



LUND UNIVERSITY
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Emptying MFA 34

The European fishing fleet and its impact on West African fish consumption

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Abstract

Fish, seafood and fishery products are important sources of animal protein for people living in coastal states of Western Africa. High levels of activity in the West African water puts heavy pressure on fish stocks that are already on their way to being overexploited. This paper investigates the impact European fishing fleets operating in West African coastal waters has on fish consumption in the region. It also examines how fishing cooperation agreements between the EU and the coastal states are designed and whether or not the compensations paid by the EU actually benefit the West African populations.

Keywords: *Consumption, Fisheries Partnership Agreements, Common Fisheries Policy, Exclusive Economic Zone, Coastal States, European Union, Local Production*

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Abbreviations

ACP	Africa, Caribbean and Pacific Group of States
CCSBT	Commission for the Conservation of Southern Bluefin Tuna
CFP	Common Fisheries Policy
EC	European Communities
ECOWAS	Economic Community of Western African States
ECU	European Currency Unit
EEZ	Exclusive Economic Zone
EU	European Union
FAO	Food and Agricultural Organization of the United Nation
FIFG	Financial Instrument for Fisheries Guidance
FPA	Fisheries Partnership Agreement
IFQ	Individual Fishing Quotas
IWC	International Whaling Commission
MAGP	Multi-Annual Guidance Plans
RFB	Regional Fishery Bodies
SSA	Sub-Saharan Africa
TAC	Total Allowable Catches
UNCLOS	United Nations Convention on the Law of the Sea
UN-OHRLLS	Office of the High Representative for the Least Developed Countries, Landlocked Developing Countries and the Small Island Developing States

1. Introduction

Countries in Sub-Saharan Africa (SSA) are among the poorest countries in the world. Since 1981 the rate of people living under \$ 1.25 a day has shown no sustained decline and is still around 50 percent. In absolute terms, the number of poor has almost doubled (World Bank, 2010)¹. The latest projections from the World Bank show that SSA will be the only region failing to meet the poverty reduction goals of the Millennium Development Goals by 2015 (World Bank, 2010). In five years, an estimated 366 million people will be living on less than \$ 1.25 a day, which will represent around 38% of the population in the region. Malnutrition, which is a major health problem in Sub-Saharan Africa, is directly linked to poverty. Together with inadequate water supply it increases the risk for diseases and death (WHO, 2001)².

Many of the smaller coastal states of Sub-Saharan Africa, like Guinea-Bissau, Liberia, Sierra Leone and Togo, are found near the very bottom of the GDP per capita index (CIA, 2010)³. The fish industry in these countries employs a large number of people and supplies the population with an important source of protein. Overfished coastal waters and depleting fish stocks could result in a decrease in availability and an even worse situation for populations already living on minimal resources. Eleven of the eighteen countries included in this paper are on the UN-OHRLS's list of least developed countries (UN, 2009)⁴. Six of the eleven currently have or have had Fisheries Partnership Agreements with the EU. Each agreement is signed following negotiations between a joint community of some of the world's largest economies and the individual underdeveloped coastal state.

1.1 The importance of marine resources

Fish is a main source of animal protein for the populations in many of the West African nations. In smaller coastal nations, where alternative protein sources are scarce or too expensive, fish can contribute to more than sixty percent of all animal protein intakes (Gambia 61.7%, Equatorial Guinea 61.9%, Sierra Leone 63%, Ghana 63.2%) (European Commission, 2000)⁵. Fish is also a good source of calories and minerals that can be of great importance when preventing or treating malnutrition⁶.

For many of the West African coastal states fish and fish products are also important export goods. For example, fish and vegetable oil represent forty percent of the export earnings in Senegal (Todaro & Smith, 2006)⁷. Export earnings in foreign exchange are especially attractive to countries that run current account deficits and have large debts to other countries. Foreign exchange can also be used for importing goods or services the country itself does not produce. Industrial machinery, medical

¹ Global Monitoring Report 2010: The MDGs after the Crisis, p. 102

² Turning the tide of malnutrition: Responding to the challenge of the 21st century, p. 3

³ CIA World Factbook 2010. Country Comparison: GDP – Per Capita (PPP)

⁴ World Statistics Pocketbook 2008: Least Developed Countries

⁵ Communication from the Commission to the Council and the European Parliament, p. 9

⁶ Fish and Food Security in Africa, p. 3

⁷ Todaro & Smith (2006), p. 581

equipment and electronic appliances are examples of goods these countries might be in great need of. But sometimes the desire for foreign exchange has very undesirable effects. In the Senegalese case the large amount of exports of fishery products has led to a protein deficit in the countryside as exports has disrupted the domestic supplies of cheap fish (Alder & Sumalia, 2004)⁸.

Economists have for years stressed the importance for Least Developed Countries to domestically refine natural resources to add value to products that are internationally competitive and thereby increase export earnings⁹. But LDC's are typically characterized by having limited possibilities of making the necessary investments to improve economic growth in such industries. In countries where poverty and public health get prioritized governments have a hard time justifying investments in infrastructure. Reports estimates the value added from processing marine resources harvested in West African waters to approximately € 100 million per year (2001)¹⁰. The value added alone covers two thirds of the budget for Fisheries Agreements of 2010, which are set to € 151 million (EU, 2010)¹¹.

1.2 EU fishing fleets in West African waters

Fish and seafood caught in waters of developing countries represent between 50 and 60 percent of the value of the total global catches, and more than fifty percent of the catches in African, Caribbean and Pacific (ACP) countries are caught by foreign vessels (European Commission, 2000)¹².

EU's Common Agricultural Policy (CAP) has, according to Krugman and Obstfeld (2006), turned into a massive export subsidy program¹³. The surplus produced gets heavily subsidized and exported all around the world increasing its demand and competitiveness over local agricultural produce. The Common Fisheries Policy (CFP) has the same legal basis as the CAP but work in a different way¹⁴. Instead of a surplus of fish on the European market, the European waters cannot supply enough fish for the population of the union. Therefore the subsidies consist of compensations paid by the union to West African coastal states in return for fishing rights in their Exclusive Economic Zones (EEZs). The Partnership Fisheries Agreements (FPA) runs for a predetermined time period in which the union can send a set number of vessels into the region. Each vessel owner then pays a smaller fee upon entering the waters in order to give them the right to extract a more or less unlimited amount of fish and seafood. The FPAs has fixed quantity quotas (except for tuna vessels, which are set to a fixed number of vessels) but though the technology exists, and there have been improvements to the arrangements for the Union vessel register, research shows that capture data from many areas are incomplete (Hatcher,

⁸ Alder & Sumalia (2004), p.171

⁹ Todaro and Smith (2006), p. 589

¹⁰ Kaczynski & Fluharty (2001), p. 77

¹¹ Budget no. 10 of the European Union for the financial year of 2009, p. 171

¹² Fisheries and Poverty Reduction (2000), p.4

¹³ Krugman and Obstfeld (2006), p. 187

¹⁴ Nello (2005), p. 244

1999)¹⁵. Inadequate regulations and low fees for fishing licenses make fishing in West African waters a lucrative business for EU vessels.

