumptions of physical theory and neglects those of economic theory. The first to formulate a gravity model using economic concepts was Anderson in 1979. In his model Anderson initially assumes that the distance between countries has no influence. He also assumes that the exchange takes place between two countries, each one producing a single good. Each of the two countries produces with different technologies, through a single input (the work) and constant economies of scale. This assumption means that the ratio between output and input used is constant and that the production function for good x_i and good x_j, in the respective countries i and j, results as follows:

$$X_i = \alpha * l_{Xi}$$

$$X_j = \beta * l_{Xj}$$

where l_{xi} and l_{xj} represent the work employed in the production of each of the two goods. Anderson also assumes that the market is in a state of perfect competition.

From the consumer's point of view, a Cobb-Douglas type homothetical preference function is assumed in which the units produced by different companies are perceived by each consumer as identical. The Cobb-Douglas type utility functions are a class of utility functions that can be represented as follows:

$$U : R^N \to R$$

$$U(c_1, \ldots, c_N) = \Pi_{i=1}^{N} c_i^{\alpha_i} \ , \ \alpha_i \geq 0 \ , i = 1,\ldots,N$$

Where U is the level of utility and there the consumption of the good i - esimo, alpha 1, 2, N are constant.

It is therefore possible to derive the so-called pure expenditure system model because the only assumption is related to the share of expenditure for the good produced externally. Defined with bi the share of income spent (equal for each country) for the good of the country i - eximo. The volume of exchange from i to j is defined as $X_{ij} = b_i * E_j$, where E_j is, precisely, the income of the country j.

$$X_{ij} = \frac{Y_i * E_j}{\sum_j E_j}$$

where the denominator component is a constant.

3.2.2 Bergstand

In the years following Anderson's work, the gravity model lost popularity among scholars as the underlying theoretical foundations were criticized (Deardof, 1984). This was because despite an excellent predictive ability there was no satisfactory theoretical motivation.

Bergstrand (1985) tries to formulate a theoretical model different from Anderson's one. Bergstrand uses Ricardo's (1951), Heckscher - Ohlin's (1936) and Chamberlin's (1936) model on the competitive monopoly to build the gravity model.

Ricardo's model taken from Bergstrand is a model in which it is assumed an economic system composed of two sectors and where the only productive factor considered is work with two different goods produced by two different countries with two different unit costs of production. In this model there are two scenarios:

1) In the first case we have a country with a lower cost for the first good and the other country has a lower cost for the second good, therefore a specialization will take place. By specialization we mean a situation where the first country will produce only the first good, and will export part of it to the other country, which, on the other hand, will produce only the second good, exporting part of it to the first country.

2) In the second case, Ricardo assumes that one of the two countries has an advantage in terms of the unit cost of production in both goods. Here the issue of comparative costs is introduced; in this case there is still interest in exchange, but only if the ratio of the production costs of the two goods is different in the two countries, and the reason for international exchange is between the ratio of one country and the other. Under these conditions the country that will produce the good in question will be the country with the lowest comparative cost, while the other country will produce the remaining good and international trade will be non-zero.

Bergstrand adds a third hypothesis to the Ricardian model thanks to Heckscher and Ohlin's theory. In this scenario a second productive factor is assumed, the capital. Here the trade basis is in the difference in capital allocation. The model shows how each country exports the good that requires the largest productive factor of which the country is in excess.

Bergstrand takes up these models on which he makes his assumptions:

- the factors of production are labor and capital, and no longer only labor;

- the perfect mobility of the productive factors is assumed, that is no costs are incurred when entering a new market.

The movement of the factors of production is driven by the need to find the most productive sectors. In fact, by shifting the hypothesis towards a market that is not perfectly competitive, the factors of production will continue to move from one country to another if profit rates and wages are different from one country to another.

Bergstrand also assumes increasing returns to scales (changing Anderson's assumption of constant returns to scales). This assumption owes its basis to Chamberlin's competitive monopoly model (1936).

In conditions of competitive monopoly and increasing returns to scales, a simple equilibrium modelling (Bergstand, 1985) can be described as follows: let us suppose, from the demand side, that in each of the j countries considered the utility function (CES: constant elasticity of substitution) of the consumer is constant and therefore the elasticity of substitution between products is maximum. The amount demanded is constrained by the consumer's income in country j, which depends on level of prices, which are calculated considering:

- tariffs
- transport costs
- the currency exchange rate

By maximizing the utility function under the budget constraint it is possible to determine the quantity (in equilibrium conditions) of goods produced in i and demanded by country j, which depends:

- on the income in j;
- the prices charged in i and j for each individual good;
- The coefficient of consumer elasticity to price changes.

On the supply side, companies are interested in maximizing the profit, which is given by the sum of the price and quantity of goods sold for each good of the product, subtracted by the cost of labour remuneration. The cost of remuneration depends on the amount of labour allocated in country j, which in turn depends on the Constant elasticity of transformation (CET), assumed to be constant (workers have no preference to work in one or the other country). By binding the profit function to the equation that determines CET, we derive the amount of good's supply from i to be exported to j, which will depend on:

- income in i;
- the prices charged in i and j for each individual product k;
- the elasticity coefficients of the CET function.

The optimal quantity of goods exchanged is identifiable by matching the quantity offered and the quantity demanded. This quantity will depend on the CET function for each country, transport costs and tariffs for each pair of countries.

3.2.3 Krugman

Another important contribution to the gravity model theory comes from Krugman (1991). Krugman introduces the "home market effect". This occurs when an industry tends to operate in the country where the consumption of the good it produces is maximum. Krugman explains his theory through a two-country model in which there are two productive sectors: one agricultural and one manufacturing. The agricultural sector is assumed with constant returns to scales and the second with increasing returns to scales.

The utility function is the same for each individual and depends on the quantities consumed in each sector:

$$U = c_M^{\alpha} c_A^{1-\alpha}$$

c_M: sum of the consumption of each good produced in the manufacturing sector

c_A: sum of consumption of each good produced in the agricultural sector

The labour factor is considered to be mobile between the two countries. The total demand for work is given by:

$$M = l_1 + l_2$$

The amount of work necessary for the production of the good i is related to the production of the good itself c_M (for the manufacturing sector) and is given by

$$l_M = \alpha + \beta c_M$$

Given these assumptions, each company that produces a different product will have an interest in maximizing profit and it will define a price

$$p_1 = \left(\frac{\sigma}{\sigma-1}\right)\beta\omega_1 \quad \text{for country 1}$$

$$p_2 = \left(\frac{\sigma}{\sigma-1}\right)\beta\omega_2 \quad \text{for country 2}$$

where ω_1 (ω_2) represents the workers' share of income in country 1 (2). From this profit maximisation model it follows that

$$\frac{p_1}{p_2} = \frac{\omega_1}{\omega_2}$$

In the case of a zero profit economy, we can say that

$$(p_1 - \beta\omega_1)x_1 = \alpha\omega_1$$

which implies that the quantity of output in the two countries is the same and is given by

$$x_1 = x_2 = \frac{\alpha(\sigma - 1)}{\beta}$$

3.3 Recent Theory Developments

This paragraph takes into account the recent developments of the gravity model theory. An important contribution in this sense has been made by Anderson and van Wincoop (2003,2004) with their work on Multilateral resistance terms. However, Anderson and van Wincoop founded their work in response to McCallum's paper (1995). To understand the recent theory it is therefore necessary to explain the latter.

