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Bachelor Thesis

What are the economic consequences of the EU's CAP on trading with Africa?

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1 Executive Summary

The agricultural sector is crucial for the development and later industrialization of a country. According to several researchers the improvement of productivity in the agricultural sector, and hence the movement of labor from the agricultural to the production sector, is the base of moving countries away from poverty. Since the EU, and others, pays a lot in development aid to African countries, it is interesting to investigate how EUs agricultural support system (CAP) affects the African countries. The aim of this thesis has been to see what role the CAP has on agricultural trade with African countries, and therefore also on their economy and development.

Theory suggests that African countries enjoy a comparative advantage in the agricultural sector compared to the EU. This is due to the development stage of the African countries, as well as the relative labor and land abundance. Trade figures also show that African countries export more agriculture to the EU than they import, but in recent years imports have grown relative more than exports. This might suggest some form of distortion in the market.

A look at the EUs CAP shows that it has several trade distorting effects according to theory. In the beginning the CAP was made up of production subsidies, intervention buying, and export subsidies. Through several reforms with the aim of creating a more liberalized market, the production subsidies have been changed to a direct subsidies scheme and intervention prices have been lowered a bit. The production/direct subsidies and the intervention buying both create higher prices in the internal EU market. This means that too much is produced, and most overproduction is sold to world market prices with the aid of export subsidies. Through underestimation of the world market prices the EU has been accused of dumping agricultural products into the African markets.

In the opposite direction several agreements have been made to ensure African producers tariff free access to the European market. However, very high food safety standards have been set along with other non-tariff barriers, which prevent many African producers to export to the EU.

Trade theory suggests that a free trade situation would result in the EU importing much of their agricultural consumption from Africa. However the high minimum prices on the EU market have resulted in far less consumption and held together with the much higher production, the EU have gone from being net importer to net exporter of agricultural goods. Due to the tariff free access of the African producers, all their production would be sold to the EU at the high prices, as no African consumers are willing to pay these high prices. On the other hand the EU overproduction would be

exported to the African market at world market prices. Several reforms of the CAP and trade agreements have improved this situation a bit, but it is still the theoretical outcome.

In order to test if theory applies, a quantitative analysis has been conducted of the situation using the gravity equation. The gravity equation uses trade value as a dependent value and analyses how several variables, such as GDP, population, and distance, influence bilateral trade between countries. To see if the CAP affects agricultural trade with Africa, it is important to isolate agricultural trade from other trade, and see if a difference exists. The results show that Africa trade relative more in agriculture than non-agriculture with the EU. What is really interesting is that results show the other EU countries trade more with the EU than Africa does, a result that is contradicting to the theory of a free market, but is in compliance with the theoretical trade distorting effects of the CAP and trade agreements.

Besides all the theoretical explanations of subsidies, tariffs, and minimum prices, other reasons can be found to the situation. Non-tariff barriers presumably play a large role in restricting the African producers from exporting to the European market, but also supply restraints have a large effect on the trade outcome. Trade theory is based on unlimited resources, but the small African farmers have a hard time obtaining more land and thereby expanding production. To make matters worse, the lack of decent storage facilities often force farmers to sell their harvest right away, sometimes at very low prices.

Future research into several areas would be interesting, especially into the relation between development aid and agricultural support systems. This could show how to help the African agricultural sector in the best way. Also, it could be interesting to conduct quantitative analysis of the policy changes made to the CAP and trade agreements, to see what effects these have had in reality.

2 Introduction

Development aid to Africa is one of the big political subjects of today, and many developed countries pay large sums of monetary aid to these and other developing countries. However, questions have started to arise if development aid is the right way to help these poor countries. A good and effective agricultural sector is seen as the cornerstone in developing and industrializing a country. But how is the developed world, mainly the EU and USA, helping building this foundation? Both have enormous agricultural support systems domestically, where especially the large Common Agricultural Policy (CAP) in the EU has dramatic effects on the world market for agricultural goods. Do these support systems actually undermine the agricultural sector in African countries and hence hinder their development? If this is the case, we have a quite complex situation. Enormous sums are paid to help the development of the very same countries, which own support systems in effect hold down. To find out if there is any ground to these claims, I will try to investigate whether the EU's CAP has any effect on agricultural trade with African countries¹ and thereby also the economy and development of these countries.

A quick look at the trade situation today, and how it has developed during recent years, will start off the investigation. As this in itself does not tell us anything about the CAP's effect on trade it is merely to give an overview of the trade development.

To give a better insight into the trade situation, a more detailed description will be made of the EU-Africa trade relationship. This description will include the roles of agriculture and international trade in the development of a country, to give a brief glance of what is at stake. Also the CAP and any trade agreements between the two regions will be assessed and various critique points will be discussed.

To put the situation into a more theoretical perspective, the described scenarios will be put into the context of international trade theories. By putting the existing policies and agreements into a theoretical framework we will obtain a basis for analyzing how reality is.

A statistical analysis will be conducted on how the CAP affects the agricultural trade between Africa and the EU. This will be done in order to obtain empirical evidence to answer the questions asked in the problem statement. As the CAP is not new in any way it will be hard to determine how a world without the CAP would look like. Therefore any results will be held up against trade theory

¹ Because of obvious difference in culture and development stage I will be putting my focus on the sub-Saharan African countries, thus excluding the Northern African Arabic countries. This means that referral to Africa will, unless stated otherwise, be to the sub-Saharan African countries.

of how the world market should look in a free market setting.

The statistical analysis will hopefully show some interesting results of how the trade situation is between Africa and the EU. Therefore an assessment of the results, and why we obtain these particular results, will be conducted. This will consist of secondary literature findings as well as reasoning between description, theory, and results. At the end of this section a comprehensive overview of the situation should have emerged.

Before concluding on the findings in the research, a section will be dedicated to suggesting future research steps, which could be conducted if further knowledge of the area is desired.

2.1 Problem Statement

The questions I will aim to answer within this thesis are the following:

How does EU's CAP affect agricultural trade between sub-Saharan Africa and the EU?

- How does theory suggest the current situation affects trade?
- Can a difference in trade value be found between the two regions due to the CAP?
- How do political agreements between the two regions play into the situation?

In order to assess if the CAP has an influence on agricultural trade it is crucial to look at theory as well as statistics. If theoretical and statistical analyses complement each other, much stronger conclusions can be drawn. Also a look at the influence of other political agreements is important, as they can alter the effect the CAP might have.

A change in the trade situation will indisputably also have an effect on the economy, which leads to the next issue:

What are the economic consequences of the EU's CAP on sub-Saharan Africa?

- Are the African countries better or worse off due to the CAP?
- Does the existence of the CAP hinder development of African countries?
- What are the economical ramifications of the individual components and changes of the CAP and other policies?

It is important to determine how the economy is affected in order to put the effects into a development perspective later on. The development perspective is of course very interesting, as we might determine if the CAP, and thereby also the EU, is holding back the development of African countries through protection of own interests.

The individual components and policy changes are quite interesting in order to determine which parts of the CAP have influence on the economical outcome.

2.2 Methodology

This thesis will be based on economical theory which will be supported by research literature of the subject and data analysis. Quantitative analysis will be used as the main analytical method. An emphasis will be put on trustworthy sources for literature and data, which will primarily be collected from peer reviewed journals and international organizations.

2.3 Delimitations

Models for assessing agricultural trade policies such as the World Agricultural Trade Simulation (WATSIM) model (von Lampe, 2002) will not be used. This is due to the complex nature of the model, and the use would simply be without the scope of this thesis.

Some African countries and organizations use French and other non-English languages, and therefore available information may be in a language without the reach of my language skills.

Also, due to the low level of development in most African countries, statistics will often be scarce and the needed statistics may not be available through African countries, but rather international organizations.

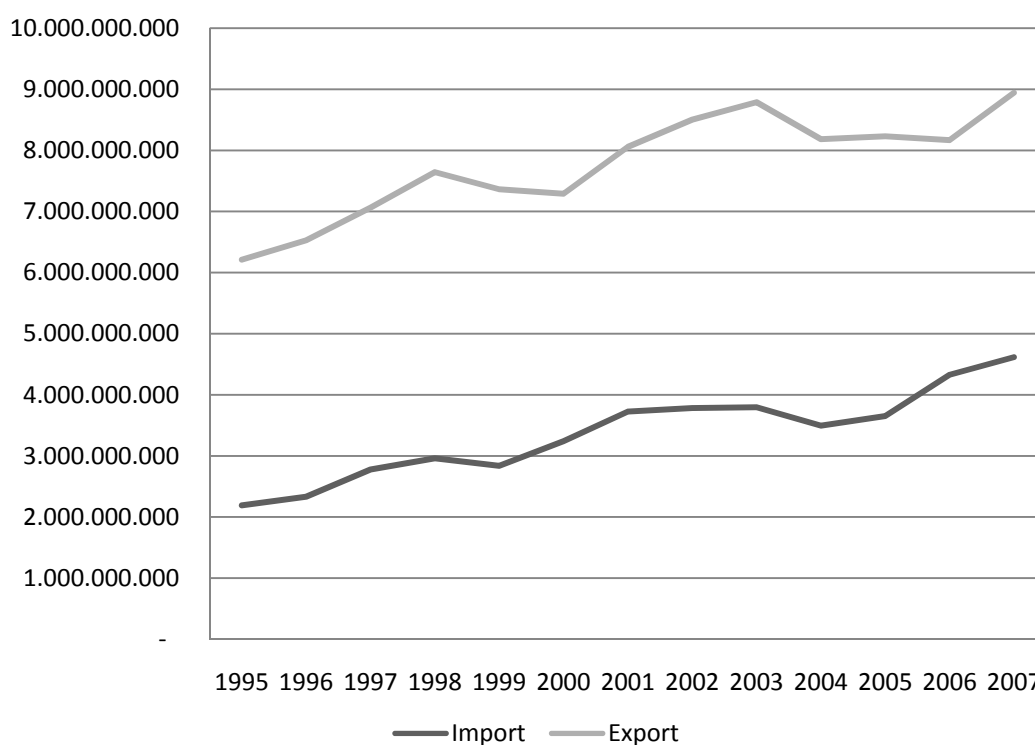
Due to the limited size of this thesis some issues will be left out of the analysis. First of all, no parallel will be drawn between the agricultural trade and development aid, which was mentioned in the introduction. This subject is simply too comprehensive. Second, trade between other regions than the EU and Africa will not be dealt with, as again this will simply be too large a subject for this thesis. Also, agricultural and other reforms in the individual African countries will not be given any attention, all though these might in fact affect the trade outcome. The detail in looking at every single country is simply too much compared to the presumably limited effect it has on agricultural trade for the whole region. Finally, the effects of the enlargements of the EU will not be considered, even though this has changed the competitive situation on the world market, as more countries were let into the internal EU marketplace, especially since these new countries have a much larger agricultural sector than the existing EU-15. However it is far too extensive to include this subject into the limits of this thesis.