1.3 Negotiating agreements

In the public debate there are opinions saying that contracting countries are losing out, being a weaker party at agreement negotiations (Cullberg, 2009)¹⁶. Because of the absence of cooperation between the coastal states at the negotiations the compensation can vary substantially from country to country with the country most desperate for foreign exchange drawing the shortest straw. Mauritania and Guinea-Bissau are currently almost completely dependent on agreement compensation¹⁷. Corrupt government officials have in some cases even allowed fleets to operate outside the terms of the agreements, extracting more fish than what they initially agreed on¹⁸. In 1975 the Economic Community of Western African States (ECOWAS) was founded bringing together sixteen nations of Western Africa to improve trade within the region and create a joint trade community towards the rest of the world. The creation of ECOWAS unfortunately failed to improve the community's negotiation status, largely due to the member governments being unable to cooperate. Extreme political instability in many of the countries was part of the reason the trade agreements failed (Ray, 1998)¹⁹.

Sub-Saharan governments fight with high levels of corruption and there are lots of examples of when compensation or aid ends up in the wrong hands instead of reaching the population or being invested in the designated sector²⁰. Most times corruption leads to the improved wellbeing of few and the general public ending up no better off or worse. In the case of compensation trickling down to the whole population or being invested in the fishery sector most likely both improve the lives of the poor. Botswana, South Africa and Namibia have worked hard to fight corruption and according to the Transparency International's Corruption Perception Index (CPI) they are succeeding. However, most of the countries in Sub-Saharan Africa end up in the bottom of the list consisting of 180 positions.

1.4 The depleting fish stocks

The main cause for the decline in fishing productivity worldwide is overfishing. The latest reports from the Food and Agricultural Organization of the United Nations (FAO) estimate that an incredible 52% of the worldwide marine resources were fully exploited. Another 28% were either overexploited (19%) or depleted (9%) (FAO, 2009)²¹. The most common solution for decreasing productivity in regions with high fish depletion is to relocate part of the fishing fleet to other areas so that the remaining vessels can keep extracting reasonably large yearly catches. But by doing so, one is only postponing the problem and still

¹⁵ Hatcher (1999), p.136

¹⁶ Cullberg (2009), p. 50

¹⁷ Cullberg (2009), p. 24

¹⁸ Alder & Sumalia (2004), p. 170

¹⁹ Ray (1998), p.745

²⁰ Collier (2007), p. 99

²¹ Sofia 2008

contributing to overfishing but now on a larger, global scale. The global fishing fleets of today are two to three times as large as needed for our oceans to sustainably support and when production efficient fleets from the western world transfer to waters outside smaller coastal states with underdeveloped fisheries they could also pose a threat to domestic production and consumption²².

1.5 Related studies

Recent research has been evaluating EU's attempts to solve the problem of overexploited fish stocks in European waters. Future unemployment and decommission of vessels have been postponed by introducing subsidy programs and relocating vessels to waters outside Africa (Porter, 1997)²³.

Porter's analysis of Euro-African fishing agreements' impact on fish stocks in African waters identifies the political and economic aspects of the agreements from both European and African perspectives. He further acknowledges the environmental impacts subsidies might pose on the African waters if foreign vessels are allowed to maintain their fishing efforts. Porter recommends a new international rule that prohibits subsidized fishing access for national fleets. The absence of adequate license fees and royalties encourage foreign fleets to overharvest the resources, contributing to overfishing. He also emphasizes the importance of a joint negotiation policy for the African states so they can improve their negotiation powers. Porter (2003) also categorized the different kinds of subsidies in order to find out the degree of impact on fish stocks. The report could therefore be used when designing new subsidy programs or when restructuring already existing subsidy programs that have a negative impact on the marine environment. In the following report, Porter (2004) included subsidy impact on the different sub-groups within the fishing industry. The report further clarifies which subsidies are worth investing in and which have the biggest negative impact.

By using regional catch data, value of fisheries agreements and market price of fish, Kaczynski and Fluharty (2001) were able to estimate how much money West African nations miss out on by letting European vessels extract their resources and then selling them on the European market²⁴. An illustrative example is Guinea-Bissau who received € 8.5 million in compensation in 1997 for their Fisheries Partnership Agreement. The market value alone of the registered catches from European vessels fishing in the Guinea-Bissau EEZ the same year was € 72 million. Additional add-on values to the catch boosted revenues even higher.

Hatcher (1999) explains the controversies in politics within the European fishing industry. How the EU is struggling with trying to sustain the employment in an industry where the efficiency and productivity improve with technological advancement but where the resources are declining. This leads to fewer (and most times also larger) vessels that can catch more fish with fewer people working on them. At the same time the union is working towards improving the sustainability in the sector so that the people of the European Union can enjoy the benefits of consuming fish in the future. In addition

²² Porter (1998)

²³ Porter (1997)

²⁴ Kaczynski & Fluharty (2001)

from working with the objectives of the CFP the EU has suggested to reduce fishing efforts of stocks identified as overfished. Early-retirement schemes have also been used in order to try to guide people in to other professions.

Alder and Sumalia (2004) further evaluate the environmental impacts caused by the EU in Western Africa. Catches are thoroughly divided into groups of species and areas where they were caught to see what species are in decline. They also investigate the economic impacts on the West African populations caused by overfishing of the marine resources in the region, where many rely directly on the fish stocks. Population growth in Sub-Saharan Africa also negatively affects the supply of fish and if trends continue it will be even harder to meet food demands in the future. The authors do bring some hope to the topic by describing the success story of Namibia. A country that after independence introduced a policy of Namibianization, which is the foundation of a Fisheries Management System that focuses on increasing Namibian ownership in the fishery sector and promotes responsibility and efficiency amongst the fishermen^{25, 26}. The system has been proven to be very successful and is an example of how a country can use quotas and quota fees to manage fisheries.

This paper adds to the ongoing debate about the European Union's fishing arrangements in West Africa. It also gives a brief update on trends in global fishing efforts and recent estimates on the environmental impacts. By bringing up many of the current issues about the international fishing industry it gives a general understanding to the problems we are facing in the future.

Additionally, this paper addresses the changes in fish consumption and animal protein intake in developing countries caused by intensified presence of EU vessels in West African waters. Also included in the analysis are the effects EU compensations have on domestic fish consumption and whether or not the size of the compensation matters. The diversities amongst the West African states are taken into account in the analysis and land-specific aspects as well as time-specific effects have been investigated.

1.6 Method and motivation

European vessels extract a substantial amount of fish from West African waters but the coastal states' fishing fleets extract seven times more. Whether there are plenty of fish for everybody or if foreign fleets operating in West African waters affect local consumption lead to the formulation of the first question:

Do catches from European vessels in West African waters affect the consumption of fish in the region?

By law coastal states have special rights to the marine resources in waters outside their coast. The FPAs give EU vessels permission to fish in the waters outside of countries involved. Therefore one could

²⁵ Shotton (2000), p.148

²⁶ By promoting responsibility the authorities wish to create a feeling for ownership and encourage fishing practices that are sensitive to the marine eco-system and by promoting a better understanding of efficiency they wish to protect the fish stocks from over-capitalization.

question if the FPAs lead to a decrease in fish consumption in those countries. If that assumption is true then countries without FPAs could have a higher or at least unchanged consumption due to less competitiveness in their EEZ. The possible impacts from FPAs lead to the second question:

Do the Fisheries Partnership Agreements contribute to an even greater effect on the consumption?