3.3.1 McCallum: The Border Puzzle

Mc Callum focuses his study on the implications of national borders on international trade. Through a study between Canadian and U.S. provinces he reveals that Canadian provinces trade 20 times more with each other than with American states. This phenomenon is described as a "border puzzle". McCallum says that national borders have a significant impact on trade even though they are very close in distance and very similar culturally and economically.

McCallum estimates the flow of trade between Canadian provinces and between U.S. states through gravity equation:

$$lnXij = a + b\ lnY_i + d\ lndist_{ij} +\ eDUMMY_{ij} +\ U_{ij}$$

Where:

X_{ij}: is the trade flow between region i and region j

Y_i and Y_j: are the GDPs of the provinces or states

DUMMYij: it is a dummy variable that assumes value 1 if the regions are 2 provinces of Canada or assumes value 0 if the trade flow is between a province of Canada and a U.S. state.

McCallum argues its results saying that in a world without borders the gravitational model foresees a much stronger trade between provinces and states because of their economic mass. However, current patterns of trade indicate strong interprovincial trade, suggesting that national borders have a great impact on trade and limit trade between countries, even though these countries are very similar in terms of language, economic institutions and culture, as in the case of the United States and Canada.

3.3.2 Anderson and van Wincoop (2004)

Anderson and van Wincoop take McCallum's job as the starting point. To solve the border puzzle they introduce a new variable that until then had not been taken into account: multilateral resistance terms (MRT). The multilateral resistance terms (MRT) are the trade resistance effect that is not due to the barriers related to each pair of countries, but rather to the effect of the third country (rest of the world). Abram (2007) defines bilateral resistance terms (BRT) as a dimension of the barriers to trade among country i and country j, while multilateral resistance terms as the barriers that each country i and j have in trade with the rest of the world. The introduction of multilateral resistance terms has created the possibility to consider the substitutability effect in a country's trade to one partner rather

than another, keeping total trade flows unchanged. There is therefore a compensatory effect: variations affecting the barriers between a pair of countries that lead to a variation in trade within the pair itself. These variations are offset by an increase in trade in other directions. To better understand the concept, think of an exchange situation between Italy and France. A reduction in barriers to trade between France and a third country (e.g. Great Britain) should reduce the multilateral resistance terms of France. In this circumstance, the bilateral resistance terms between Italy and France would seem unchanged, but a decrease in France's multilateral resistance terms causes a decrease in trade between Italy and France at the expense of an increase in trade between France and Great Britain.

Anderson and van Wincoop analyze this phenomenon taking into account the trade flow analyzed by McCallum between the Canadian provinces and the US states. In their work, however, they have also added the trade flow between the various states of the United States. Therefore, a new variable DUMMY has been introduced, which assumes value 1 if the US states trade between them and 0 if US Canada barriers exist.

So when you check for size and distance, the US trades 1.51 times more than the provinces and states. Anderson and van Wincoop suggest that the big difference between Canadian interprovincial trade and US interstate trade arises because of the omitted variable bias - in this context the terms of multilateral resistance. Since Canada is a small open economy and relies heavily on cross-border trade, even an intermediate trade barrier can increase the provinces' multilateral resistance. On the other hand, a border barrier between the US and other trading partners does not have a major effect on the multilateral resistance of states, since the US has a large internal market and the border barrier does not affect inter-state trade.

3.4 Empirical analysis of the model on ECOWAS countries

In this paragraph I explain how I applied the gravity model for international trade in the countries of the future ECOWAS area and the results I have achieved. The objective of this analysis is to show the trade flows among these countries to analyze what are the variables that determine trade. The peculiarity of the area we are going to study is that 8 of these countries (Benin, Burkina Faso, Ivory Coast, Niger, Mali and Togo) are already part of a monetary union (CFA Franc). Unlike most of the literature in this field, this is a new feature. This fact gives us the opportunity to see if the effects of a union in the ECOWAS area can improve the countries' trade as verifiable from the experience of the CFA. I will then explain how I introduced this factor into the model.

3.4.1 Data selection

Trade

The first data necessary to carry out the analysis of the gravitational model is the trade that takes place between the countries of the ECOWAS area. Literature defines the trade variable in different ways: exports, imports, export plus imports, average of exports and imports, average of exports plus imports of i and exports and imports of j (Glick and Rose, 2002). I used the variable of imports. This choice was made because of the difficulty of finding some data for the selected period. Some country export data were not available and this would have caused problems for the model. The imports were downloaded from https://comtrade.un.org/[27]. The value of imports was taken in units of dollars. This variable was introduced in the model using its logarithm. The literature of the gravity model gave two

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[27] The United Nations COMTRADE is the largest depository of data on international trade. It contains over 3 billion data records since 1962. All commodity values are converted from the national currency into US dollars using the exchange rates provided by the reporting countries, or derived from monthly market rates and trade volume.

reasons for using logs in the model. First, it allows to estimate the gravity equation in linear form. Second, it allows to interpret the coefficients as elasticity.
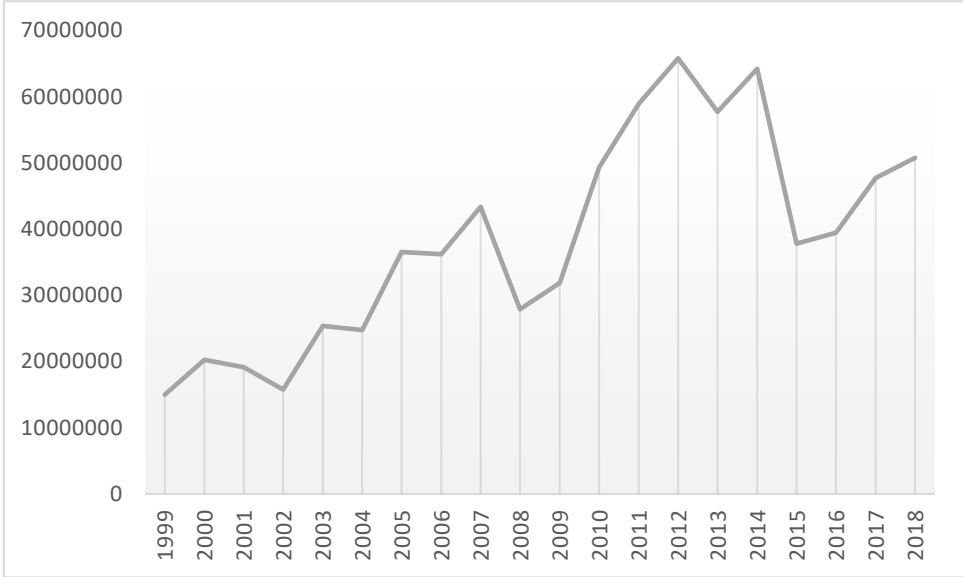
Figure 5: Average imports during the period selected

Figure 5 shows the evolution of imports among the 15 ECOWAS countries over the 20 years selected for the analysis.