3 Africa-EU trade development

Trade in agriculture is the main focus in this paper, so a glance at the trade development should be interesting, before describing and analyzing the complex trade situation between the EU and Africa. Descriptive statistics can help to give an overview of what we are dealing with. Theory and analysis, which will be applied later, can tell a lot about how the situation should look, or what lies behind the current situation, but only descriptive statistics give a picture of how the situation actually is.

A simple look at the agricultural trade figures for sub-Saharan Africa in total can be seen in figure 3.1.

Figure 3.1 - African agricultural trade with the EU-15



Source: Eurostat, 2009.

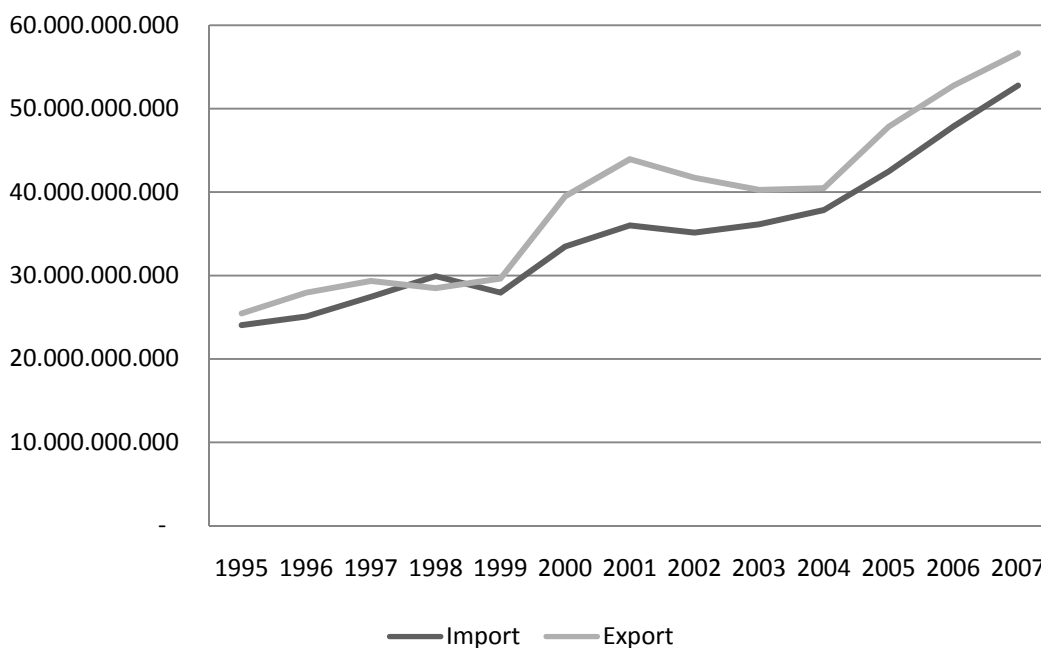
The numbers used are for all of sub-Saharan Africa, and show the import from and export to the EU-15 in Euros. As it easily can be seen, the export of agricultural goods is about 2-3 times as large as the import. Both import and export have overall been rising during the years 1995-2007, which will be used as the base of the analysis later. Imports have gone from a total of 2,190,216,531 Euros in 1995 to 4,615,756,252 Euros in 2007, while exports have risen from 6,210,075,620 Euros in 1995 to 8,943,406,199 Euros in 2007. All numbers are in nominal terms, so inflation has not been

taking into account in these figures. However it is clear to see that imports have more than doubled in the period, while exports have risen less than 50%, so imports have grown relatively more than exports.

A look at the figures for the individual African countries shows that export figures are a lot more volatile between countries than import. While countries like Liberia, Djibouti, Guinea, and Sierra Leone all have exports worth less than one million Euro in 2007, all countries except Liberia have imports for more than one million Euros. In general there are far more countries who in the 13 year period export for less than one million Euros than countries who import below this level. Some of the export numbers are even extremely low being below 100,000 Euros. It is also notable that a large country as South Africa in some years has had imports for less than one million Euro, which is probably due to South Africa's special status amongst the African countries. The composition of the trade in individual countries is interesting since export is so much higher than imports, and some countries apparently are not contributing to this.

The agricultural trade becomes more interesting when held up against total trade between the two regions. This gives an opportunity to compare if agriculture is unusual in any way. To see the difference in trade in agricultural goods and total trade between the two regions, figure 3.2 shows the total trade between the sub-Saharan countries and the EU-15.

Figure 3.2 - Total African trade with EU-15



Source: Eurostat, 2009.

The figure shows that import and export are much closer for total trade than agriculture. However it might be a surprise that total export is actually larger than total import, considering Africa's technological development stage.

Again export figures seem to be a bit more extreme values, as several countries have exports below 10 million Euros, while all import figures are above this level.

Hopefully this paper can help explain some of the reasons lying behind these trade figures, through the research of the agricultural trade situation.

4 Agricultural and trade policies

The interest of this thesis is to look at the CAP in terms on economical impact on Africa. This is interesting because the western world keeps paying a lot of money in development aid, while at the same time financing an expensive protectionist agricultural sector. Because the consensus in general is that a good agricultural sector is the basis for industrializing, and hence develops a country, it is of great concern to many that the CAP is undermining the establishment of a sturdy agricultural sector in Africa. A quite striking figure to start off with is the OECD countries' support to agriculture of US\$ 311 billion, which is six times the value of official development assistance (Nelson and Halderman, 2004).

4.1 Agriculture in development

The most important commodity group for every country is food, in order to survive. Therefore agriculture is at the base of every society, and the concentration of manpower in this sector determines how much manpower can be employed in other sectors. As Haque (2007) puts it; "Economic development implies structural transformation, typically from low productivity to high productivity activities, from agriculture and simple manufacturing activities to modern industry". This really highlights the base of this school of development theory. In order to develop, a country must become more productive. As far most developing countries have large agricultural sectors this is obviously the sector to enhance productivity in. For African countries the average agricultural percentage of GDP was 32% (World Bank, 2009) during the years 1995-2007, while the average for EU countries is 2-3%. Of course there are great deviations between countries, especially in Africa, where the range is from Botswana with 2-4% in all years to Liberia which had 94% in 1996 but had come down to 64% in 2007. When agriculture constitutes this much of a countries economy it is easy to see why it is of such great importance. So in order to develop a country, the thought is to increase

productivity in the agricultural sector, freeing up labor to work in other industries, hence increasing the size of other industries. This thought is underpinned by the fact that employment in agriculture is above 60% of the total workforce in African countries (FAO, 2006).

However agricultural growth also has a direct positive effect on growth of other sectors, according to Thirwall (Morrison and Sarris, 2007). When the agricultural sector starts to grow the demand for non-agricultural products will increase, as the wealth of the country becomes higher. This increase in demand will logically lead to growth in the non-agricultural sector, which in time will become competitive in the international market, and therefore a growth through export will commence.

4.1.1 Infrastructure

It is also clear that Africa has the capacity to become a great agricultural contributor. The sub-Saharan countries in total have 198 million hectares of arable land (FAO, 2006), and much of this is unused or even unexplored. The main problem seems to lie within the infrastructure of the countries. Water is not being utilized in an optimal way, which is crucial to fight droughts. Currently only 1.6% of water is utilized (FAO, 2006). This leads to only 4% of the land being used efficiently. Therefore a water management system is one of the many measurements that will need to be taken in the improvement of the infrastructure. Other obvious improvements are within the transport sector.

Timmer (Morrison and Sarris, 2007) has found that there are three main agricultural development theories in modern research; one with a free-market approach, one focusing on rural development, while the last emphasizes the importance of price and marketing in the agricultural sector. What is interesting, however, is that these three different theories all conclude that government investment in infrastructure is crucial to further development, although they differ greatly in how to make the right investments.

Because of the inadequate infrastructure, transport costs and insurance represent more than 25% of the costs of agricultural goods in 1/3 of the countries (FAO, 2006). These high extra costs are of course damaging for the international competitiveness of agricultural goods from Africa, which leads us to the next issue in the subject.

4.1.2 Agricultural trade and development

So far I have not mentioned anything about the role in international trade in this issue. This section will primarily discuss the theories of trade and development, while more specific trade policies and trade theories will be discussed in depth in a later section. International trade plays a great role in

the whole matter for obvious reasons; if African countries can become more productive in agriculture (or any sector for that matter), they will be more competitive on the international market, which will lead to an increase in trade and eventually economical growth. Haque (2007) remarks that it is not as simple as this basic theory describes. The intense focus on low cost production, used in great parts of Asia, will simply not be applicable today since the world has changed in the direction of a more globalized world. He adds that a producer now has to be a part of a network or value chain, and to become this needs to have a proven record of production. If this is in fact the case, African countries will be put in the bottom of this value chain (if anywhere), where the profit is the lowest. Looking at agricultural products the far most value addition is in the processing of these into different types of food. If African countries are simply selling raw agricultural goods to other countries for processing, there will be little value added and thereby little growth. To establish oneself as a producer (or processor of these raw goods), one has to have a proven track record within this area to compete on the international market, according to Haque (2007). This makes it extremely hard to get a production culture started, and is of course a great obstacle for development in the African countries. What is more or less ironical is that these goods may be re-imported to the same countries, once they have been processed in other countries.