All agreements are different from each other. The size of the compensation depends on many different factors like the geographic size of the EEZ, the condition of the fish stocks, the number of vessels that are allowed in the EEZ and the duration of the agreement. It is fair to assume that the size of the compensation can have various effects on the population's consumer behavior. Large compensations that increase household incomes could perhaps result in a decrease in consumption of fish because the households rather consume other animal proteins like beef or pork. The possible effects from different sizes of compensation lead to the third question:

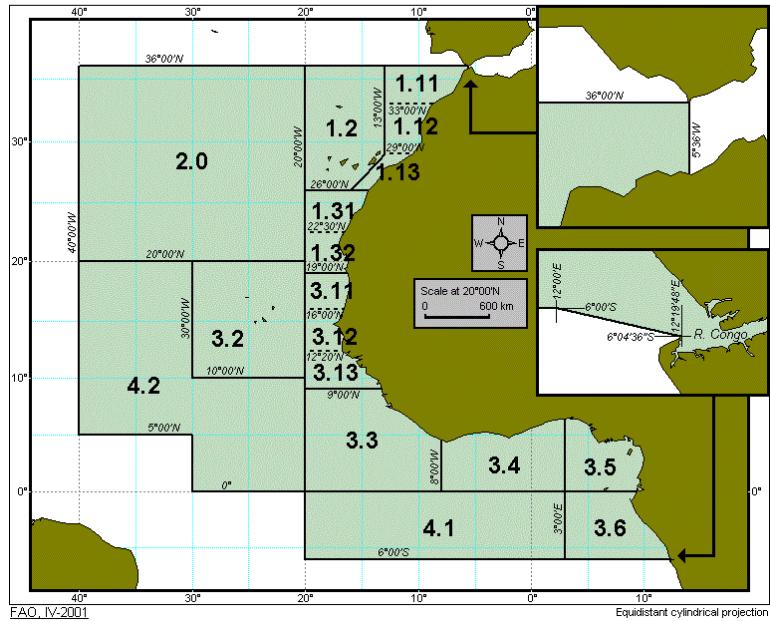
Does the size of the compensation matter?

I would have liked to analyze trends in fish consumption by including all African coastal states. However, the division of oceans into Major Fishing Areas has made it possible to analyze only certain regions. The waters outside Western Africa are also very desirable for European fishermen as they are reasonably close to Europe, which makes it possible for the fishermen to return to where they live rather frequently. Since fish and seafood are perishable products the vessels need to operate within a certain distance from the port at which they want to unload their catches. I decided to limit the countries to those of West Africa based on the possibility of gathering data from the area where European fishermen are most active. The West African coastal states I have included in my analysis extract a majority of their annual catch from the eastern central part of the Atlantic Ocean, also known as the FAO Major Fishing Area 34 (MFA 34). The MFA 34, shown in figure 1, stretches from Morocco in the north to the southernmost part of the Democratic Republic of Congo in the south²⁷. The eighteen countries along the coastline are Benin, Cameroon, Republic of the Congo, Democratic Republic of the Congo, Côte d'Ivoire, Equatorial Guinea, Gabon, Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Mauritania, Morocco, Nigeria, Senegal, Sierra Leone and Togo. MFA 34 hosts the same species across the whole area, though the migration of fish may make catches vary over time. The area also displays a small variation in water temperature and ecological characteristics, which make fishing conditions similar all across MFA 34. The fishing sector is an important industry in all the eighteen countries, which is another reason for including all countries in the region in the investigation.

²⁷ MFA 34 is also divided into subareas which make research on an even smaller level possible.

Most of the countries are former colonies to the major European colonial powers and did not achieve independence until the 1960-70's. The ties to former colonial powers may affect the outcomes in agreement negotiations. Many of the countries have also been depraved with social and political instability where autocracy and poor governance sometimes have led to civil wars and several coup d'état. This could create disturbances in fish production at times. Though many of the countries have common characteristics there are also innumerable differences amongst them. Some have a majority of their population living in the countryside, far away from the coastline. Others may be located in very dry areas where vegetables and other agriculture goods are hard to grow. These differences are taken into consideration in the paper.

Figure 1. Major Fishing Area 34



1.7 Structure of the paper

The rest of the paper is structured as follows: Section 2 explains the importance of marine resources for both West African coastal states' governments and their populations. It also explains why the European Union started fishing in West African waters, what rules and regulations apply for foreign operations and how trade policies are designed. Section 3 shows how the empirical models are constructed and introduces the different variables. It further explains what data is being used and how it was collected. Section 4 reveals, discusses and interprets the results of the regressions. The final part of the paper contains a concluding discussion.

2. Background

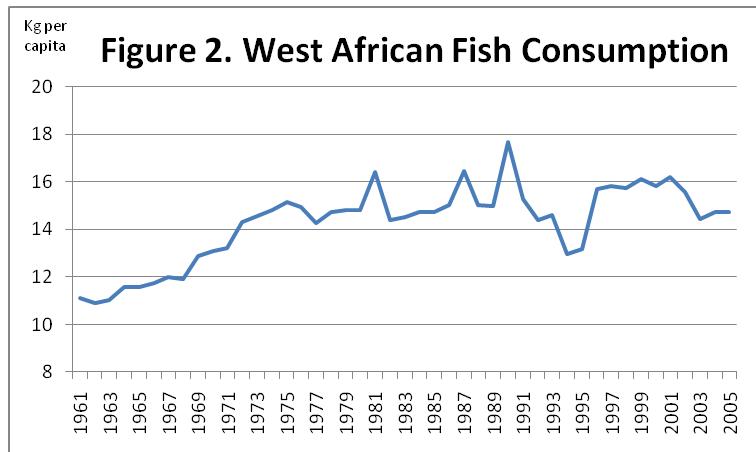
Fishing is still considered an honorable profession in most parts of the world and provides many families with food and income. Many fishermen stay in the business their entire lives and maritime knowledge is passed on from generation to generation. The production in the MFA 34 has steadily grown for the past six decades. In addition of generations of experience, technological progress and invention of new fishing equipment increases the fishing industry's efficiency. Today the eighteen coastal states of West Africa produce 3500 million tons of fish and seafood annually. Most of the catches are supplying the domestic markets in West Africa but a substantial part is also being exported. Though some of the

produce is being traded with other coastal and landlocked African nations the majority is being exported to Europe²⁸.

Compared to the exports, which have steadily increased over the years, import levels are consistently fluctuating. Some major factors behind the shifting trends may include shifts in supply of other protein resources, extreme weather conditions, economic instability and altered trade policies.

2.1 Fish consumption

Figure 2 shows the fish consumption of the coastal states in 1961-2005. The consumption has on average not changed much during the past 44 years for the population of the coastal states. The accessibility and price of other protein resources is probably the main reason behind the fluctuation of the trend in figure 2. Today the average West African consumes about 14.5 kilograms of fish and fishery products a year. Judging by a quick look at production data there is no obvious correlation between country size, be it geographic or demographic, and fish production. There are also no direct indications that countries with a long coastal line have citizens that consume higher amounts of fish than countries with small coasts. Among the coastal states consumption varies considerably. In 2005 the average citizen of Guinea-Bissau consumed as little as 1.5 kilos compared to an impressive 40 kilo per capita consumption in Gabon (which is twice as much as the average European) (FAO, 2010). These level effects get picked up by the country dummies in the regression models.