GDP

As an economic dimension of the countries, the GDP of the exporting country and the GDP of the importing country were taken into account. The data were downloaded from the International Monetary Fund. The real GDP data reported at current purchasing power parity (PPP) in millions of US$ Also in this case the logarithm of these values was taken.

Distance

The distance is almost always measured with the formula of the "Great Circle" which uses latitudes and longitudes of the most populous cities. This formula approximates the shape of the earth as that of a sphere and calculates the minimum distance of the surface. For empirical analysis the distances to the capitals of the 15 countries have been taken. The data were downloaded from the CEPII database http://www.cepii.fr/.

D. Hummels and P. Krugman justify the importance of distance as follows:

1) Distance is a proxy for transport costs. David Hummels argued that maritime transport costs (transport costs and maritime insurance) can explain much of the negative impact of distance on trade;

2) Distance indicates the time spent during the shipping process. For perishable goods the probability of surviving intact is inversely proportional to transport time. Perishability may include the following risks: a. damage or loss of the good due to weather conditions (bad weather) or maltreatment; b. decomposition and deterioration of organic materials; c. loss of the market (the possible buyer becomes unable or unwilling to make payment).

3) Synchronisation costs. When companies combine different inputs in the production process, they need them to arrive on time or discontinuities will emerge. One possibility to overcome the drawback is to use sheds to maintain stock of each input, but this approach suffers from various disadvantages (increased land costs, technological obsolescence, fashion changes and low pressure on quality control). Having the input source nearby reduces synchronization costs;

4) Communication costs. According to Paul Krugman (1991), the distance 'approximates the possibility of personal contact between managers, customers, and so on.

5) Transaction costs. Distance can also be related to the costs of finding business opportunities and building trust between potential business partners;

6) Cultural distance. Often a greater geographical distance is related to a greater cultural difference.

Estimates of distance effects obtained with gravitational models suggest that a 1% increase in distance between countries is associated with a reduction in trade volume between 0.7% and 1%.

Euro area GDP

In the empirical analysis that will be shown below, an augmented version of the gravity model has been made with the introduction of some variables related to the Euro area. This is because we wanted to analyze if there was a link between the economic policies adopted in the Euro area in the reference period with the effects in the ECOWAS area. In particular, the countries that are part of the CFA Franc should be influenced by these decisions because their currency is linked to the euro. The first variable introduced is therefore the aggregate GDP of the euro area. The data have been downloaded from the Eurostat database. Again, the natural logarithm of these values has been taken.
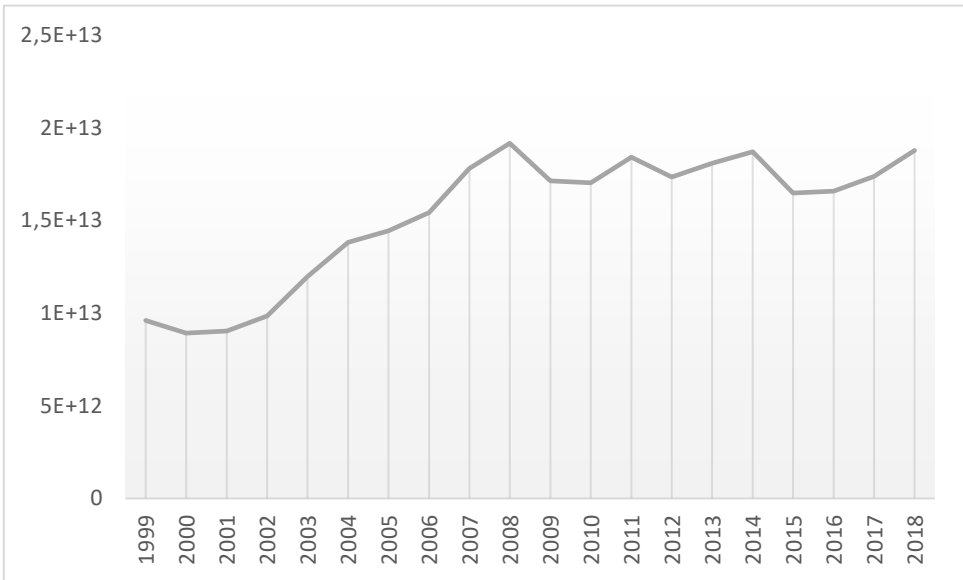

Figure 6: GDP area Euro in the period selected

Figure 5 shows the evolution of the Euro area GDP for the period 1999-2018.

Euribor and Eonia

In addition to the GDP of the Eurozone, two other variables have been introduced that could be an indication of how monetary policies over the years have influenced African countries. The Euribor and Eonia data were taken from the European Central Bank data warehouse. For convenience, annual averages of the Euribor and Eonia rates have been taken at annual maturity considering that all other data (Imports, GDP) have been taken at annual frequency.

3.4.2 Methodology followed for the Intuitive Gravity Model

To estimate the gravity model for international trade, regressions have been made using the Ordinary Least Square as an estimator.

In this first case I decided to build the model based on the intuitive gravity model. Later on a second approach based on Anderson and Van Wincoop's paper (2003) will be tested. The substantial difference between the two approaches is that in the second one the Multilateral Resistance, which we have discussed in the theoretical part of the literature, is also taken into account. In the first case we are going to estimate the Intuitive Gravity Model for ECOWAS countries.

The formula used is as follows:

$$lnYie = \beta 0 + \beta 1 lnGDP_i + \beta 2 lnGDP_e + \beta 3 lnDistij \\ + \beta 4 lnGDP_{euro} + \beta 5 Euribor_{1y} + \beta 6 Eonia_{1y} \\ + DUMMY_{CFA} + \mu ij$$

Where:

- $\beta_0, \beta_1, \beta_2 \dots \beta_n$ are the coefficients to estimate

- $\ln Y_{ie}$: It's the dependent variable. In this case it is the natural logarithm of imports

- lnGDP_i: represents the natural logarithm of the GDP of the importing country.

- lnGDP_e: represents the natural logarithm of the GDP of the exporting country.

- lnGDP_e: represents the natural logarithm of the GDP of the exporting country.

- lnDist: is the natural logarithm of the distance among capitals of the 15 countries.

- lnGDP_euro: represents the natural logarithm of the Eurozone GDP

- Euribor_1Y: is the EURo Inter Bank Offered Rate (Euro Inter Bank Offered Rate) with annual maturity. It is a reference rate, calculated daily, which indicates the average interest rate of financial transactions in Euro among the major European banks.

- Eonia_1Y: The Euro OverNight Index Average represents the weighted average of the overnight rates applied on all unsecured

financing transactions concluded on the interbank market by the main European banks.

- DUMMY_CFA: is a variable included in the equation that assumes a value of 1 if the two countries share the same currency (if both countries are in the CFA Franc area) and it assumes a value of 0 if they do not have the same currency.

The first part of the formula $\beta0 + \beta1 lnGDP_i + \beta2 lnGDP_e + \beta3 lnDist_{ij}$ is the basic Gravity Model of the literature. Here we studied bilateral trade flows with the Importer's GDP, Exporter's GDP and the distance. The second part of the formula $\beta4 lnGDP_{euro} + \beta5 Euribor_{1y} + \beta6 Eonia_{1y}$ we augment the gravity equation taking into account three variables to study the effects of a fixed exchange rate with Euro.