4.1.3 Liberalization

The main discussion in international trade communities is to which degree trade should be liberalized. Morrison and Sarris (2007) argue that too much liberalization in the crucial agricultural sector can be hurtful for the development of a country, and that some level of protection can be helpful in this matter. They go on to argue that in the light of the Doha round (which will be described later), where agricultural trade liberalization is a great issue, some categories of developing countries should be allowed flexibility in their protection of the agricultural sector for two main reasons. First of all, it will help the domestic agricultural sector in competing with imports that might be subsidized, and therefore have an unfair low price (as examples from the EU will show later on). Second, the flexibility will help to change the tariff structure once the development process is so far along that agriculture does not play a central role in the economy. However, the developed countries are anxious to gain easier access to these developing markets, and are pushing hard to lower barriers of entry (Morrison and Sarris, 2007). This refers directly back to what started my interest in this subject, why developed countries donate so much money in development aid, while policies might contradict any efforts towards development.

4.2 The Common Agricultural Policy

In the beginning the Common Agricultural Policy (CAP) was developed under the Treaty of Rome to ensure food supply in Europe, after years of war, and maintain a reasonable standard of living for workers employed in agriculture (Cardwell, 2004). This was mainly done through minimum price guarantees and subsidies for investments in technology and development of rural areas (European Commission, 2007). Nelson and Halderman (2004) argue that the CAP was one of the main platforms of the development of what has now become the European Union. Early tools to reach the guaranteed price levels were to impose taxes on imports and intervention buying when prices within the EU fell too low. The minimum prices were set to such a level that the least efficient producers could still survive as producers (Trebilcock and Howse, 2005), which of course meant that more efficient producers made large profits. Facing a market that guaranteed minimum prices, farmers, of course, produced as much as possible to earn a maximum profit, as Martin puts it; 'European farmers have demonstrated beyond a shadow of a doubt that they are economically rational' (Trebilcock and Howse, 2005). By the 1980's this started to lead to enormous surplus stocks of food from all the intervention buying from the EU. One way to get rid of these surpluses was of course to export them to other countries by paying the farmers the difference between the guaranteed price and the lower world price level. According to Trebilcock and Howse (2005), critics have argued that the EU actually constantly underestimated the world market price; hence effectively selling agricultural products below the world market price. This has in turn resulted in several accusations of dumping, especially into Africa and other developing countries, and in some cases these accusations have found to be true. For instance, reports have concluded that the EU dumped beef at unreasonable low prices into West and South Africa during the 1980's and 90's, as well as skimmed milk powder into Jamaica and other countries (Nelson and Halderman, 2004). But dumping is not the only issue concerning the CAP's influence on world markets. By selling enormous volumes of agricultural products, a bias is created in the world market, lowering the price below its natural level. This development of the CAP to have a large effect on the international market, has, according to Trebilcock and Howse (2005), developed the CAP from keeping foreign producers out of the European market, to making it increasingly harder for them to survive in their domestic markets.

Based on all these forms of subsidies to farmers, the expenditures of the CAP has reached astronomical levels accounting for nearly half of the EU expenditure, even after two of the three reforms described below. The budget figures for 2000-2006 actually show a rising share of agricultural expenditure. For 2000 agricultural expenditure was set to 40,920 million Euros while total EU ex-

penditure was budgeted at 91,995 million Euros. These budget figures shifted to 41,660 and 90,260 million Euros in 2006 (Cardwell, 2004). This has been the subject of much internal criticism in the EU from organizations, politicians, and citizens. These, and other, issues have led to several reforms of the CAP system.

4.2.1 Reforms of the CAP

There have been three actual reforms of the CAP since it was first implemented. I will be explaining the first to rather brief in order to understand the movements in the CAP, while the latest reform of 2003 will be discussed in more detail, in order to obtain a picture of the situation today. The main focus will be on what effects the reforms have on interaction with international markets, and rather internal policy changes will be described briefly or simply mentioned.

4.2.1.1 *The MacSharry Reform*

The first official reform of the CAP came in 1992 with the MacSharry Reform. The reform had two main concerns to address, and two different communities to please. The first objective was to bring the market back into balance (Cardwell, 2004). The enormous stocks of agricultural goods that were being stored in the EU at this time generated large costs on many levels, and the solution of simply exporting the surplus of goods seemed to be distorting international market. Storage and handling of agricultural goods in its self generates high costs, along with the transportation costs to these storage facilities. On top of this, a large overproduction implies that too much is being paid in subsidies to the farmers, or too much intervention buying is taking place. To further complicate matters there are also great costs to the consumers, who in the first place pay the taxes to finance the CAP. Consumers also have to pay higher prices for agricultural goods, as EU prices are artificially high, while imports from cheaper countries are being taxed to reach the same high price. So the goal was to find a way to bring down these costs while still maintaining a decent standard of living for the European farmers.

The second concern was towards the international market. Because of the many accusations of dumping in developing markets and the general distortion of world market prices, there was increased pressure on the EU to change the CAP's external effects. Especially the United States where interested in liberalization of world trade (Cardwell, 2004), perhaps so they could gain more access to the markets where the EU was selling cheap agricultural goods. At the same time as the MacSharry reforms were conducted the Uruguay Round in the GATT was undergoing, with great focus on liberalization in world trade, including agriculture. Therefore the GATT, and especially the

USA, had to be satisfied with the reform. Ironically it was not the developing countries, who were directly affected by the policy, who objected the most, perhaps due to lack of political and economical power.

The most important measure of the MacSharry reform was the shift from production subsidies to direct payment of the farmers. The aid to the farmers no longer relied on their level of production, as such, but were paid on a direct payment scheme (Cardwell, 2004). This also resulted in prices being lowered, in the best interest for all of the concerns raised earlier. In return for these direct payments, quotas were imposed on the farmers in order not to reach the same levels of overproduction.

Other elements of the MacSharry reform was to encourage more environmental friendly agricultural production, early retirement schemes for farmers, aid for forestry, and a movement away from paying aid in modules.

4.2.1.2 Agenda 2000

The document 'Agenda 2000' was issued in July 1997. In the preface to the reform the European Commission made the following statement in the Cork Declaration: "the Common Agricultural Policy will have to adapt to new realities and challenges in terms of consumer demand and preferences, international trade developments, and the EU's next enlargement" (Cardwell, 2004). This declaration was made in March 1998 along with a set of proposed regulations of the initial suggestions of the July 1997 document. The regulations were seen as less ambitious than the original proposals, while the final reform differed even further from these proposals.

The basics behind the Agenda 2000 focused on five different areas. First of all a reduction of the intervention price was proposed, in order to further liberalize the agricultural market. Second and third areas were to put more focus on rural development and environment. Furthermore the reform should take a look at the financing of the CAP, and finally, a structural reform should take place, in order to prepare the CAP for the Eastern enlargement of the EU (Cardwell, 2004).

The final reform was agreed upon at a summit in Berlin in March 1999. All of the focus areas were touched upon although to different extents. A reduction of intervention prices in three main areas was agreed, these areas being arable crops, beef and veal, and milk and milk products. Table 4.1 shows the intervention price changes created by the reform for cereals and beef, and as the figures clearly show the actual price reductions were somewhat lower than initially suggested. Also, the reduction in intervention prices was implemented in two and three steps, instead of an initial one

step approach. Furthermore the reductions were not implemented right away, as reduction in milk intervention prices, for instance, were implemented as late as 2005.

Table 4.1

Intervention prices in EU agriculture products, Ecus per tonne

	Pre-reform price	Initial proposal	Actual new price
Cereals	119.19	95.35	101.31
Beef	2,780	1,950	2,224

Source: Cardwell, 2004.

Additionally, more progressive rural development plans were decided. These included investments in agricultural holdings, setting up young farmers, training, early retirement, developing less favored areas, and maintaining the countryside and the style of living, among other things. Also more focus was once again put on protecting the environment where possible. On the other hand little change was made in the financing of the CAP. Finally, structural changes were made to favor support to the least developed regions within the EU, while preparing the CAP for the enlargement of the EU to Eastern Europe, where most regions might be considered less developed compared to the EU-15.

The largest effect on international trade was however the reduction in intervention prices. This made the EU market a bit more liberal, resulting in less overproduction and hence less surplus to export, thereby reducing the effect on world market prices.

In relation to the agreement of Agenda 2000, it was also stated that reforming the CAP was an ongoing process.

4.2.1.3 Decoupling

In 2003 the most recent reform of the CAP took place. The name ‘Decoupling’ refers to the aim of removing the link between particular crops and the subsidies paid. This is primarily done by paying subsidies based on hectares and giving the farmers free choice of how to utilize these hectares. The reform can once again be divided into 5 different sections. 1) Adjustments to common market organizations, including further reductions of intervention prices. 2) Single farm payment scheme. 3) Compulsory cross-compliance. 4) Strengthening Rural Development Regulation measures. 5) Ensuring financial discipline (OECD, 2004).

First of all, the adjustment of the common market organizations simply changed the amounts and prices for support and intervention in the existing policy. Many areas were liberalized, and for some goods, such as rye, intervention was removed completely. These adjustments were also made to prepare the policy for the new single farm payment scheme by specifying which areas were to be included into this policy. The adjustments can also be seen as a part of the ongoing process of reforming the CAP, so that it always attempts to fit the new market needs and demands.

The next area is the most revolutionary part of the 2003 reforms, namely the single farm payment scheme (SFP). This is where the decoupling actually takes place, and direct payments are now calculated on the basis of former direct aid and hectares of the individual farm. However, payments are based more on a regional level, where each region is responsible for determining the level of aid per hectare, based on other concerns as well. The main idea behind this decoupling is to obtain less direct interference with the individual commodity markets. By letting the farmers choose what to produce themselves, the agricultural market resembles a free market a bit more, although the existence of intervention and export subsidies still prevents a normal market behavior. A few restrictions still exist within fruit, vegetables and table potatoes, as well as certain standards to the agricultural and environmental condition of the land are set. There are some possibilities in the reform for regions to promote certain crops over others, along with other exceptions to the strict hectare payment scheme.