2.2 Exclusive Economic Zone

The Exclusive Economic Zone (EEZ) is a sea zone stretching 200 nautical miles out from a country's coastal line. Within the zone the country has special rights over the exploration or the use of its marine resources. Prior to 1982 when the EEZs were introduced in the third *United Nations Convention on the Law of the Sea* (UNCLOS), the territorial sea zones only stretched 12 nautical miles out from the coasts. The extension from 12 to 200 miles stopped foreign vessels from operating in marine rich waters outside coastal states. The introduction of the EEZ's did not trigger a substantial increase in coastal state's domestic production, which enabled recovery of some fish stocks.

²⁸ On average 82.9% of West Africa's exports went to the European market during 2005-2007 (FAO, 2007).

The extension of the EEZ's also gave the coastal states with waters rich in fish and seafood the possibility to earn foreign currencies by signing Fisheries Partnership Agreements.

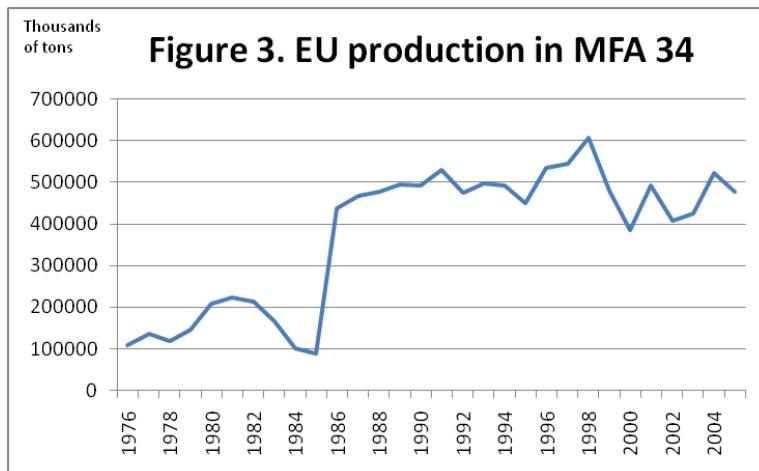
2.3 Fisheries Partnership Agreements

The Fisheries Partnership Agreements are designed to give EU vessels the rights to fish in EEZ's outside non-EU countries (European Commission, 2010). In return the EU pays financial compensation and gives technological support to the development of the domestic fishing industry in those countries. There are two types of FPAs, one solely for tuna, which allows for the pursuit of tuna stocks along the shores. The second one, the mixed FPA provides access to a wide range of fish stocks, given the stocks are in good shape and not fully exploited. FPAs are exclusive agreements, meaning no single vessel can make a private arrangement outside the FPA.

One of the main reasons why many coastal states are signing FPAs with the EU is because the compensation received is usually greater than the export earnings generated by the fishing industry. An example is the roughly € 4.8 million Guinea-Bissau received from a fisheries agreement in 1990, which represented more than one-third of the country's foreign exchange earnings that year^{29, 30}. Many of the coastal states fisheries are underdeveloped and therefore not capable of extracting and processing as large quantities as the well developed fleets and industries of European countries. If the guidelines of the agreement are not clear the EU presence in domestic waters of a small coastal state could well lead to a dramatic decrease in fish supply and subsequent loss of an affordable protein source. To compensate for a shortage of fish the population would then have to find alternative food sources.

2.4 European production in West African waters

Figure 3 shows the EU production in MFA 34 from 1976 to 2005. The effects from the introduction of the EEZs in 1982 are very clear. When foreign fleets were not allowed to keep operating in the waters the production decrease dramatically. However, after signing of FPAs with Guinea, Guinea-Bissau and Equatorial Guinea there was a rapid increase in effort and large quantities of fish and seafood were extracted. It was followed with agreements signed between the EU and Gambia, Mauritania and Senegal in the mid-1980. The



²⁹ Calculated using the \$ to ECU currency rate from 1st July 1990.

³⁰ Porter. (1997). p. 4

production peaked in 1998, which can be explained with the time the EU had the most amounts of FPAs in place in the same time. The effects of the agreements on the whole area are obvious and one has to bear in mind that half of the nations along the coast have never had agreements in place, which therefore makes some areas more exploited than others.

2.5 Trade Policies between Europe and the developing world

Trade agreements have for a long time been signed between countries or regions all across the globe. Their main purpose is to reduce or eliminate trade restrictions on the traded goods to enable easier trade between the signatories. All countries involved will of course try to negotiate the terms into their favor but the negotiation power of some countries is bigger than others.

In 1975 the European Community (what after the Maastricht Treaty became the European Union) signed the first trade and aid agreement with 71 African, Caribbean and Pacific countries (ACP) in Lomé, Togo. Apart from setting a new framework of cooperation between the EC and ACP countries the signing of the Lomé Convention also meant that the community committed to help ACP countries through aid and investments. The Lomé Convention recognized the role European fishing industries could play in African coastal nations in their development and exploitation of their own marine resources. Kaczynki and Fluharty (2001) raised concerns about the fact that the Lomé Convention is silent in regard to the requirements to unload harvested produce in the coastal states for the purpose of value added. If the trade agreements are designed to both increase trade and promote economic development then maybe the unloading of a percentage of the catches in coastal states should be a requirement. The Lomé Convention expired 1999 and instead of extending the agreements a new convention replaced the old. The Cotonou Agreement is expected to run for 20 years with a revision of the agreement every five years. The last revision took place in March 2010 and the parties involved particularly highlighted the importance of sustainable fisheries in order to meet the Millennium Development Goals³¹.

Though the EU could play a key role in ACP countries' development the community is not obligated to help these nations with sustainability related issues such as resource conservation, environmental protection and assistance with development of local fishing fleets. However, in some agreements certain parts of the compensation are earmarked for specific projects. But a lot of the earmarked money goes straight to the general treasuries of the coastal states and the fishery sectors get neglected³².

The Directorate-General for Maritime Affairs and Fisheries (DG MARE) of the European Commission, an executive body of the EU, is the department negotiating the FPAs with third world countries. The mission statement of DG MARE state that the policy aims to "*realize the economic potential of the oceans and seas in harmony with the marine environment and the needs of coastal communities.*"

³¹ European Commission (2010), p. 13.

³² Kaczynski & Fluharty (2001), p. 77

The policies of the FPAs should also be consistent with other EU agreements so there will be no confusion as to where the EU stands. FPA policy guidelines regarding support for industry development are similar to those of the Lomé Convention, which says that the FPAs give “*non-EU countries financial and technical support to develop their national fishing industry on a sustainable basis in return for fishing rights for EU vessels.*”

However, Kaczynski and Fluharty (2001) argue that although the guidelines clearly state what approach the EU ought to have towards third world countries, the union chooses to consider the agreements as purely commercial and often disregards its responsibilities to improving third world fisheries³³. From their perspective, EU’s use of FPAs are most importantly a way for the community to maximize the access in West African waters, secure the jobs of European fishermen and fishing industry workers, supply the European market with fish and fishery products at the lowest price possible.

2.6 The history of European fishing

Concerns about rapid fish stock depletion in European waters and disputes between European countries regarding communal fishing areas, were brought to light as early as 1957 during the Rome Treaty. The countries involved agreed that there should be a common policy for fisheries and that the community should try to manage the fish stock for the European Communities as a whole if possible. At the same time as the fish stocks were depleting in European waters the demand for fish and fishery products in the European market increased.