As has been said, the estimator that is used is the ordinary least square (OLS). As the name suggests, the OLS minimizes the sum of square errors. Under certain assumptions, the OLS is a useful statistical tool for hypothesis test and draw inferences.

The OLS-based estimate of the gravity model needs three necessary and sufficient conditions:

1. The errors must have mean zero and be uncorrelated with each of the explanatory variables (the orthogonality assumption).
2. The errors must be independently drawn from a normal distribution with a given (fixed) variance (the homoskedasticity assumption).
3. None of the explanatory variables is a linear combination of other explanatory variables (the full rank assumption).

If all three conditions are satisfied then the OLS estimator is consistent, unbiased and efficient.

	Import	*Distance*	*GDP_i*	*GDP_e*	*GDP_Euro*	*Euribor.1Y*	*Eonia.1Y*
Mean	39297294,5	1271,95149	3,2771E+10	3,0228E+10	1,5161E+13	2,18838315	1,72665531
Standard Error	3149739,67	14,4777087	1761041235	1712827107	6,8895E+10	0,03279374	0,0328225
Median	1673961,5	1095,425	7097198712	5462709498	1,6576E+13	2,2737	2,049
Mode	6482	733,3586	8573159697	4983024408	9,8322E+12	3,4934	3,287
Standard Deviation	160048932	735,661371	8,9484E+10	8,7035E+10	3,5008E+12	1,66636102	1,66782228
Sample Variance	2,5616E+16	541197,652	8,0075E+21	7,575E+21	1,2256E+25	2,77675906	2,78163115
Kurtosis	126,533769	-0,7492691	16,5084274	18,0317663	-0,98206809	-1,27757581	-1,49829704
Skewness	9,89099889	0,40024126	4,10221406	4,26892278	-0,73668201	0,12144479	0,18904792
Range	2886628482	2987,2914	5,6801E+11	5,6827E+11	1,0241E+13	4,9864	4,75
Minimum	11	105,1806	487038822	224446664	8,9159E+12	-0,1729	-0,363
Maximum	2886628493	3092,472	5,685E+11	5,685E+11	1,9157E+13	4,8135	4,387
Sum	1,0147E+11	3284178,75	8,4616E+13	7,8049E+13	3,9145E+16	5650,4053	4458,224
Count	2582	2582	2582	2582	2582	2582	2582

Tab 3: Descriptive statistics of model's variables

In the table above there are the descriptive analyses of the variables used in the model.

3.4.3 Interpretations of results of the Intuitive Gravity Model

The final model presents a panel data of 2582 observations with 7 variables plus the independent variable. Data taken into account are multi-dimensional data involving measurements over time. It contain observations of multiple phenomena obtained over multiple time periods for the same country-pairs. The reference period taken into account for the analysis is from 1999 to 2018. The number of observations should be higher for this period but unfortunately on some occasions it has been difficult to

find data from these countries, especially the older ones. For this reason, a code has been included during the analysis to address the missing values.

	Estimate	Std. Error	t value	Pr(>|t|)	CI Lower	CI Upper
(Intercept)	2.06695	8.3031	0.2489	8.039e-01	-14.4022	18.5361
log(Dist)	-1.11109	0.1970	-5.6394	1.531e-07	-1.5019	-0.7203
log(GDP_i)	0.60778	0.1057	5.7485	9.427e-08	0.3981	0.8175
log(GDP_e)	1.24317	0.1136	10.9412	6.769e-19	1.0178	1.4685
log(GDP_Euro)	-0.76297	0.3280	-2.3258	2.201e-02	-1.4136	-0.1123
Euribor.1Y	-0.04567	0.1392	-0.3282	7.435e-01	-0.3217	0.2304
Eonia.1Y	0.18092	0.1438	1.2578	2.113e-01	-0.1044	0.4662
DUMMY_CFA	1.92399	0.2873	6.6965	1.187e-09	1.3541	2.4939

Multiple R-squared: 0.4781 , Adjusted R-squared: 0.4767
F-statistic: 57.38 on 7 and 102 DF, p-value: < 2.2e-16

Tab 4: my own results from R

All the literature says that from the Gravity Model we should expect that GDP's size is positive correlated with trade flows instead distance between countries is negative correlated always with trade flows (both imports and exports). The results of the analysis show us some expected data after the study of the gravity model literature. In particular, it can be seen that as both GDP increases, trade flows between countries increase, while as the distance increases, the trade flows decreases. Results show a positive coefficient of 0.6 for the GDP of the importing country and a positive coefficient of 1.24 for the exporting country. Distance, on the other hand, has a negative beta of - 1.11. All these data are statistically significant at 1%.

On the other hand, the analysis with European variables shows results with a low predictive value. We expected that these variables are very tentative transmission of ECB to these countries. Total GDP od Euro area, Eonia and Euribor rates are some indicators of the European's economic monetary decisions. The study want to find a correlation between the economic choices of Europe and the effects of these decisions in the CFA zone and

ECOWAS. The coefficients of the Euribor and Eonia rates are particularly low to indicate that when the rates vary there is no great variation in trade flows. Instead, there is a negative correlation of -0.76 between GDP growth in the Eurozone and trade flows in the Ecowas area. GDP variable will be analyzed better later with Multilateral Resistence terms. However, these 3 variables are not statistically significant in the intuitive gravity model.

One possible solution could be that the data are not large enough to verify this factor. Monetary policies require time to be implemented and a lot of time to see their effects. In this case we analyze the effects of monetary policies of one continent in another continent and it is possible that 20 years is not enough as a period of analysis.

The DUMMY variable included instead shows us some interesting results. The coefficient of 1.92 at a level of significance of 1% shows that the countries in the CFA area actually trade much more than the countries outside the Union. This is a finding in favour of future monetary union. With the elimination of barriers between countries now part of different areas, it is reasonable to expect an increase in trade flows.

	Imp	Dist	GDP_i	GDP_e	GDP_Euro	Euribor.1Y	Eonia.1Y
Imp	1	-0,11	0,04	0,57	0,24	-0,19	-0,20
Dist	-0,11	1	0,13	0,11	0,00	0,00	0,00
GDP_i	0,04	0,13	1	0,13	0,55	-0,39	-0,43
GDP_e	0,57	0,11	0,13	1	0,42	-0,31	-0,34
GDP_Euro	0,24	0,00	0,55	0,42	1	-0,52	-0,58
Euribor.1Y	-0,19	0,00	-0,39	-0,31	-0,52	1	0,98
Eonia.1Y	-0,20	0,00	-0,43	-0,34	-0,58	0,98	1

Tab 5: correlation matrix

3.4.4 Methodology followed for The Structural Gravity model

In this second model we use a different methodology following the work of Anderson and Van Wincoop (2004). This model includes the Multilateral Resistence Terms, variables that are not observable and that were previously omitted from the Intuitive gravity model. So we need a way to include the effects of these variables inside the model because they cannot be included as data in the panel. The method that will be used is the fixed effects estimation method.