The principle of compulsory cross-compliance is closely linked to the SFP. It is in all simplicity a set of requirements farmers need to fulfill in order to receive the aid from EU. Complementing this are a set of rules regarding penalties in the situation these requirements are not fulfilled. These set of rules are a necessity after aid is no longer linked to production, as farmers could simply stop producing and still collect aid based on their hectares, if no requirements were set.

More aid schemes exist under the rural development regulations. Examples of these are aid to participate in quality improvement programs, in order to improve the quality of agricultural goods. In addition to this, farmers can also receive aid to meet the stringent standards set by the EU, and to ensure environment protection and animal welfare. These measures are all a part of ensuring further development in the agricultural sector, and ensuring the highest standards of agricultural goods, which also gives an advantage, when trading on the international market, but distorts the market for foreign producers.

The final measure of the 2003 reforms is a financial control system to ensure that the spending on CAP does not spin out of control. Already employing such a large post of the EU budget, there is a public pressure to reduce spending on agricultural support.

4.3 Relationship between the EU and Africa

At the heart of the subject of trade between EU and Africa is the political relationship between the two regions. Again the main focus will naturally be on trade between the two regions, in particular in the agricultural sector.

4.3.1 ACP-EU agreements

Several agreements have been made between the EU and Africa starting with the Yaoundé Agreements from 1959-1974. The Yaoundé Agreements were followed by the Lomé Conventions from 1975 until 2000 where the existing Cotonou Agreements were reached. As of the start of the Lomé Conventions the organization ACP was founded to represent the developing countries as one. Besides the sub-Saharan African countries the ACP also contains some Caribbean and Pacific countries, though with the African countries being the dominant force representing 48 of 79 countries in the ACP. The main aim of the Lomé Conventions was to improve the trade relationship between the regions, which has been done by slowly liberalizing trade agreements.

However the focus will be on the existing Cotonou Agreement, as to give a picture of the trade relationship the countries face today.

4.3.2 The Cotonou Agreement

The Cotonou Agreement in itself provides free access for the ACP countries into the EU markets, with some exceptions. This is believed to be achieved in a better way when adopting regional differences into the agreement, and therefore negotiations are taken up at a regional level. The main new part of the Cotonou Agreement compared to the Lomé, is the creation of so called Economic Partnership Agreements (EPAs). These have a purpose of promoting further regional integration of the ACP countries, which for Africa concerns the following four regions/unions: CEMAC - Economic and Monetary Community of Central Africa, ECOWAS – Economic Community of Western African States, ESA – Eastern and Southern Africa, and SADC – Southern Africa Development Community (FOA, 2006). However, they were not to be implemented until 2008, so a further description of actual effects is still to be seen. The concept behind these EPAs is that a stronger regional relationship between the African countries will strengthen them in the international market.

If we look at a free trade agreement between EU and Africa it should in principle be of great advantage to the agricultural sectors in African countries, however other commodities might become even harder to compete in. It is almost certain that African countries enjoy a comparative advantage in the agricultural sector (FOA, 2006), so the removal of trade barriers into the EU should foster more exports. However there is still the issue of EU export subsidies, which might undermine domestic producers in Africa. Comparative advantages will be discussed in the trade theory section.

The free market access granted by the Cotonou Agreement primarily works in one direction, namely from Africa into the EU. As negotiations move along the ACP countries can hope to remove the few remaining exceptions to free access, while the EU would like the ACP countries to (FOA, 2006):

- Remove all quantitative restrictions and reduce tariffs on goods imports over a transition period. However tariffs are still allowed on some goods.
- Remove “charges having equivalent effect” immediately.
- Negotiate provisions in other areas, such as services.

Because these negotiations are made between EU and Africa, and not on a global scale (perhaps WTO), critics say that it will make Africa even more dependent on EU (Goodison, 2007a).

4.3.3 Everything But Arms

The initiative Everything But Arms (EBA) was taken in 2001 by the EU Council, and provided full tariff free entry into the EU market for 49 Least Developed Countries (LCDs). As the title of the program suggests this is with the exception of trading with armaments, but also bananas (until 2006), sugar, and rice (both until 2009) (FOA, 2006). The idea behind the program is straight forward; to provide easier access to the EU market, and through this, assist with the development of the countries. However 40 of the 49 countries were already covered by the Cotonou Agreement, which also pretty much grants free access, so the effects of the EBA are thought to be limited (FOA, 2006). Therefore I will not go any deeper into this subject, but the fact that it runs besides the Cotonou Agreement made it worth mentioning.

4.4 Agricultural trade after the 2003 CAP reform

Now that the CAP and the trade agreement between the EU and Africa have been briefly described, it would be interesting to see what impact the 2003 CAP reform had on the Cotonou Agreement of 2000.

The first immediate impact is the reduction of price levels in the EU. By lowering intervention prices, and instead employing direct support of the farmers, the general price level of individual agricultural goods will fall. This might look as a liberalization of the market, which in theory should benefit other participants in the international market. However, due to the Cotonou Agreement and EBA initiative, African countries enjoy an advantage of selling at the high EU prices without paying taxes. Because the prices are lowered with the CAP reform, these African exporters now get a lower price, while EU farmers still enjoy the same high level of subsidies. This scenery has an adverse effect on the African exporters (FOA, 2006). Research suggests that even small declines in EU market prices will force high cost African exporters out of business (FOA, 2006). An example of the price reduction effects can already be seen in the beef sector, where ACP earnings have fallen 20% since the 2003 CAP reform (Goodison, 2007b). So the initial good intentions of using direct payments to even out competition actually had the complete opposite effect on the ACP countries, which the EU is trying to help. Of course the reform also contains an element of defending the CAP against pressure from the US and WTO, and is not only focused on helping out developing countries. However, the change in the EU support system will also have an impact on international market prices, as the CAP has been undermining these prices, and a small increase in world prices will occur theoretically (FAO, 2006). The result is a very complex set of winners and losers from the price changes, which can be quite hard to comprehend.

The next area that is affected by the reform is the food safety standards, already stated as an obstacle earlier. The CAP reform enforces even stricter standards for African exporters to comply with. Goodison (2007b) suggests that these standards, among other obvious reasons, as health, are made because EU producers cannot compete against their African counterparts in pure price. Therefore these high set of standards are set to drive African competitors out, as they face higher costs for meeting these standards, and can be banned totally if standards are not satisfied. It is estimated by Technical Center for Rural and Agricultural Cooperation that the costs for meeting these standards are about 2-10% of a company's export turnover (Goodison, 2007b). When the African exporters simultaneously face the lower prices discussed above, it leads to a less profitable business to export agricultural goods to the EU.

Two more areas, which might be more indirectly affecting African exporters, are differentiation of products, and an increase in price competitiveness on simple value-added food produced in the EU (Goodison, 2007b).

The first issue is the increased focus on differencing goods, which is partly a part of the CAP reform, but is also formed by the market demand for more luxury goods. This constitutes a problem for the African exporters, as they export in bulks of similar goods. So in order to gain access to the EU market, marketing will be of great importance to the African exporters.

Another subject, which has not been touched greatly upon so far, is that of simple value-added food products. These are obviously the easiest products for African companies to produce, or start up production in, as they have fairly low costs compared to more advanced products. Because of the change in support to EU farmers, raw materials will become cheaper, hence reducing the production costs on value-added products. This gives the EU producers a greater competitiveness on the international markets, including the African.

Both these issues are critical in the sense that they may prevent African countries in moving away from the simplest production of agricultural goods into a more advanced production society. So here we might see a direct link between the CAP and the development of African countries.

4.5 WTO agreements

In development of trade policies and the CAP reforms, much attention has been paid to fulfilling the GATT/WTO agreements. The agreement that is in force at the moment is still the Uruguay Round agreement from 1993, while the Doha Round is still taking place as of today. I will briefly describe the main context of these two WTO rounds, obviously with main focus on agricultural trade policies. However, much attention will not be paid to the WTO agreements in this paper, as Africa-EU agreements have much more influence on the direct trade relations between the two regions. Many critics (such as Goodison 2007a, Bertow and Schultheis 2007) say that the EU simply aims to please these WTO agreements when reforming the CAP, or making the ACP trade agreements, so therefore the WTO agreements form a basis for these policies. A closer look and analysis of the WTO agreements is simply without the scope of this thesis.

4.5.1 The Uruguay Round

The Uruguay Round started in 1986 and reached a final agreement in December 1993. The main negotiation took place between the two major members, the USA and the EU. These two giants were so concerned with their own situation that little attention was paid to developing countries

(Trebilcock and Howse, 2005). The agreement on agriculture was by far the most difficult to reach and the final details were agreed upon in the last week of negotiations. The agreement ended up containing several reductions in support to farmers; a 20% reduction in domestic support, a 21% reduction in the volume of export subsidies, and 36% in value of export subsidies (Trebilcock and Howse, 2005). Another important part of the Uruguay round was the decision to convert all non-tariff barriers to tariffs (Cardwell, 2004), which by far makes the trade picture more transparent. For agricultural support it was also decided that direct support to farmers was allowed, which is also why critics accuse the EU of simply modifying the CAP to fit WTO agreements. But in general it can be said that the Uruguay round is, what can be achieved, when so many countries, with own interests in mind, have to agree.

4.5.2 The Doha Round

The next attempt to reach a new trade agreement was at the Millennium round in Seattle; however no agreement could be made. Therefore high hopes are attached to the current round of negotiations in Doha. In the framework agreement of July 2004, the issues were set to be; the use of monopoly power and the end of trade distorting practices (Trebilcock and Howse, 2005). As of today, the Doha round is still in negotiation, but much emphasis is put on the highly controversial agricultural area.