One way to solve the increasing demand for fish was to transfer some of the European vessels to waters rich of European commercial species. West African waters were rich in tuna, demersal fishes and crustaceans (shrimps, crabs, lobsters etc.) and by moving part of the fishing fleet there the community were not only able to maintain the productivity in the fishing sector but they were also able to secure the jobs of thousands of fishermen who would otherwise become unemployed. European countries had been sending vessels to MFA 34 for over 30 years but with the introduction of the Exclusive Economic Zones in 1982 European fishing fleets were not allowed to keep operating in waters outside fish rich non-European nations anymore and the importance of a common policy for fisheries for the European Communities grew even stronger. The policy would not only have clear guidelines for the fishing sector within the community but also help improve the community’s relations with non-European governments willing to sell fishing rights in exchange for the hard currency ECU. The European Union fisheries policy, also known as the Common Fisheries Policy (CFP), was set up in 1970 but differences between the member states postponed the initiation, which meant it first became fully operative from 1983³⁴.

³³ Kaczynski & Fluharty (2001)

³⁴ Nello (2005), p.244

2.7 Common Fisheries Policy

One of the main tasks of the CFP is setting quotas of Total Allowable Catch (TAC) for each member state. The CFP decides how much of each species the member state is allowed to catch on an annual basis, an amount that is based on the availability of the species and the country's traditional share of fish production. The TAC is then divided into Individual Fishing Quotas (IFQ) for each vessel in the fishing fleet of the country. The vessels have to keep records of catches landed and are only allowed to use certain gear on the boat. But even with constant development of new technologies and modernization of European vessels authorities were in the beginning of the millennium still having difficulties collecting complete reports from its fishing fleets³⁵. Using quotas is one way of trying to obtain sustainable harvesting of marine resources. Through Multi-Annual Guidance Plans (MAGPs) the CFP also regulates the size of the European fishing fleets so that it doesn't become any bigger than it already is. Critics have said that even though the fleet size stay the same overfishing might still increase in the future with the continuous improvement of fishing techniques that makes the vessels more efficient. Concerns have also been raised due to the fact that permanent removals of vessels from the union's fleet can contribute to overfishing in other parts of the world. Union aid programs, like the Financial Instrument for Fisheries Guidance (FIFG), compensate vessel owners for early retirements. However, there have been reports that the same vessels later get reflagged in a non-European country where the owner can continue fishing³⁶.

3. Empirical approach

This paper investigates variations in consumption of fish in West African coastal states. The following section presents what procedures I have used to process data associated with consumption. I clarify how the models are constructed and explain the different regression variables. I also explain how the data was collected and discuss the importance of data reliability. When investigating West African fish consumption I identified the production of coastal states and the EU in MFA 34 as the major factor causing variation. I constructed three econometric models, which include variables representing production from the coastal states and the European Union.

3.1 The econometric models

Three econometric models are being used in this paper, one basic model and two modified models. The basic model consists of consumption as the dependent variable, domestic and foreign production as the independent variables and two dummy variables. Country dummies were added to pick up country-specific effects that are constant over time. These are important for reasons mentioned in the introduction, describing differences among the countries. Time dummies were added to the models to pick up effects in seasonal change. The modified models have the same foundation as the basic model but also include an additional dummy variable for the existence of FPAs in the first modified model and

³⁵ Hatcher (1999)

³⁶ Folsom & Rovinsky (1993)

an additional independent variable representing the size of FPA compensation in the second modified model.

The estimated equation of the basic model is specified as:

$$\text{Consumption}_{jt} = \alpha_j + \alpha_t + \text{Production}_{jt} + \text{EU production}_t + \varepsilon_{jt}$$

where j denotes country, t denotes year, *consumption* is the domestic consumption in the country, *production* is the domestic production in the country, *EU production* is the aggregate European Union fisheries production in the MFA 34 and ε is an error term. The country dummy, α_j , picks up particular level effects between the countries and the time dummy, α_t , picks up common seasonal variations in, e.g., climate and global business cycles.

The estimated equation of the first modified model is specified as:

$$\text{Consumption}_{jt} = \alpha_j + \alpha_t + \alpha_{fpa} + \text{Production}_{jt} + \text{EU production}_{jt} + \varepsilon_{jt}$$

It consists of the same dependent, independent and dummy variables as the basic model but has an additional *fisheries partnership agreements* dummy variable, α_{fpa} , which takes the value of 1 if there is a FPA in place and correspondingly the value of 0 if there is no FPA in place.

The estimated equation of the second modified model is specified as:

$$\text{Consumption}_{jt} = \alpha_j + \alpha_t + \text{Production}_{jt} + \text{FPA compensation}_{jt} + \text{EU prod}_{jt} + \varepsilon_{jt}$$

The second modified model also consists of the same dependent, independent and dummy variables as the basic model. But this model also has an additional independent variable, a *FPA compensation* regressor, which captures compensation amounts paid to the country by the EU.

The three independent variables, *Domestic production*, *EU production* and *FPA compensation*, are log-linearized in all three models in order to regulate large variations in the observations. Summary statistics of the variables in the models are further described in table 1. To estimate the models I have used the *Ordinary Least Square* (OLS) method.

3.2 Time period

The chosen time period features several interesting events. 1976 was the first year FAO began collecting statistical data on consumption habits of the African populations. It will therefore be the first year of the time period in this analysis even though data for other variables date back even further. The first protocol housing a cooperative between the EU and a West African country was initiated in 1981 when representatives from the union and Guinea-Bissau signed the agreement. One year later the 200-mile Exclusive Economic Zones were introduced. Though some of the FPAs expire after 2005 and some have been signed since then, I have restricted the time period so that the final year is 2005³⁷.

3.3 Consumption

The consumption of fish products statistics dates back to 1976 and is complete for the entire time period except for one of the 18 nations I have included in my analysis: Only in recent years have there been reliable fish consumption statistics from Equatorial Guinea, which leaves most years before 1999 with missing data. By going through documents from other organizations I have managed to find data from some of the missing years^{38,39}. However, there are still some years with no data available.

The consumption is measured by adding the consumption of fish, seafood and any other fishery products into one variable. Since the intention of this study is to focus on the nutritional aspect of fish consumption, this variable is measured in kilogram of fish consumed per capita per year.

3.4 Production

FAO production statistics are divided into nine main groups of commercial species but only five of those were included in the calculations. The groups I chose to exclude are “Aquatic plants”, “Miscellaneous aquatic animal products”, “Miscellaneous aquatic animals” and “Whales, seals and other aquatic mammals” as they are not considered a main source of fish protein. The domestic production data are registered by the selected African countries and reported yearly to the Fisheries and Aquaculture Department of the FAO. Each country’s total catch contains of capture- and aquaculture production in inland waters and oceans. All eighteen countries operate in MFA 34 as stated earlier. A few nations also operate in the southwest Atlantic (FAO Major Fishing Area 41), the southeast Atlantic (FAO Major Fishing Area 47) and the Mediterranean (FAO Major Fishing Area 37). Catches in these waters are included in the domestic production as they contribute to the supply on the domestic market. Local production is measured as the total production of fish and seafood in thousands of tons.

Production data from EU fishing fleets is the overall production from the fishing fleets of EU member states operating in MFA 34. France, Germany and Italy were members of the community before the selected time period, which means their catches are included from 1976 and onwards. Ireland, the Netherlands and the United Kingdom also became part of European Communities before

³⁷ At the time of writing this paper consumption data was available up to 2005.