The model is then rewritten like this:

$$logX_{ie} = C + F_i + F_e + (1 - \sigma)[log\tau_{ie}]$$

$$C = -log Y$$

$$F_i = logY_i - log\prod_i$$

$$F_e = logY_e - logP_e$$

$$log\tau_{ie} = \beta_1 logGDP_{euro} + \beta_2 Euribor_{1y} + \beta_3 Eonia_{1y} + \beta_4 DUMMY_{CFA}$$
$$+ \mu ij$$

where:

C: It is a regression constant. In the literature it is equal to world GDP but for estimation it can simply be captured as a coefficient multiplied by a constant term.

F_i: It represents a full set of importer fixed effects. In order to take in MRT in the model we create a dummy variable for every country that assumes unity each time it appears in the dataset.

F_e: It represents a full set of exporter fixed effects. It is created a set of dummy variables as the importer side.

This approach is seen as a way to quantify all sources of non-observable heterogeneity that are constant for a given importing country for all countries where it exports and constant for a given exporting country for all countries where it is imported. With this methodology we must omit the variables of both countries' GDPs. This is because the model no longer allows variables that vary in the same dimension.

3.4.5 Interpretations of results of the Structured Gravity Model

The model presents a panel data of 2550 observations of 31 variables. We have to compare these results with results from the intuitive model.

	Estimate	Std. Error	t value	Pr(>|t|)	CI Lower	CI Upper
log(Dist)	-0.99571	0.1285	-7.7515	7.030e-12	-1.2505	-0.7409
log(GDP_Euro)	1.89739	0.2475	7.6654	1.076e-11	1.4064	2.3884
Euribor.1Y	-0.15212	0.1364	-1.1150	2.675e-01	-0.4227	0.1185
Eonia.1Y	0.06819	0.1394	0.4890	6.259e-01	-0.2084	0.3448
DUMMY_CFA	1.70119	0.3975	4.2798	4.232e-05	0.9128	2.4896
impBEN	-0.59741	0.4155	-1.4379	1.535e-01	-1.4215	0.2267
impBFA	0.07881	0.5718	0.1378	8.906e-01	-1.0554	1.2130
impCPV	-1.90382	0.5917	-3.2176	1.733e-03	-3.0774	-0.7302
impGMB	-1.99209	0.5110	-3.8981	1.737e-04	-3.0057	-0.9785
impGHA	1.67712	0.4868	3.4450	8.302e-04	0.7115	2.6427
impGIN	-0.45594	0.4710	-0.9680	3.353e-01	-1.3902	0.4783
impCIV	0.95618	0.5850	1.6345	1.052e-01	-0.2042	2.1165

…

Multiple R-squared: 0.6499 , Adjusted R-squared: 0.6456
F-statistic: 654.8 on 31 and 102 p-value: < 2.2e-16

Tab 6: my own results from R

The first notable feature is that the model's explanatory power is higher if we include Fixed Effects. R^2 is 65% against the previous value of 47%. The second thing we can observe is that coefficient are different from the two models. In the Intuitive gravity model the coefficient of distance is -1.11 against -0.995 here. The new data is perfectly in line with the literature. In the previous chapter we see that from empirical analysis the beta of the distance should be between -0,7 and -1.

The most interesting evidence is that the variable of the aggregate annual GDP of Euro's country is statistically significant after the inclusion of fixed effects. The beta is 1.89 positive at a level of significance <1%. There is an

evidence that the CFA franc area and ECOWAS have a positive relationship with Europe. The CFA fanc has benefits to be pegged with Euro.

When Europe has a period of growth demonstrated by GDP growth, the countries pegged to the euro currency show a growth in bilateral trade. As explained in the thesis, the growth of imports and exports from one country to another is certainly a symptom of prosperity and economic growth.

Conclusion

The aim of the paper is to analyze the conditions and the features of the ECOWAS countries that will form the monetary union. The first analysis focuses on the economic characteristics of the countries, trade relations and their dependence on Europe. The picture that emerges is that the whole area is showing important economic growth. Over the last ten years, the growth rate of the total aggregate GDP has been 4.95% per year while that of GDP per capita has been 2.21% per year. However, these countries are still in poverty: often the industrial and services sector is underdeveloped and the primary sector is the main source contributing to GDP and in many areas the level of education is low (in Ivory Coast almost 35% of population has no education). Similar to the European Monetary Union, ECOWAS has also set convergence criteria that countries are required to achieve before monetary integration. The criteria aim to guarantee the credibility, sustainability and stability of the union. Unfortunately, no country has managed to reach all the targets and many of them are far from achieving them.

The empirical analysis aims to analyze the possible effects of selected explanatory variables on import flows between ECOWAS countries. The model used for the analysis is the gravity model for international trade.

For the empirical study is built a dataset of 15 countries. The dependent variable is the import of the importing country i from the exporting country e in year t (with t ranging from 1999 to 2018). The explanatory variables used are the distance between the countries, the GDP of the exporting country, the GDP of the importing country, the currency (whether CFA Franc or not), the GDP of the Euro area and the Euribor and Eonia rates with one year maturity.

The theory has allowed us to make these assumptions:

- The larger the countries are in the economic sense, the higher their GDP, and the more trade flows there will be
- The more distant the countries are, the smaller the trade exchange rates will be
- Countries that do not have trade barriers and that have the same currency will have more trade.
- Greater growth in the euro area should be matched by an increase in the welfare of euro-related CFA countries as well.

By performing the model with an OLS approach, almost all the hypotheses are confirmed.

- GDP betas are positive and significant, respectively 0.6 and 1.24 for the importing and exporting country.
- Distance beta is negative -1.11 and significant
- The dummy variable included to see trade between countries that are already part of a monetary union proves to be consistent and positive. The beta 1.92 makes us understand that countries without trade barriers trade much more
- The explanatory variables included to capture the effects of the European monetary policy transmission are not consistent

In order to improve the results concerning the variables explaining the transmission of European monetary policies, a second model has been constructed following the paper by Anderson and Van Wincoop (2004). Here we include, through dummy variables, the Fixed effects not observable. Thanks to this adjustment, the beta of the explanatory variable of the Euro area GDP is positive (1.89) and significant. With these results it can be concluded that an increase in economic conditions in Europe also has a positive effect in the ECOWAS countries due to the fact that the currencies of eight of these countries are pegged to the euro.

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Summary

The issue of monetary union has always been a fascinating topic that has involved various scholars and academics since the 1950s. Many contributions in this sense have been made to understand what are the main characteristics that a given area must have in order to be considered an optimal currency area and therefore an area where countries would benefit from adopting a common currency.

The aim of this paper is to investigate this phenomenon through the real case of the future ECOWAS Monetary Union. The analysis of a real case gives us the opportunity to understand what are the advantages and disadvantages of creating a common currency, the opportunities it brings and the necessary conditions that countries must respect. The area studied in this thesis includes fifteen West African countries that will form a common monetary area in 2020. Eight of them (Benin, Burkina Faso, Guinea-Bisseau, Ivory Coast, Mali, Niger, Senegal and Togo) are already part of a monetary union with a single currency, the CFA Franc, pegged with a fixed exchange rate with the Euro. The other 7 countries (Cabo Verde, Gambia, Ghana, Guinea, Liberia, Nigeria, Sierra Leone) are neighbouring countries of the CFA area with their own currency.