5 Trade theories

In the following section I will be looking at the key components of the ACP-EU agreements, the CAP, and EU-Africa agricultural trade in context of traditional trade theories. First of all, I will describe the basic setting of the trade relationship from classic theory, including tariffs and comparative advantages. Following this I will take a look at how customs unions, like the EU, change the trade outcome. This will be followed by a more specific look on how the CAP affects the trade outcome, and finally how the ACP-EU agreements have changed these outcomes, for the better or worse, which will give us the final picture of the trade outcome, and be the real interesting part of this analysis.

5.1 Basic trade theory

In the context of the basic Ricardian theory of comparative advantages it should be quite clear that African countries enjoy a comparative advantage towards the EU in the agricultural sector. This can quite clearly be concluded by the stage of development the two regions are at, but more hard evi-

dence can also be found, simply by looking at how large a role agriculture plays in the economy of the two regions. In African countries agriculture on average constitutes 35% of the GDP, 35% of export earnings, and employs 70% of the workforce (Bertow and Schultheis, 2007). The numbers for the total EU-27 (which include the more agricultural Eastern Europe) in 2007, are: 1.8% of GDP, and 5.8% of the workforce employed in agriculture (Eurostat, 2009). Africa also has more natural resources (FAO, 2006) which give them a further comparative advantage towards the EU. This can be seen by applying the Heckscher-Ohlin theory of relative factor abundance (Salvatore, 2007). Remark that this discussion of comparative advantages is only concerning the relationship between Africa and EU, as other situations may occur on a global level, where for instance South Asia is more labor abundant compared to Africa (FAO, 2006). All these factors taken into account, there should not be any doubt that Africa in fact does have a comparative advantage in agricultural goods. So in a complete free trade environment, there should be large exports of agricultural goods from Africa to the EU, and of more advanced products in the opposite direction. However several distortions exist that give a rather complex trade situation.

5.1.1 Tariffs

The starting point is that tariffs existed between the two regions, and as such also between the individual countries within the two regions. Traditional trade theory suggests that a tariff on imports into one country gives a gain to the domestic producers, while the consumers need to pay a higher price, so they lose from the tariff. On the other side the foreign producers also lose, as less is imported into the country. Figure 5.1 shows the economic effects of imposing a tariff on the agricultural market for an individual European country.

Figure 5.1 – Imposing tariffs in individual European countries

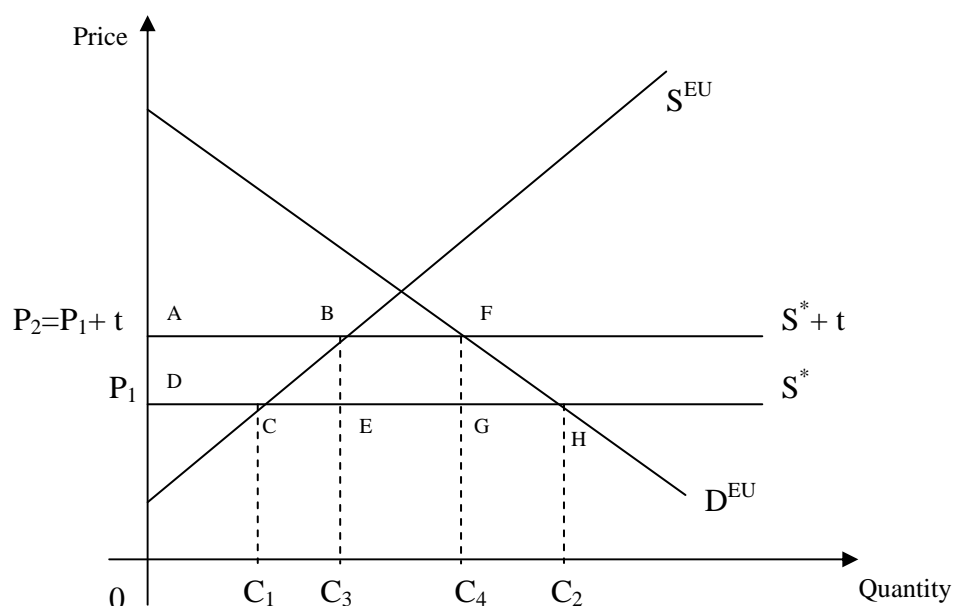


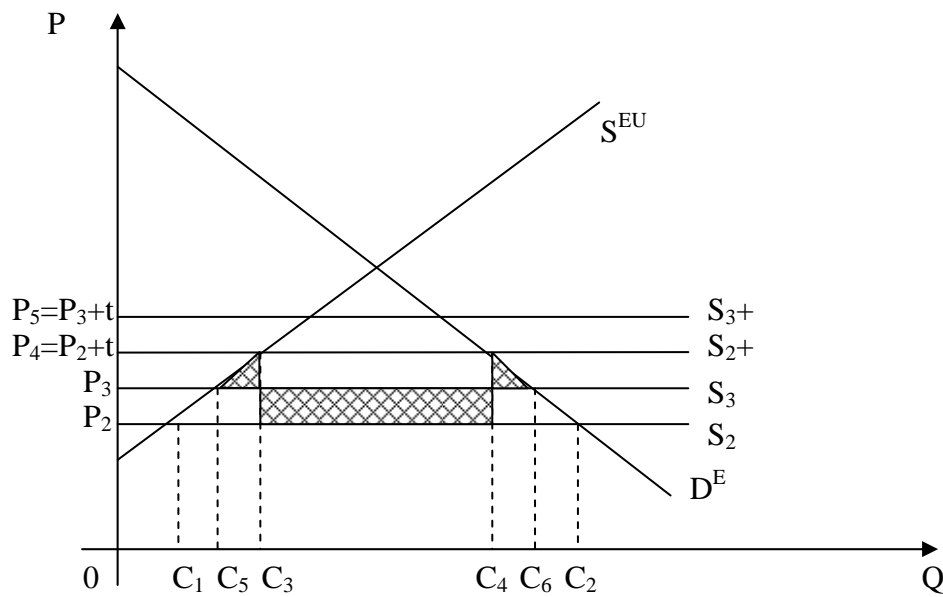
Figure 5.1 simply assumes that Africa has a comparative advantage in agricultural goods. By imposing a tariff the price moves to P2, which means that domestic producers move up the supply curve to C3. A higher price also results in consumers buying less and thereby moving to C4. This means that the import from Africa has now changed from C2-C1 to C4-C3 and already here we can conclude that the African producers have lost considerable revenue. On the domestic market of the European country, the domestic producers gain ABCD while consumers lose AFHD. The EU gains import tariffs in the amount of BFGH, which means there is a deadweight loss of BCE and FGH. This means that not only the African producers lose from imposing a tariff, but so does the EU as a whole. However the main objective of helping the EU farmers has been fulfilled.

This situation is, however, not an issue in the trade between Africa and the EU today, due to the Cotonou agreement, and therefore I will not go into any detail with the issue, but rather move forward to what is relevant for trade today. From a situation where tariffs existed between all countries, the EU was formed as a customs union, where member countries over time have ended up not having any tariffs between each other.

5.2 Customs union

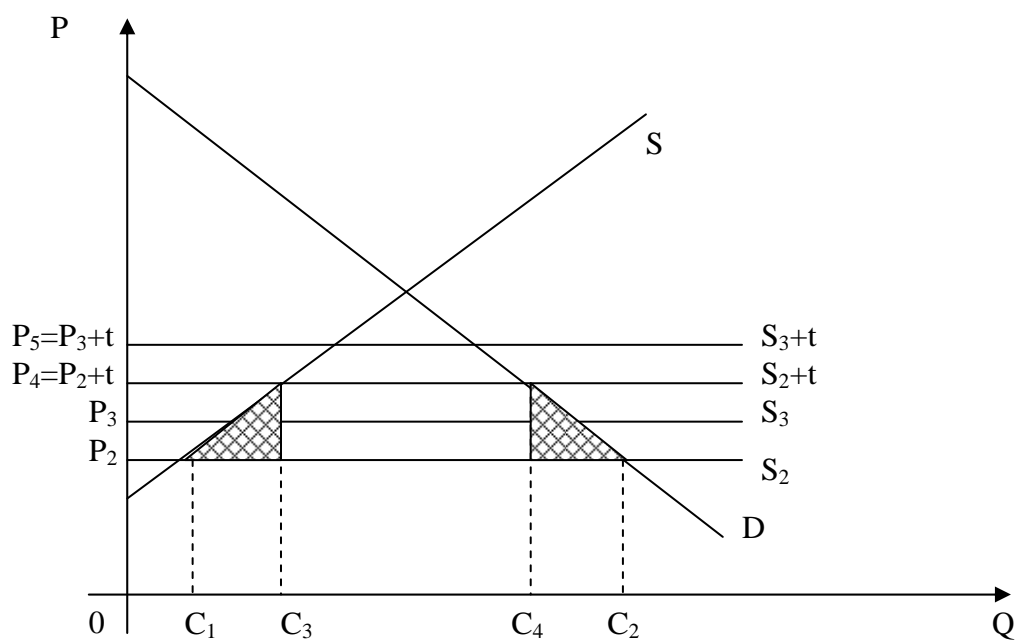
The discussion of a customs union in this context is whether the formation of the EU theoretically has changed the trading partners for the member states and in this light, if it has affected trade with Africa. The main indicator is whether the EU members would have traded with each other without the existence of the union. It therefore comes down to who is the cheapest producer and hence has the comparative advantage in the goods of interest. As the discussion of comparative advantages concluded, Africa has a clear comparative advantage in agricultural goods, while the EU has in more advanced products. A simple analysis of these facts give that the EU is trade diverting within the agricultural sector, but trade creating in nearly all other sectors (in relation to Africa). Figure 5.2 shows the effect of the creation of the EU on agricultural products, while figure 5.3 shows on non-agricultural goods.