³⁸ NOAA (2004), p. 82

³⁹ FAO Yearbook (2007), p.63

1976 but did not start fishing in the MFA 34 until 1996 (Netherlands) and 2001 (Ireland and the United Kingdom). Greece joined the union in 1981 and started fishing in the area straight away and so did Portugal and Spain when they joined in 1986. In 2004 another ten countries joined the union and three of those have been sending fishing vessels to the waters outside western Africa. Latvia and Lithuania have been fishing since 2004 but since Poland only just started in 2008 their production ended up outside my time period. Today there are vessels from 12 EU-countries fishing in the MFA 34. However, 15 EU-countries do not have vessels operating in the area⁴⁰.

3.6 Fisheries Partnership Agreements

A fishery partnership agreement lasts for a specific time period that varies from one year up to as much as six. The date from which an agreement runs all depends on what the two parties agree on at the negotiation of the agreement. New negotiations normally take place before the old agreement ends so that the new agreement can come into force just as the old expires. When negotiation deadlocks occur the two parties sometimes agree on a short extension of the old agreement to get more time for further negotiations. The extension can apply for a couple of months up to a year and are included in my data. To be able to calculate a yearly sum for how much the agreements generate to each country I had to make some modifications. There are of course some agreements that come in force during other parts of the year than in the beginning, which complicates my investigation since all other data are presented on a yearly basis from first of January to the end of December. To make the data coherent I adjusted the starting point of the agreements. Agreements starting during the first quarter have been adjusted back to the first of January the same year. Agreements starting during the second quarter have been adjusted forward to the first of July. The adjustments have been done so that EU contribution can be divided into half years, which simplified calculations to a year by year basis. All compensations have been accounted for, including earmarked sums that are part of the agreements. At the time of when the first agreements were signed the currency used was the European Currency Unit (ECU). In 1999 the ECU was replaced with the euro (EUR), so to keep the data consistent when working with the values of the FPAs in this paper the compensations are measured in thousands of EUR⁴¹. Table 1 in the appendix gives an overall view of agreements signed by the EU and West African coastal states during the 1981-2012 time period.

⁴⁰ Countries not operating in the area are Austria, Belgium, Bulgaria, Czech Republic, Cyprus, Denmark, Estonia, Finland, Hungary, Luxemburg, Malta, Romania, Slovenia, Slovakia and Sweden.

⁴¹ The ECU was replaced by the euro to a ratio of 1:1.

Table 2 represents a summary statistics of the variables of the regression models. It shows the minimum, maximum, average (mean) and standard deviation values of each variable.

Table 2. Summary Statistics

	Consumption	Log(Production)	Log(EU Production)	Log(FPA Compensation)	α_{fpa}
Mean	15.12	4.7397	5.5168	6.5042	0.2542
Maximum	50.91	6.0418	5.7835	8.0000	1.0000
Minimum	1.08	3.2876	4.9522	4.9542	0.0000
Std. Dev.	10.50	0.6357	0.2520	0.2156	0.4358

3.7 Data collection

To perform this study, the fishery statistics programme database of FAO provides the best and most detailed data available. I have used production and consumption data from the online query panels of the FAO Department of Fisheries and Aquaculture, which is freely available and can be customized for desired purposes. The FAO puts a lot of time and effort into the construction and update of their database. Error of measurement can occur if the department receives incorrect values or if values of missing data have been estimated. Most of the data regarding fishing agreements have been collected from documents available on the web based EU-Lex, an EU database containing European Union law documents and other documents which are considered public. Some information has been collected from other official documents from either the European Union or West African coastal states⁴².

The fishery statistics programme database is run by the Fisheries and Aquaculture Information Statistics Service⁴³ (FIES) that collects and compares data annually from countries all around the world. The authorities from countries worldwide report the data by filling in questionnaires, which can later be followed up by clarification if numbers seem questionable. The clarification comes after collected data is cross-checked with data from other sources like, e.g., Regional Fishery Bodies (RFB) such as the IWC or the CCSBT. When there is no data available FIES and consultant experts use estimates based on the best information available from any source. It is of course not optimal to estimate missing data when the data lay the foundation of research projects. However, estimates are better than having several years of data missing when observing trends in capture data or fish stock quantity over longer periods of time.

There is a long list of other activities FAO is involved in to further strengthen the reliability of the database statistics. A few examples include producing statistical manuals and software, training statistical officers and developing or upgrading national statistical systems. The latter was recently done in many Mediterranean and African countries.

⁴² A summary of all documents underlying the data construction of this essay is presented in table 3 in the appendix.

⁴³ FAO & WECAFC (2008)

Estimation Results

4.1 The Basic Model

Table 4 in the appendix shows the results from the regression of the basic model. The results show that there is a strong correlation between the domestic consumption and EU fishing production in the MFA 34. The estimations, which included 521 observations, received a high adjusted R^2 value of 0.89. This means that 89% of the variation in consumption can be explained by the model. The expected negative effect of European fishing fleet production is confirmed as the *EU production* variable shows a parameter coefficient value of -5.39. The variable is statistically significant at the 1 percent level of significance. Not surprisingly the second regressor, *Domestic production*, has a positive effect on domestic consumption. The variable has a positive parameter coefficient value of 8.05 and is also statistically significant at the 1 percent level of significance. Interestingly the negative effect from European presence is in the same size range as the positive domestic production effect.

The coefficient value of the country dummies range from around -32 to +28 and some of the dummies had relatively high probability values, which could suggest that these dummies should be excluded from the model. However, a Wald test that has been performed to investigate whether country dummies should be included was significant on the 1 percent level. The time dummies displayed small variations in coefficient values and low probability values, which suggests that they should be included in the model.

4.2 The first modified model

Table 5 in the appendix shows the results from the regression of the first modified model. The added FPA dummy variable was insignificant at any reasonable level of significance. The model, which was reestimated for the same sample as the basic model, has an unchanged explanatory value of 0.89. There are almost no changes in coefficient values of the two independent variables and they are still statistically significant. The country and time dummies also behave about the same as they did in the regression of the basic model.

4.3 The second modified model

Table 6 in the appendix shows the results from the regression of the second modified model that had 127 observations as it only included observations for, which a partnership agreement was in place. The result of the third regression shows an even higher explanatory value than the two earlier models. The adjusted R^2 value is 0.96, which means that 96% of the variation in consumption can be explained by the model. The compensation variable has a negative coefficient value of -1.03 and is statistically significant at the 1 percent level of significance.

The coefficient values of the country dummies vary from around 20 to 54 and all of the dummies are statistically significant at the 1 percent level of significance. Since there are only nine countries that have had agreements with the EU and since they do not have agreements in place during the entire time period some of the time dummies were dropped in the estimations. The time dummies have coefficient values range from around -8 to 3.5. Their rather high probability values could question whether or not they should be included in the model. A third Wald test showed that they were jointly significant on the 1 percent level of significance and therefore should be included.

As stated from the results from the first modified model the pure existence of FPAs does not affect local fish consumption. However, if there is an agreement in place the size of the compensation paid has effects on domestic consumption. The results show that there is a connection between the FPAs and domestic fish consumption. However, the consumption does not increase as the compensation increase, which is what the signatories of the FPAs are hoping for. On the contrary the compensations are disadvantageous to the local population and their consumption habits.