As most of the recent contributions on the study of Monetary Union use the European Monetary Union as a reference, the study of the thesis topic comes from the idea of using this monetary union to investigate the existing literature applying these concepts to the ECOWAS area which is preparing to join a common monetary zone.

In the first chapter the ECOWAS area is presented. This part describes the economic characteristics of this area, its strengths and weaknesses, its link with France and the Euro, as well as its trade relations with other African countries and with the rest of the world.

The second chapter deals with the major contributions that have been made in the literature of monetary unions. Initially, contributions from the classical theory of Mundell, McKinon and Kenen are studied. Subsequently, modern theory is taken into consideration, mainly by De Grauwe and Krugman, which is able to give an empirical view through the observation of developments in the European Monetary Union.

In the third chapter is introduced the gravity model for international trade. Thanks to this model it is possible to study empirically what are the determinants of trade flows. My empirical analysis therefore aims to understand what are the main determinants that influence international trade between the countries of the Ecowas area.

CHAPTER 1 – 2020 ECOWAS Common Currency project

The Economic Community of West African States (ECOWAS) is a regional group of fifteen countries founded in 1975 with the Treaty of Lagos. Its mission is to promote economic integration in "all fields of economic activity, particularly industry, transport, telecommunications, energy, agriculture, natural resources, commerce, monetary and financial questions, social and cultural matters...". The objective of a monetary union began with the establishment of this regional body.

The idea behind the creation of ECOWAS was born to make any member states, especially countries with a very small and undeveloped domestic market, more competitive. This can be seen in the broader project of raising the population's living standards and maintaining a certain economic stability that has failed in recent years. The vision of the project aims to build strong relationships between member states to contribute the progress and common development. The common area of the ECOWAS aims therefore to help states to emerge with policies aimed at eliminating custom duties and related taxes, establishing a common external tariff,

harmonizing economic and financial policies and, what will be the object of the thesis, with the creation of a single monetary zone.

Hence, the priority of ECOWAS is to create a common market for member countries, where goods can freely circulate without taxes and limitations. Another very important aspect is the promotion of private sector. In particular, governments want to increase incentives and facilities for the development of SMEs within the territory. Last point of the program is the creation of transnational companies and joint ventures to share capital and "knowledge" in order to be more competitive outside the common area.

The desire to create a new monetary area is driven by the criticism of the WAEMU countries against their current currency, the CFA franc. The use of the CFA Franc is voluntary but countries involved must deposit 50% of their foreign currency reserves to the French Treasury to compensate the exchange rate fluctuations. Motivations of countries that do not have a currency pegged to the euro are different. The former British colonies want to join the ECOWAS monetary union because they see it as an opportunity for price stability, greater security and more opportunities for businesses and markets, greater economic stability and growth as well as more integrated markets.

ECOWAS decided to establish six macroeconomic criteria, known as entry requirement, that countries have to follow as a goal for 2020. These criteria are called "Maastricht type" criteria because they are similar, as typology and intentions, to the criteria used by European Union to create the euro zone. The criteria aim to guarantee the credibility, sustainability and stability of the union. This requires setting up certain appropriate macroeconomic targets (otherwise, known as entry requirements) that must be gradually satisfied by all members prior to the formation of a monetary union. One of the reason to set up criteria convergence is to avoid the spillover effect among countries of the same union. After many countries had problems reaching the targets set, the monetary union was

postponed over time. In 2015 it was decided the last date for the introduction of ECO in March / July 2020.

CHAPTER 2 – Literature

The most important and significant contribute to the study of the monetary union is the Optimum Currency Area theory. An Optimum Currency Area (hereinafter referred as "OCA") is defined as "the optimal geographic domain of a single currency, or of several currencies, whose exchange rates are irrevocably pegged and might be unified. The single currency, or the pegged currencies, can fluctuate only in unison against the rest of the world" (Mongelli, 2002).

All the literature and various approaches about the optimum currency area have been inspired by Mundell's paper. Mundell (1961) shows how the characteristics of an economy are decisive for the choice of the exchange rate regime to be adopted. In particular he identifies those conditions for which, under determined assumptions, having different currencies with a floating exchange rate is not the best choice.

McKinnon gives an important contribution to the OCA theory with the publication of his paper "Optimum currency areas" in 1963 . McKinnon relates to Mundell's theory by emphasizing the importance of internal and external balances, the need for stability of domestic prices and focusing on the strong influence of the degree of openness. The degree of openness is defined as the ratio of tradeable to nontradeable goods in domestic production and consumption.

$$\text{Openness of Economy} = \frac{\text{tradeable}}{\text{nontradeable}}$$

Kenen extends Mundell's theory in his paper in 1969. He introduces another useful criterion to define an optimal currency area: product diversification. Kenen believes that the diversification of a country's economy must be

relevant in choosing which exchange rate regime to adopt. He argued that a well-diversified economy also has a diversified export sector. In fact, every industry can be affected by some kind of shock. If these shocks are not correlated, a positive shock in one sector and a negative one in another would balance each other without any effect on total exports, making the economy more stable. Kenen thinks that countries with greater product diversification are better candidates to be part of a monetary union. Instead, countries that have an economy based only on few productive factors must adopt the floating exchange rate to be ready to implement a monetary policy when shocks to aggregate demand occur.

After the classical theories of Mundell, McKinnon and Kenen that have been described earlier there has been a period of disinterest on the part of scholars in the field. This interest has instead regained strongly when they started talking about European Monetary Union and especially since the successful introduction of the euro in the first twelve countries in January 2002. Krugman (2013) makes an analysis of the European project, from how it started to how it was implemented, pointing out that some economists should have foreseen that the euro would be an economic trap. Krugman tries to propose measures to the European single currency project to make the euro "workable" despite the fact that the area is not an optimal currency area. He argues that the euro was essentially a wrong project but that there is no going back because it would entail huge "transaction costs" as well as all the political implications. The creation of the euro was achieved by ignoring years of theory about optimal currency areas, which proved to be right.

About the studies on the European crisis Paul De Grauwe and Yuemei Ji (2016) wondered whether the European Union is an optimal currency area. In their studies they analyzed how the eurozone crisis has highlighted the critical points of an apparently solid union like the European one. According to them, the Eurozone is not an optimal currency area as it shows some criticalities that are not admissible according to the theory of the OCA. In

particular, they highlight the main problem that does not make the European Union an optimal currrency area: The European monetary union lacks a mechanism that can deal with divergent economic developments (asymmetric shocks) between countries. The conclusion reached by De Grauwe and Yuemei ji is that the European Union thus formed is not only not an optimal currency area but is also at risk of survival. Therefore they propose to follow a strategy of small steps to solve the fragility of Europe. These steps are essentially 2 : One is to create some fiscal space at the level of the Eurozone and to start with a limited programme of debt consolidation.