Figure 5.2 – Customs union, Agricultural market



In the agricultural sector in figure 5.2, the creation of the EU customs union is trade diverting. This occurs because Africa is the low cost producer of agricultural goods, which means that in a world without tariffs, or one with equal tariffs on all countries, the EU would import from Africa (P_2 and P_4). Because of the creation of the customs union, the EU now trades internally at P_3 . This creates some trade, marked by the two crossed triangles, while it gives a trade loss of the crossed rectangle compared to a free trade situation (Salvatore, 2007).

Figure 5.3 – Customs Union, non-agricultural markets



Although the EU might be trade diverting in the agricultural sector, theory strongly suggests that it is trade creating in more advanced sectors, where European countries have a comparative advantage. In figure 5.3 the European countries would trade at P2 in a free trade world and P4 if all countries had equal tariffs. As both P2 and P4 represent the EU, the trade partner will be the same in either trade setting, which means that a creation of a customs union creates more trade within the EU. The gains of this trade creation are indicated by the two crossed triangles.

Therefore it cannot unambiguously be said whether the creation of the EU has been good or bad for trade with Africa. If we focus on the agricultural sector, which is the main focus of this thesis, the EU is most certainly trade diverting just by existing as a customs union. On top of this are of course the real interesting effects of the CAP on trade with Africa.

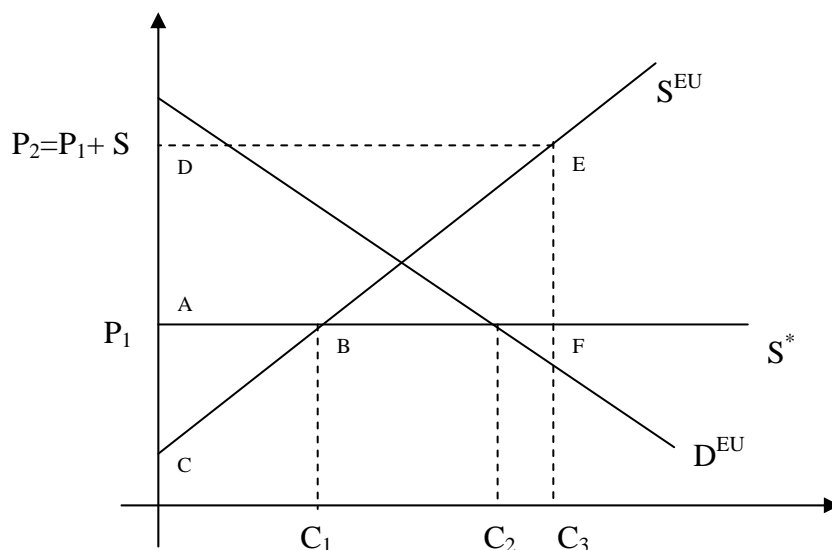
5.3 CAP effects on trade

The CAP is made up of many different components, and has changed during the years. To properly analyze the effect of the CAP, I will go through the development of the CAP during the years. This starts with the basics of the CAP and ends up with the 2003 decoupling reform. Some of the measures are relevant to show at a 'domestic' EU level, while others will need to be put in perspective of the world market.

5.3.1 Production subsidies

The main components of the CAP are basically a set of subsidies, however enforced in different ways. In the beginning the main element of CAP was direct production subsidies. Normally this would give the outcome as in figure 5.4, where the consumers do not lose anything, as they would still achieve free trade equilibrium prices.

Figure 5.4 – Imposing production subsidies

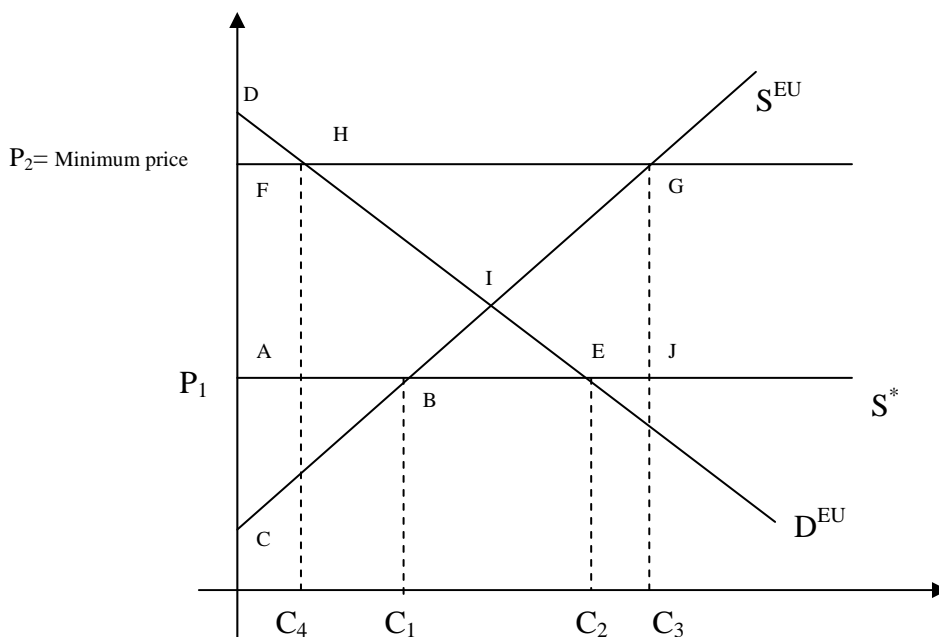


If the CAP was simply made up of payments of direct unit production subsidies the situation would be as in figure 5.4. The EU is a net importer of agricultural goods in a free market setting, shown by the difference C_2-C_1 . A direct subsidy payment would, in this case, lead to an enormous gain to the producers of $ABED$. Because there is no limit to the quantity of production subsidies, the farmers keep on producing as long as it is economically feasible. The consumption of agricultural goods would however stay the same in this situation, so a surplus will be created as suggested by figure 5.4. Also the EU as a society loses $AFED$ as they have to pay the subsidies, but some of this loss is naturally offset by the gain in producer surplus.

5.3.2 Intervention prices

However the CAP is not that simple put together, and a part of the support scheme is guaranteed minimum prices, where the EU intervenes if prices drop too low. So on top of the direct subsidies, which are distorting towards foreign producers, the domestic consumers are also affected with higher prices. This is shown in figure 5.5.

Figure 5.5 – Imposing a minimum price on agricultural goods



The effects of the intervention buying do not only move the producers away from the market equilibrium but also the consumers. The producers have the same economic gain as with the subsidies, while the consumers experience a massive loss of utility. The loss of consumer surplus is $AEHF$. At the same time the EU has to pay this minimum price, for all the products not being bought by consumers, which gives a welfare loss of HGC_3C_4 . Some of this loss is offset by the increase in pro-

ducer surplus of ABGF. On top of this an even larger surplus of agricultural goods is created, as less is consumed, where disposal or export are the only options.

5.3.3 Export subsidies

The export subsidies paid by the EU also have a trade distorting effect. Because of the often underestimated world price, the subsidies help EU producers' underbid domestic producers in Africa. At the same time the overflow of EU agricultural goods into the world market has an effect of lowering the price on the world market. This gives a loss to producers on the African market, while the winners are once again the EU farmers.

The theoretical foundation of this assumes that the EU is a major nation in the world market, and therefore can change the equilibrium price on the world market by changing the quantity.

5.3.4 The 2003 CAP reform

Through several CAP reforms the support schemes have now been changed and are today made up of direct support, and lower intervention prices. In theory this should reduce the trade distortions in both the domestic market and the world market. However what in theory happens is just a lowering of the subsidies and intervention price. This leads to a smaller producer surplus, a small gain in consumer surplus, while a smaller quantity is available for exports. This should in theory be beneficial to other producers in the world market, including the African. However the stricter food safety standards created by the reform have a large negative effect on less technological producers. These quality requirements in large have the same effect of a tariff, as they impose extra costs to producers, however the costs may be distributed unequally among the foreign producers. One could imagine it would be easier for large producers to maintain these standards, while small producers might fail. So these non-tariff barriers might turn out to have an even worse effect on trade than an actual tariff. The direct impact of these will be shown later in the section showing the impact of the trade agreements.

It is important still to note that the special agreements with Africa and other countries have not been taken into account yet.

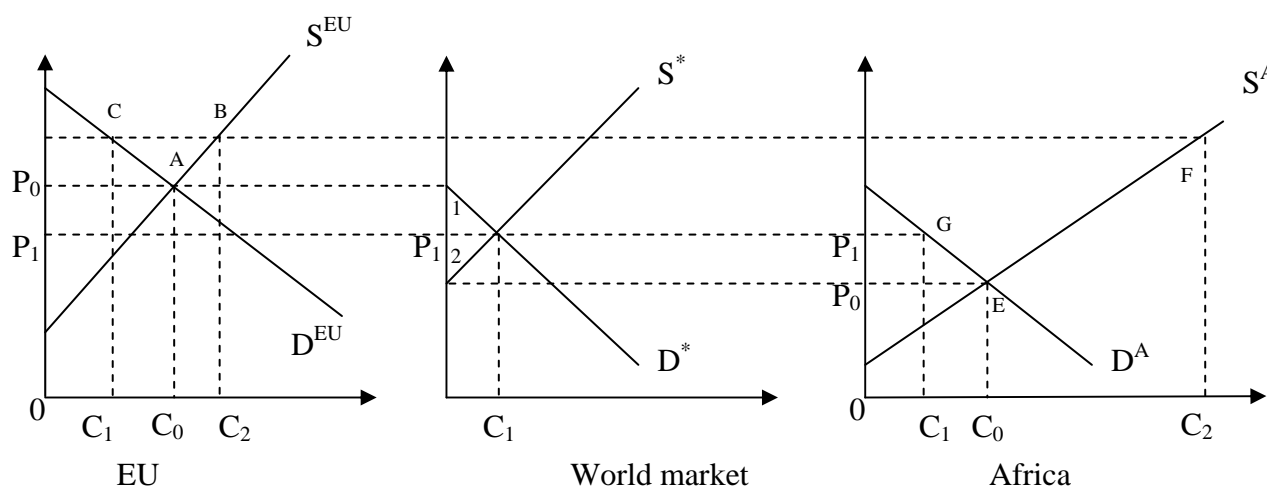
5.4 ACP-EU trade agreements

The final step in the trade theory is to apply the existing situation under the customs unions and CAP to the ACP-EU agreements focused on the most current, the Cotonou Agreement. This should give a picture of how trade between Africa and the EU looks in theory.