4. Concluding discussion

The results from the regressions show that the presence of EU fleets in West African waters greatly affects the livelihood of the coastal states populations. The extraction of fish and seafood from foreign vessels in the region affects local consumption of fish in a negative way. Though the pure existence of Fisheries Partnership Agreements does not have an effect on consumption the size of the compensation paid does. The effect compensations paid to coastal state governments has on fish consumption is negative. Probably to the disappointment of many government officials and policymakers who wish to improve the situation for the poor. One cannot draw too many conclusions to that particular result as a decrease in fish consumption could be balanced with an increase in consumption of other food products. But with other animal protein sources being more expensive the populations are most likely forced to consume products of poorer quality that contains less protein. Regardless, it would be fair to assume that many households in West Africa would be better off with well-managed fish stocks that only West African fishermen compete with.

The lack of predefined use of the compensations enables the coastal states to use it for other prioritized purposes that might not meet the populations' nutritional needs. The misuse of the compensation could lead to coastal states fisheries becoming less competitive compared to the EU fleet, which makes the situation for populations dependent on fish even worse. As mentioned earlier some of the compensation might also end up in the wrong hands due to high level of corruption. A solution to the corruption problem could be more restricted use of the compensation. With a larger part of the compensation earmarked it could be easier to follow the money to its specified destinations. A larger part being used to improve the fisheries sector could lead to more efficient vessels that are more competitive, which in return increase domestic production and therefore improve nutritional supplies of the populations.

The results in this paper further highlight the importance of a joint negotiation policy for low developed countries toward the EU. A joint negotiation policy could improve the coastal states' negotiation power toward the EU and thereby for example enable the demand for improvements of register programmes to control catch quantities. A joint negotiation policy could also benefit the coastal states by increasing the compensations and thereby increase or stabilize fish consumption. It could also be a step towards the right direction when it comes to obtaining sustainable levels of fishing.

The European Union's is constantly working with improving the design of its trade policies. Though they already include sustainability and development aspects there is still room for improvement when it comes to designing agreements that better benefit LDCs and those living in them. It is also important to focus on sustainability issues associated with global fisheries and overfishing. To slow down the depletion of fish stocks and improve sustainability the union could focus more on erasing loopholes in trade agreements and EU policy programmes. Inefficient agreements could not only contribute to problems with overfishing, but also worsen the situation of the poor only to benefit those who are considerably better off.

Though the European fishing fleet is the biggest non-African operator in the West African waters, other non-EU countries also operate the waters of MFA 34. Russia, the United States, Asian countries and other African nations sign agreements with the coastal states. It would therefore be interesting to investigate the impact they pose on West African fish consumption in future studies.

Another interesting topic that has been outside the scope of this essay but needs to be further investigated is the problem of reflagging, which is an increasing threat to waters already under a lot of pressure. Reflagging is an activity involving sales of vessels from one country to another. Reports are saying that vessels that used to be fishing under European flag now are reflagged in landlocked African states and fishing, sometimes illegally, around the coasts of Africa⁴⁴. The fisherman then enjoy the benefits of both being paid early-retirement aid form the EU and being able to make money fishing in a different area. This problem is an example of how some actors take advantage of loopholes in systems and it highlights the need of better developed domestic and international regulations.

⁴⁴ Dotinga & Kwaitkowska (2001)

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Appendix

Table 1. Agreements signed by the EU and West African coastal states between 1981-2012

Country/ validity	Duration years	Total compensation per agreement (€)	Country/ validity	Duration years	Total compensation per agreement (€)
Côte d'Ivoire			Guinea		
7/91-6/92	1	2400000	2/83-2/86	3	2120000
7/92-6/94	2	3600000	2/86-2/89	3	9005000
7/94-6/97	3	2500000	1/90-12/91	2	7500000
7/97-6/00	3	3000000	1/92-12/93	2	14200000
7/00-6/04	4	3830000	1/94-12/95	2	4950000
7/04-6/07	6	6390000	1/96-12/97	2	4000000
7/07-6/13	6	3570000	1/98-12/99	2	6500000
			1/00-12/01	2	5920000
Equatorial Guinea			1/02-12/02	1	2960000
6/83-6/86	3	540000	1/03-12/03	1	2960000
6/86-6/89	3	5315000	1/04-12/08	5	17800000
6/89-6/92	3	7165000	1/09-12/12	4	4300000
6/94-7/97	3	660000	Morocco		
7/97-6/00	3	760000			
7/00-6/01	1	273400	12/95-12/99	4	355000000
Gabon			Mauritania		
4/98-3/00	3	2025000	7/87-6/90	3	21100000
12/01-12/05	4	5050000	8/90-7/93	3	29010000
12/05-12/11	5		8/93-7/96	3	27270000
			8/96-7/01	5	267850000
Gambia			8/01-7/06	5	430000000
7/87-6/90	3	3580000	8/06-7/8	2	172000000
7/90-6/93	3	4115000	8/08-7/12	4	305000000
7/93-6/96	3	1410000	Senegal		
Guinea-Bissau			2/88-2/90	2	12550000
1/81-12/85	5	7375000	5/90-4/92	2	15625000
6/86-6/89	3	8150000	10/92-10/94	2	16400000
6/89-6/91	2	11930000	10/94-10/96	2	18000000
6/91-6/93	2	13400000	5/97-4/01	4	48000000
6/93-6/95	2	12700000	7/02-6/06	4	64000000
6/95-6/97	2	11400000			
6/97-6/01	4	36000000			
6/01-6/06	5	51000000			
6/06-6/07	1	7260000			
6/07-6/11	4	28500000			

Table 3. Summary of FPA protocols

Country	Year	Name of protocol
Cote d'Ivoire	1991-1994	L 379 , 31/12/1990 P. 0014
	1994-1997	L 180 , 31/07/1995 P. 0015 - 0026
	1997-2000	L 025 , 31/01/1998 P. 0085 - 0095
	2000-2003	COM (2001) 102
	2003-2013	COM (2003) 379
Equatorial Guinea	1983-1986	L 237 , 26/08/1983 P. 0014. L 188, 16.7.1984
	1986-1989	L 29, 30. 1. 1987, p. 1
	1989-1992	L 299 , 17/10/1989 P. 0010, L 125 15/05/1990 P. 0018
	1994-1997	L 180 , 31/07/1995 P. 0002 - 0007
	1997-2000	C 366 , 04/12/1997 P. 0011
	2000-2001	COM (2000) 690 final/2 - 2000/0287 (CNS)
Gabon	1998-2001	COM (1998) 376 final - 98/0212 (CNS)
	2002-2005	COM (2001) 765 final 2002/0301
Gambia	1987-1990	L 146 , 06/06/1987 P. 0003 - 0010
	1990-1993	L 379 , 31/12/1990 P. 0017
	1993-1996	L 079 , 23/03/1994 P. 0002 - 0010
Guinea	1983-1986	L 084 , 30/03/1983 P. 0001 - 00016
	1986-1989	L 029 , 30/01/1987 P. 0010 - 0016
	1989	COM (89) 463 final
	1990-1991	L 125 , 15/05/1990 P. 0046, L 212 09/08/1990 P. 0016
	1992-1993	L 107 , 24/04/1992 P. 0022, L 379 23/12/1992 P. 0002
	1994-1995	L 188 , 22/07/1994 P. 0005 - 0016
	1996-1997	C 165 , 08/06/1996 P. 0010
	1998-1999	L 196 , 14/07/1998 P. 0032 - 0045
	2000-2001	COM (2000) 304 final - 2000/0154 (CNS)
	2002	COM (2002) 41 final - 2002/0034 (CNS)
	2003	COM (2003) 107 final - 2003/0049 (CNS)
	2004-2008	COM (2003) 765 final - 2003/0290 (CNS)
Morocco	1995-1999	L 306 , 19/12/1995 P. 0007 - 0043, L 030 31/01/1997 P. 0005
Mauritania	1987-1990	L 302 , 24/10/1987 P. 0026 - 0035, L 388 31/12/1987 P. 0003
	1990-1993	L 117 , 10/05/1991 P. 0015 - 0019
	1993-1996	L 290 , 24/11/1993 P. 0020 - 0031
	1996-2001	COM (1996) 417 final - 96/0210 (AVC)
	2001-2006	COM (2001) 591 final - 2005/0229 (CNS)
Senegal	1988-1989	L 127 , 20/05/1988 P. 0018, L 137 02/06/1988 P. 0003
	1990	L 208 , 07/08/1990 P. 0032
	1990-1992	L 053 , 27/02/1991 P. 0003
	1992-1994	L 212 , 23/08/1993 P. 0002
	1994-1996	L 193 , 16/08/1995 P. 0006 - 0021
	1996	COM (96) 611 final 96/0287 (CNS)
	1997-2001	COM (97) 324 final 97/0179 (CNS)
	2002-2006	COM (2002) 497 final 2002/0238 (CNS)