CHAPTER 3 – Gravity Model of International Trade

The gravity model is a method that has increased its popularity over the years to study and model trade flows in international economics. The use of gravity models for the estimation of international trade dates back to 1962, when the economist Jan Tinbergen, winner of the Nobel Prize for Economics in 1969, used his knowledge gained with his PhD in Physics, in the field of international economics. However, its origins date back to the universal gravitation law of physics developed by Isaac Newton in 1687. In physics the law of universal gravitation affirms that in the Universe two bodies attract each other in a way directly proportional to the product of their masses and inversely proportional to their high distance squared.

$$F_{ij} = G \frac{M_i M_j}{d^2{}_{ij}}$$

- F_{ij} is the attractive force;
- M_i and M_j are the masses of the two objects;

- d_{ij} is the distance between the two objects;

- G is a gravitational constant as a function of the units of mass and force.

This relationship is suitable in various contexts where flows or movements can be studied. The gravity model in international trade therefore brings the universal gravitational law into an economic context.

In 1962 Tinbergen took up the same formula, applying it to international trade flows. This new gravitational equation can be approximated in the following way:

$$F_{ij} = G \frac{M_i^\alpha M_j^\beta}{d^\gamma{}_{ij}}$$

- F_{ij} is the "flow" of trade from the country of origin i to the country of destination j. We define flow both imports and exports or alternatively, also the total volume of interactions between i and j;

- M_i and M_j are the economic dimensions of the two countries. If F is measured as monetary flow (e.g. export values), then M is usually the gross domestic product or gross national income of each country. If F considers flows of people, then it is more logical for M to indicate the populations;

- d_{ij} is the distance between the two countries (usually measured from capital to capital).

In its basic version, the gravitational model considers only distance and economic size to be relevant for trade. Tinbergen explains that the

coefficients α, β and γ can assume values other than 1. This refers to the elasticity of the GDP of the importing country, GDP of the exporting country and the distance elasticity. In the case that α = β = 1 and γ = 2 the equation used by Tinbergen will correspond to Isaac Newton's law of universal gravitation.

The first to formulate a gravity model using economic concepts was Anderson in 1979. After him, other important contributions come from Bergstand (1985) and Krugman (1991) with the introduction of the "home market effect". Important authors for the recent contributions are McCallum (1995) with the border puzzle and Anderson and Van Wincoop (2004) for the introduction of the multilateral resistance terms.

Mc Callum focuses his study on the implications of national borders on international trade. Through a study between Canadian and U.S. provinces he reveals that Canadian provinces trade 20 times more with each other than with American states. This phenomenon is described as a "border puzzle". McCallum says that national borders have a significant impact on trade even though they are very close in distance and very similar culturally and economically.

McCallum estimates the flow of trade between Canadian provinces and between U.S. states through gravity equation:

$$lnXij = a + b \, lnY_i + d \, lndist_{ij} + \, eDUMMY_{ij} + \, U_{ij}$$

Anderson and van Wincoop take McCallum's job as the starting point. To solve the border puzzle they introduce a new variable that until then had not been taken into account: multilateral resistance terms (MRT). The multilateral resistance terms (MRT) are the trade resistance effect that is not due to the barriers related to each pair of countries, but rather to the effect of the third country (rest of the world). Anderson and van Wincoop analyze this phenomenon taking into account the trade flow analyzed by McCallum between the Canadian provinces and the US states. In their work,

however, they have also added the trade flow between the various states of the United States. Therefore, a new variable DUMMY has been introduced, which assumes value 1 if the US states trade between them and 0 if US Canada barriers exist. So when you check for size and distance, the US trades 1.51 times more than the provinces and states. Anderson and van Wincoop suggest that the big difference between Canadian interprovincial trade and US interstate trade arises because of the omitted variable bias - in this context the terms of multilateral resistance. Since Canada is a small open economy and relies heavily on cross-border trade, even an intermediate trade barrier can increase the provinces' multilateral resistance. On the other hand, a border barrier between the US and other trading partners does not have a major effect on the multilateral resistance of states, since the US has a large internal market and the border barrier does not affect inter-state trade.

Empirical Gravity model for international Trade

To estimate the gravity model for international trade, regressions have been made using the Ordinary Least Square as an estimator.

In this first case I decided to build the model based on the intuitive gravity model. Later on a second approach based on Anderson and Van Wincoop's paper (2003) will be tested. The substantial difference between the two approaches is that in the second one the Multilateral Resistance, which we have discussed in the theoretical part of the literature, is also taken into account. In the first case we are going to estimate the Intuitive Gravity Model for ECOWAS countries.

The formula used is as follows:

$$lnYie = \beta 0 + \beta 1 lnGDP_i + \beta 2 lnGDP_e + \beta 3 lnDistij$$
$$+ \beta 4 lnGDP_{euro} + \beta 5 Euribor_{1y} + \beta 6 Eonia_{1y}$$
$$+ DUMMY_{CFA} + \mu ij$$

Where:

- $\beta_0, \beta_1, \beta_2 \dots \beta_n$ are the coefficients to estimate
- $\ln Y_{ie}$: It's the dependent variable. In this case it is the natural logarithm of imports
- lnGDP_i: represents the natural logarithm of the GDP of the importing country.
- lnGDP_e: represents the natural logarithm of the GDP of the exporting country.
- lnDist: is the natural logarithm of the distance among capitals of the 15 countries.
- lnGDP_Euro: represents the natural logarithm of the Eurozone GDP
- Euribor_1Y: is the EURo Inter Bank Offered Rate (Euro Inter Bank Offered Rate) with annual maturity. It is a reference rate, calculated daily, which indicates the average interest rate of financial transactions in Euro among the major European banks.
- Eonia_1Y: The Euro OverNight Index Average represents the weighted average of the overnight rates applied on all unsecured financing transactions concluded on the interbank market by the main European banks.
- DUMMY_CFA: is a variable included in the equation that assumes a value of 1 if the two countries share the same currency (if both countries are in the CFA Franc area) and it assumes a value of 0 if they do not have the same currency.

The model presents a panel data of 2590 observations with 7 variables plus the independent variable. The reference period taken into account for the analysis is from 1998 to 2018.

	Estimate	Std. Error	t value	Pr(>|t|)	CI Lower	CI Upper
(Intercept)	2.06695	8.3031	0.2489	8.039e-01	-14.4022	18.5361
log(Dist)	-1.11109	0.1970	-5.6394	1.531e-07	-1.5019	-0.7203
log(GDP_i)	0.60778	0.1057	5.7485	9.427e-08	0.3981	0.8175
log(GDP_e)	1.24317	0.1136	10.9412	6.769e-19	1.0178	1.4685
log(GDP_Euro)	-0.76297	0.3280	-2.3258	2.201e-02	-1.4136	-0.1123
Euribor.1Y	-0.04567	0.1392	-0.3282	7.435e-01	-0.3217	0.2304
Eonia.1Y	0.18092	0.1438	1.2578	2.113e-01	-0.1044	0.4662
DUMMY_CFA	1.92399	0.2873	6.6965	1.187e-09	1.3541	2.4939

Multiple R-squared: 0.4781 , Adjusted R-squared: 0.4767
F-statistic: 57.38 on 7 and 10² DF, p-value: < 2.2e-16

Tab 1: my own results from R

All the literature says that from the Gravity Model we should expect that GDP's size is positive correlated with trade flows instead distance between countries is negative correlated always with trade flows (both imports and exports). The results of the analysis show us some expected data after the study of the gravity model literature. In particular, it can be seen that as both GDP increases, trade flows between countries increase, while as the distance increases, the trade flows decreases. Results show a positive coefficient of 0.6 for the GDP of the importing country and a positive coefficient of 1.24 for the exporting country. Distance, on the other hand, has a negative beta of - 1.11. All these data are statistically significant at 1%.