5.4.1 Removal of tariffs

The Cotonou Agreement, as well as the EBA initiative, effectively removes nearly all tariffs on products imported from Africa into the EU. This dramatically reduces the distortions on trade as figure 5.6 illustrates. The African farmers would benefit greatly from this agreement if the removal of tariffs on completely homogenous products was the actual outcome. It is worth mentioning that the world market in this figure is not entirely correct, as it in principle is built up by a two country setting, but is not entirely corrected for the trade distortions.

Figure 5.6 – Removal of tariffs

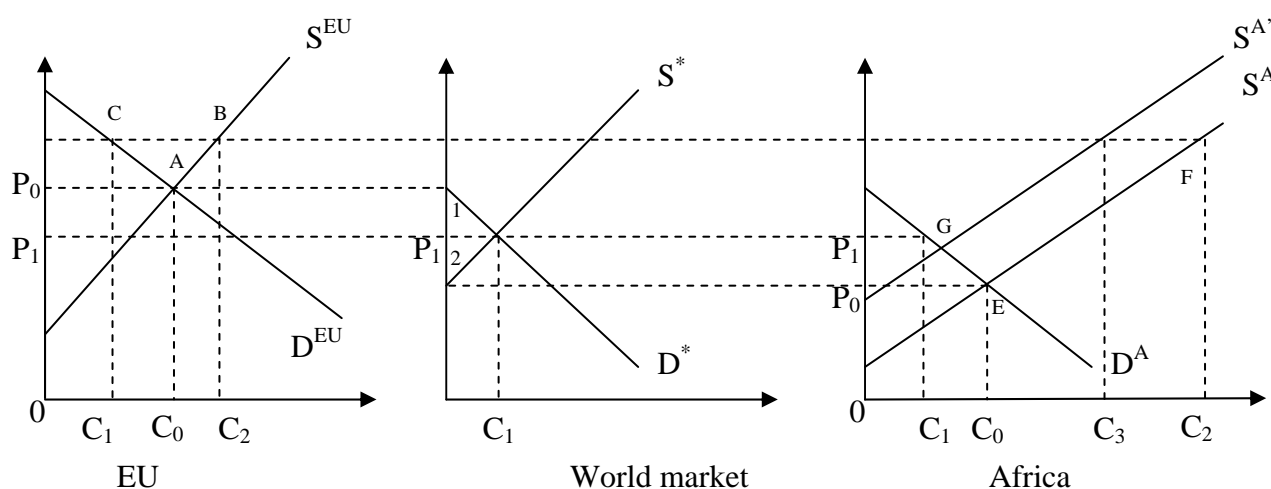


The removal of tariffs gives the African producers access to the EU market at the artificially high intervention prices. This in theory will expand the production rapidly; however figure 5.6 does not actually give the true picture of this theory. If African producers could sell all their goods on the European market, there would be no interest in selling on the domestic African market. Because the EU producers receive export subsidies so they still can sell at world market prices, all the African consumption would be imported from EU, which gives a totally perverse trade outcome. Now African producers are selling to an EU market which already has an enormous surplus, while this surplus is exported to Africa at prices lower than world market prices. This would be the outcome in theory at least.

5.4.2 Food safety standards

But unfortunately removal of tariffs is not the only part of the agreement. The existence of non-tariff restrictions is largely present in the deal between the ACP and the EU. This is especially evident for the food safety standards imposed by the EU. As described earlier these high standards induce extra costs for the African producers, reducing their direct competitiveness towards the European market. Figure 5.7 show how these non-tariff barriers affect the Africa-EU trade for agricultural goods. The same issue with the world market applies to this figure as to figure 5.6

Figure 5.7 – Increasing food safety standards



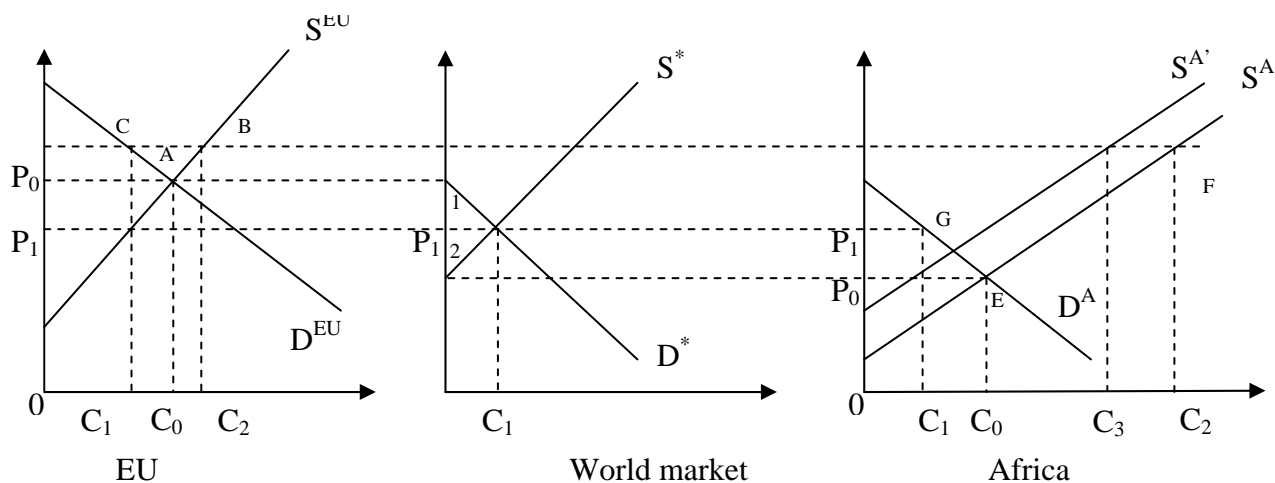
The non-tariff trade barriers, here represented by the food quality standards, increase the costs for African producers. This is seen by the shift in the supply curve S^A to $S^{A'}$. It is assumed that all goods are produced at these higher standards, including those for the domestic market. However we once again see that in this particular diagram, there will be no domestic consumption of goods produced in Africa. In reality this is not the case, and the high quality standards may not be employed to domestic markets, giving a totally different situation. The lower costs in selling to the domestic market will especially be attractive for the small producers in Africa.

5.4.3 The 2003 CAP reform

This is however not the end of the theoretical analysis of the trade relationship between Africa and the EU. The CAP reform in 2003 changed the composition of the trade relations in several ways. First of all, the intervention prices were reduced, which led to a further reduction of the profits for African producers. At the same time food safety standards were increased, imposing further costs to

the African producers. This in total gives the trade picture illustrated in figure 5.8. The same issue with the world market applies to this figure as to figure 5.6 and 5.7.

Figure 5.8 – Impacts of the CAP reform



The reform really has not changed the fundamental outcome of trade between the two regions. The intervention price has been lowered a bit, which gives a lower production surplus in EU, but at the same time reduces profits for African producers. At the same time higher costs for maintaining food quality standards are applied, which decreases profits even further.

5.5 Theoretical situation today

This leads to a theoretical picture of the agricultural trade situation between Africa and the EU today. The EU's direct subsidies give an artificially high production of agricultural goods, which yields a production surplus. European consumers are also affected since the high minimum/intervention prices give higher prices to consumers. The production surplus is sold at much cheaper world market prices, while the EU producers via export subsidies still obtain the high minimum price.

African producers can trade at the high minimum prices in EU without any tariffs, but due to higher production costs generated by high food quality standards, the trade is diverted. At the same time the extra quantities sold by the EU on the world markets reduce the world market price, and make it harder for African producers to compete on domestic markets.

This is what the theory tells us. To see how these observations apply in reality, I will be empirically testing the argument that the EU trades less with Africa because the existence of the CAP.

6 Gravity Equation

To analyze if the theory applies, and if the CAP has an influence on trade with Africa, I have chosen to use a gravity equation approach. The approach has gained immense popularity amongst researchers in international trade during the last couple of decades (see e.g. Feenstra et al. 1999, Baier and Bergstrand 2006, Grant and Lambert 2008).

The origin of gravity equations lies in physics, and explains how gravity is a function of the size of two objects and the distance between them. For use in economic analysis of international trade this is changed so that bilateral trade is a function of the size of the two countries' economy and the distance between them. Many new variables have been added such as population size (which is also relevant for the country's size), and dummies for many factors such as common border, language and currency.

The starting point in the analysis is to make four different gravity equations, two between the EU and Africa, one being for all products, and one being for agricultural goods only. This should give a picture of how trade between the EU and Africa is affected by the CAP. To test if evidence in the results of these regressions is not just caused by common trade patterns, two control equations will be made for intra-EU trade, again doing one for all goods and one for agricultural goods only.

When running a standard gravity equation all countries involved in the analysis are included with their bilateral trade with all other countries in the analysis. This is not optimal for the regression of African countries' trade with the EU. Reliable statistics for trade between African countries is nearly impossible to obtain. However, the intra-Africa trade is not interesting in this analysis, and therefore the gravity equation must be modified to fit the goal of the analysis. This will be done along the way, as several gravity models are tested until the correct model is reached.

First of all, I will go through some basic gravity equation theory, as many opposing views exist in the research community. Out from the different theories I will be choosing which parts of each theory I will be following, making arguments for my decisions along the way. Thereafter I will be going through the data collection process, and certain decisions made in choosing between different data. Finally, I will be doing a series of regressions, commenting on these along the way, and concluding with the final model.