Table 4. Regression results for the Basic Model

Variable	Coefficient	Prob.	Variable	Coefficient	Prob.	Variable	Coefficient	Prob.
LOG(EU)	-5.390497	0.0000	TDUM15	2.984292	0.0111	LDUM2	-12.46002	0.0000
LOG(DOM)	8.051815	0.0000	TDUM16	3.220474	0.0075	LDUM3	8.908833	0.0000
TDUM1	-1.335264	0.2302	TDUM17	2.952859	0.0127	LDUM4	-22.36638	0.0000
TDUM2	-0.840258	0.4478	TDUM18	4.967234	0.0000	LDUM5	-7.152907	0.0000
TDUM3	-1.443250	0.1951	TDUM19	1.203723	0.3006	LDUM6	27.84783	0.0000
TDUM4	-0.022107	0.9841	TDUM20	0.555557	0.6330	LDUM7	27.36114	0.0000
TDUM5	1.682365	0.1340	TDUM21	2.716770	0.0215	LDUM8	6.430136	0.0000
TDUM6	1.911999	0.0893	TDUM22	2.769422	0.0191	LDUM9	-9.849198	0.0000
TDUM7	0.602582	0.5907	TDUM23	2.552084	0.0318	LDUM10	-8.794694	0.0000
TDUM8	-0.994334	0.3732	TDUM24	0.394374	0.7287	LDUM11	2.351688	0.0362
TDUM9	-3.954621	0.0005	TDUM25	-1.142852	0.3106	LDUM12	2.015543	0.0256
TDUM10	-4.341673	0.0002	TDUM26	0.390493	0.7316	LDUM13	-10.06429	0.0000
TDUM11	3.860588	0.0011	TDUM27	-1.335362	0.2372	LDUM14	-32.05229	0.0000
TDUM12	4.188562	0.0004	TDUM28	-0.649582	0.5658	LDUM15	-25.82902	0.0000
TDUM13	3.997276	0.0008	TDUM29	0.514123	0.6521	LDUM16	-8.793508	0.0000
TDUM14	3.673603	0.0020	LDUM1	-7.957723	0.0000	LDUM17	-4.772846	0.0001
Number of Observations	521							
Adjusted R-squared	0.891							

Table 5. Regression results for the First Modified Model

Variable	Coefficient	Prob.	Variable	Coefficient	Prob.	Variable	Coefficient	Prob.
LOG(EU)	-5.460022	0.0000	TDUM15	2.998158	0.0107	LDUM3	8.817953	0.0000
LOG(DOM)	8.149907	0.0000	TDUM16	3.256820	0.0069	LDUM4	-22.59525	0.0000
FPADUM	-0.569146	0.3032	TDUM17	2.980788	0.0119	LDUM5	-7.024744	0.0000
TDUM1	-1.573214	0.1664	TDUM18	4.976736	0.0000	LDUM6	28.26140	0.0000
TDUM2	-1.062743	0.3461	TDUM19	1.242861	0.2854	LDUM7	27.43705	0.0000
TDUM3	-1.679466	0.1399	TDUM20	0.569670	0.6244	LDUM8	6.595448	0.0000
TDUM4	-0.241609	0.8304	TDUM21	2.771123	0.0192	LDUM9	-10.15265	0.0000
TDUM5	1.484953	0.1922	TDUM22	2.788984	0.0183	LDUM10	-8.455890	0.0000
TDUM6	1.745103	0.1247	TDUM23	2.607426	0.0285	LDUM11	2.938382	0.0197
TDUM7	0.430969	0.7036	TDUM24	0.435316	0.7020	LDUM12	2.046896	0.0235
TDUM8	-1.154495	0.3058	TDUM25	-1.145667	0.3094	LDUM13	-9.856853	0.0000
TDUM9	-4.130283	0.0003	TDUM26	0.368484	0.7462	LDUM14	-32.31022	0.0000
TDUM10	-4.547432	0.0001	TDUM27	-1.371425	0.2250	LDUM15	-26.13301	0.0000
TDUM11	3.757070	0.0016	TDUM28	-0.686039	0.5444	LDUM16	-8.748037	0.0000
TDUM12	4.151570	0.0005	TDUM29	0.489011	0.6681	LDUM17	-4.911084	0.0001
TDUM13	3.995975	0.0008	LDUM1	-8.045560	0.0000			
TDUM14	3.669132	0.0021	LDUM2	-12.62839	0.0000			
Number of Observations	521							
Adjusted R-squared	0.891							

Table 6. Regression results for the Second Modified Model

Variable	Coefficient	Prob.	Variable	Coefficient	Prob.	Variable	Coefficient	Prob.
LOG(EU)	-6.556008	0.0000	TDUM15	3.429618	0.0114	TDUM27	-1.818812	0.1352
LOG(DOM)	8.196969	0.0000	TDUM16	3.358956	0.0124	TDUM28	-0.600108	0.6219
LOG(FPA)	-1.035098	0.0078	TDUM17	3.430365	0.0085	TDUM29	0.377146	0.7574
TDUM6	-2.900109	0.2139	TDUM18	3.599726	0.0064	LDUM5	20.96228	0.0000
TDUM7	-2.372580	0.3091	TDUM19	1.652423	0.1960	LDUM6	47.42966	0.0000
TDUM8	-2.276199	0.1887	TDUM20	0.566254	0.6577	LDUM7	54.35318	0.0000
TDUM9	-6.261701	0.0002	TDUM21	2.183254	0.0876	LDUM8	34.25468	0.0000
TDUM10	-8.240157	0.0000	TDUM22	1.891715	0.1462	LDUM10	19.67733	0.0000
TDUM11	3.851620	0.0455	TDUM23	3.400592	0.0080	LDUM11	32.77513	0.0000
TDUM12	3.519207	0.0233	TDUM24	1.580893	0.1757	LDUM13	20.63161	0.0000
TDUM13	2.561361	0.0774	TDUM25	0.003789	0.9974	LDUM16	23.39133	0.0000
TDUM14	3.128558	0.0284	TDUM26	1.536231	0.2227			
Number of Observations		127						
Adjusted R-squared		0.960						