On the other hand, the analysis with European variables shows results with a low predictive value. We expected that these variables are very tentative transmission of ECB to these countries. Total GDP od Euro area, Eonia and Euribor rates are some indicators of the European's economic monetary decisions. The study want to find a correlation between the economic choices of Europe and the effects of these decisions in the CFA zone and ECOWAS. The coefficients of the Euribor and Eonia rates are particularly low to indicate that when the rates vary there is no great variation in trade

flows. Instead, there is a negative correlation of -0.76 between GDP growth in the Eurozone and trade flows in the Ecowas area. GDP variable will be analyzed better later with Multilateral Resistence terms. However, these 3 variables are not statistically significant in the intuitive gravity model. One possible solution could be that the data are not large enough to verify this factor. Monetary policies require time to be implemented and a lot of time to see their effects. In this case we analyze the effects of monetary policies of one continent in another continent and it is possible that 20 years is not enough as a period of analysis. The DUMMY variable included instead shows us some interesting results. The coefficient of 1.92 at a level of significance of 1% shows that the countries in the CFA area actually trade much more than the countries outside the Union. This is a finding in favour of future monetary union. With the elimination of barriers between countries now part of different areas, it is reasonable to expect an increase in trade flows.

In this second model we use a different methodology following the work of Anderson and Van Wincoop (2004). This model includes the Multilateral Resistence Terms, variables that are not observable and that were previously omitted from the Intuitive gravity model. So we need a way to include the effects of these variables inside the model because they cannot be included as data in the panel. The method that will be used is the fixed effects estimation method.

The model presents a panel data of 2550 observations of 31 variables. We have to compare these results with results from the intuitive model.

	Estimate	Std. Error	t value	Pr(>|t|)	CI Lower	CI Upper
log(Dist)	-0.99571	0.1285	-7.7515	7.030e-12	-1.2505	-0.7409
log(GDP_Euro)	1.89739	0.2475	7.6654	1.076e-11	1.4064	2.3884
Euribor.1Y	-0.15212	0.1364	-1.1150	2.675e-01	-0.4227	0.1185
Eonia.1Y	0.06819	0.1394	0.4890	6.259e-01	-0.2084	0.3448
DUMMY_CFA	1.70119	0.3975	4.2798	4.232e-05	0.9128	2.4896
impBEN	-0.59741	0.4155	-1.4379	1.535e-01	-1.4215	0.2267
impBFA	0.07881	0.5718	0.1378	8.906e-01	-1.0554	1.2130
impCPV	-1.90382	0.5917	-3.2176	1.733e-03	-3.0774	-0.7302
impGMB	-1.99209	0.5110	-3.8981	1.737e-04	-3.0057	-0.9785
impGHA	1.67712	0.4868	3.4450	8.302e-04	0.7115	2.6427
impGIN	-0.45594	0.4710	-0.9680	3.353e-01	-1.3902	0.4783
impCIV	0.95618	0.5850	1.6345	1.052e-01	-0.2042	2.1165

…

Multiple R-squared: 0.6499 , Adjusted R-squared: 0.6456
F-statistic: 654.8 on 31 and 102 p-value: < 2.2e-16

Tab 2: my own results from R

The first notable feature is that the model's explanatory power is higher if we include Fixed Effects. R^2 is 65% against the previous value of 47%. The second thing we can observe is that coefficient are different from the two models. In the Intuitive gravity model the coefficient of distance is -1.11 against -0.995 here. The new data is perfectly in line with the literature. In the previous chapter we see that from empirical analysis the beta of the distance should be between -0,7 and -1.

The most interesting evidence is that the variable of the aggregate annual GDP of Euro's country is statistically significant after the inclusion of fixed effects. The beta is 1.89 positive at a level of significance <1%. There is an evidence that the CFA franc area and ECOWAS have a positive relationship with Europe. The CFA fanc has benefits to be pegged with Euro.

When Europe has a period of growth demonstrated by GDP growth, the countries pegged to the euro currency show a growth in bilateral trade. As

explained in the thesis, the growth of imports and exports from one country to another is certainly a symptom of prosperity and economic growth.

Conclusion

The aim of the paper is to analyze the conditions and the features of the ECOWAS countries that will form the monetary union. The first analysis focuses on the economic characteristics of the countries, trade relations and their dependence on Europe. The picture that emerges is that the whole area is showing important economic growth. Over the last ten years, the growth rate of the total aggregate GDP has been 4.95% per year while that of GDP per capita has been 2.21% per year. However, these countries are still in poverty: often the industrial and services sector is underdeveloped and the primary sector is the main source contributing to GDP and in many areas the level of education is low (in Ivory Coast almost 35% of population has no education). Similar to the European Monetary Union, ECOWAS has also set convergence criteria that countries are required to achieve before monetary integration. The criteria aim to guarantee the credibility, sustainability and stability of the union. Unfortunately, no country has managed to reach all the targets and many of them are far from achieving them.

The empirical analysis aims to analyse the possible effects of selected explanatory variables on import flows between ECOWAS countries. The model used for the analysis is the gravity model for international trade. For the empirical study is built a dataset of 15 countries. The dependent variable is the import of the importing country i from the exporting country e in year t (with t ranging from 1999 to 2018). The explanatory variables used are the distance between the countries, the GDP of the exporting country, the GDP of the importing country, the currency (whether CFA Franc or not), the GDP of the Euro area and the Euribor and Eonia rates with one year maturity. The theory has allowed us to make these assumptions:

- The larger the countries are in the economic sense, the higher their GDP, and the more trade flows there will be
- The more distant the countries are, the smaller the trade exchange rates will be
- Countries that do not have trade barriers and that have the same currency will have more trade.
- Greater growth in the euro area should be matched by an increase in the welfare of euro-related CFA countries as well.

By performing the model with an OLS approach, almost all the hypotheses are confirmed.

- GDP betas are positive and significant, respectively 0.6 and 1.24 for the importing and exporting country.
- Distance beta is negative -1.11 and significant
- The dummy variable included to see trade between countries that are already part of a monetary union proves to be consistent and positive. The beta 1.92 makes us understand that countries without trade barriers trade much more
- The explanatory variables included to capture the effects of the European monetary policy transmission are not consistent

In order to improve the results concerning the variables explaining the transmission of European monetary policies, a second model has been constructed following the paper by Anderson and Van Wincoop (2004). Here we include, through dummy variables, the Fixed effects not observable. Thanks to this adjustment, the beta of the explanatory variable of the Euro area GDP is positive (1.89) and significant. With these results it can be concluded that an increase in economic conditions in Europe also has a positive effect in the ECOWAS countries due to the fact that the currencies of eight of these countries are pegged to the euro.