6.1 Theory of gravity equation

All theories in gravity equations have its base in physics. The equation that determines force of gravity is (Baldwin and Taglioni, 2006):

$$\text{Force of gravity} = G \frac{M_1 M_2}{(\text{dist}_{12}^2)}$$

where M_i are the physical masses of the two objects, dist is the distance between them and G is the gravitational constant. From here it is still consensus that the physical masses are replaced by the economical mass of the countries involved, while force of gravity is replaced as the dependent variable with bilateral trade. But how these variables should be defined and which other variables to include seems to be a greater issue.

There seems to be little consensus on both of the economic variables. For GDP it is the eternal discussion of whether to use real or nominal GDP in the estimation, and even if it should be per capita GDP or total GDP. The rational for using real GDP is straight forward; inflation is removed from the equation. But as Grant and Lambert (2008) argue nominal GDP also has primarily two advantages. First of all Srinivasan (1995) has found that there are too large measurement errors in the calculation of purchasing power parity. This can of course have a dramatically impact on the results. The second argument is provided by Frankel (1997) that has showed that there are small differences in the results between real and nominal data. Grant and Lambert (2008) also argue that fixed effects in panel data will correct for inflation. However one further argument can be presented. As all data is collected in either US dollars or EUROS the inflation in the African countries has already been corrected for in the currency conversions. So if the numbers where to be deflated it would be by the same (USD or EURO) deflator. For these reasons I have chosen to use nominal GDP in my analysis. The same arguments hold for the trade data, as it also is obvious that the same standard must be used for both GDP and trade data.

The discussion of whether to use per capita or total GDP is also present in the gravity equation community. Coe & Hoffmaister (1999) logically argue that per capita GDP can be used to determine the development stage of a country. But I will be using total GDP for two main reasons. The first being that we are dealing with Africa and Europe, so there is a pretty clear definition of which countries are developed and developing. If the analysis included the rest of the world it might be interesting to include as a parameter in the research. Second, population size is included in the model which in turn should make up for the use of total GDP.

The other variable which is up for discussion is the value of bilateral trade. Besides the real versus nominal numbers which has just been discussed, the discussion goes how to estimate the trade variable. The different possible measures are import, export or total trade (import + export) value. Some also use an average of the import and export. The most common approach seems to be the use of exports from country *i* to country *j* in the model. This method is used by Feenstra et al. (1999), Grant & Lambert (2008), Roijid (2006), and Baier & Bergstrand (2006), while Kirkpatrick & Watanabe (2004) uses the opposite approach of using imports of country *i* from country *j*. By using either of these approaches trade flows in both directions are included in the estimation, as they appear as two separate observations. Baldwin & Taglioni (2006) use the more advanced approach of averaging the trade flow between two countries, which of course reduces the number of observations and might also have an impact on precision, depending on the goal of the analysis. However it gives the best picture of actual bilateral trade, and not just export. The final method that can be employed is used by Coe & Hoffmaister (1999) where the sum of import and export is used. In the big picture it should not make a big difference which approach is used, and the choices are often chosen without any argumentation of why. I will be employing the last method of the sum of total trade. This is done because it is expected that there are great differences in the value of trade whether the EU or African countries are exporters. Further detailed analysis of differences between import and export can be conducted after the final model has been determined.

The next subject to approach is which dummy variables to use in gravity equations. Some relative standard variables exist that are used in most models. First of all, variables for common language, common border, and colonial history can explain the cost of information (Piermartini & Teh, 2005). These common features can be highly relevant in explaining bilateral trade as the same language and business practices make trade easier to conduct. In this particular analysis of trade between Europe and Africa, a dummy variable for colonial history can turn out to be extremely relevant as the colonial history between these two continents is extensive.

To supplement the distance variable in determining trade costs, two other variables are quite common to add in the model. These are dummies for if a country is an island or is landlocked, while the common border dummy also plays a role in the transportation costs alongside the information costs (Piermartini & Teh, 2005).

Many also use a dummy for whether countries belong to a regional or free trade agreement. This can be used in several ways, depending on if countries belong to the same agreement or if one of the countries belongs to one.

I will be using all of these “standard” dummy variables in my model, when they are relevant for the analysis. One variable that will be irrelevant as the model turns to Africa-EU trade is the border variable, as none of the observations in the data will be of neighboring countries.

6.2 Determining a model

For determining a model to use for the analysis, inspiration has been gathered from several papers on regional trade agreements and their impact on bilateral trade. This is the research that has been conducted that resembles my objective the most. Baier & Bergstrand (2006) have examined the impact of free trade agreements (FTA) on bilateral trade amongst the members, and found that FTAs double bilateral trade over a 10 year period. For a more Africa specific investigation Gbetnkom (2006) has found that trade within the FTA COMESA has changed positively with a policy change within the member states. Many other examples can be mentioned, but none of these papers address the problem I am trying to investigate. Therefore these papers have merely been used as inspiration to give ideas of how to determine a good model for isolating the effect of the CAP on bilateral trade between Africa and Europe.

The logic behind using FTA investigations as a framework is that the EU and Africa as such can be determined as two different regions and can be set instead of the FTA dummies. To elaborate a bit on this, the EU-15 can for logical reasons be directly used as a FTA, while Africa as a whole is a bit more complicated. Therefore the ACP regions are used as a basic for dividing Africa into FTAs. However one problem exists with the ACP regions, only two of them are actual FTAs. ECOWAS is made up by a large group of Western Africa countries where most belong to the same FTA, UEMOA. In order to capture the economic differences in trade in belonging to a FTA, I prefer to use UEMOA rather than ECOWAS as a dummy variable for FTAs. The other problem exists with the region of Eastern and Southern Africa. This group is not represented by a FTA, although COMESA covers large parts of the group. One problem in using COMESA is that it overlaps with many countries in the SADC FTA. Therefore I have chosen to use the FTA of EAC, which only represents the Eastern Africa countries. All in all it is rather difficult to choose FTAs in Africa, as relative many exists. Also, some FTAs, such as CEMAC and UEMOA, are more developed than others, and are actually customs unions with common currencies.

As some African countries belong to the WTO and others do not, I will also include a variable for this membership, especially as it is interesting for interaction with the EU members, which are all within the WTO.

As mentioned the colonial ties between Africa and Europe are especially strong, and therefore va-

riables showing these colonial ties are of course essential to the equation. Some African countries have never had a colonizer, but most have at some point in time. In the research of the African countries the colonizers have been identified as: United Kingdom, France, Portugal, Spain, Belgium, Germany and Italy. The latter two lost all their colonies after World War II. All of these colonial ties are however included in the model. Some countries have even had several colonizers. Some of these are due to British and French overtaking after World War II, while others are due to the many wars and movement of borders between many African countries.

An approach that has been applied in many gravity equations in recent studies is the inclusion of variables for multilateral resistance. This is for instance done by Baier & Bergstrand (2006) in their panel data estimation in reference to the research by Anderson & van Wincoop (2003). The purpose is to account for price differences in reference to the world price. I have chosen not to employ this method although it seems to be more or less consensus in the research community. My main reason for not using it is the way my regression will be run. As the data in my model only includes trade between African countries and the EU-15, price differences are not expected to have a large impact. The prices for African countries to import from EU are estimated to be more or less the same, while prices from African countries most likely do not differ a whole lot over the total spectrum of agricultural (or other) goods.

A brief discussion of some assumption problems when using the gravity equation is found in appendix A.

6.3 Data collection

The analysis is conducted on the base of all sub-Saharan African countries, which constitutes 48 countries, as well as the 15 European countries that constitute the EU-15. Based on available data the period has been set from 1995-2007.

Data for bilateral trade flows between the EU-15 and the African countries as well as intra-EU trade has been obtained from the Eurostat database. The GDP for all countries have been obtained from the UN statistical database alongside with data from World Development Indicators, which have complimented each other in filling out missing values. The value of agricultural output has been obtained from the same two databases. Population numbers for African countries have been collected from World Development Indicators, while the EU population numbers are from the Eurostat database.

Distances between countries have been calculated out from the numbers in CEPII. Facts about co-

lonial relationships, and islands and landlocked countries have all been looked up in the CIA's World Fact Book. Finally information about the FTAs and WTO has been obtained from the individual organizations, including when membership started.

All values have been converted into EURO's using official exchange rates from the Eurostat database.

7 Gravity equation analysis

After determining a model we are now more or less ready to run the gravity equation on trade between Africa and the EU. The model will be modified along the way to fit the desired analysis. EViews has been used as statistical software package to run the regressions.

7.1 Intra-EU trade

To show how the gravity equation works in its traditional sense, I will be analyzing intra-EU trade by this method. Each country within the EU-15 has been paired with each of the remaining countries in terms of bilateral trade. Relative standard dummy variables for common language, common border, and whether the country is landlocked or an island have been added, as well as population size. This gives the following equation:

$$\begin{aligned} \ln(TT_{ijt}) = & \beta_0 + \beta_1 \ln(GDP_{it}) + \beta_2 \ln(GDP_{jt}) + \beta_3 \ln(pop_{it}) + \beta_4 \ln(pop_{jt}) \\ & + \beta_5 \ln(distance_{ij}) + \delta_6 landlocked + \delta_7 island + \delta_8 border + \delta_9 language \\ & + u_{ijt} \end{aligned}$$

where,

$\ln(TT_{ijt})$ is total bilateral trade between country i and j in year t.

$\ln(GDP_{ijt})$ is the natural logarithm of the nominal GDP for country i and j in year t.

$\ln(pop_{ijt})$ is the natural logarithm of the population in country i and j in year t.

$\ln(distance_{ij})$ is the natural logarithm of the distance between the capitals of country i and j.

landlocked is a dummy for if either or both country of country i and j are landlocked.

island is a dummy for if either or both of country i and j are an island.

border is a dummy for if the two countries share a common border.

language is a dummy for if country i and j share the same language.

The regression consists of 1296 observations over a 13 year period from 1995-2007. The results are as following in table 7.1.

Table 7.1

Cross section gravity equation for intra-EU bilateral trade, in all commodities

Variable	Coefficient	Std. Error	T-statistic	P-value
Constant	-1.215165	1.467388	-0.828114	0.4078
Ln(GDP _i)	0.659611	0.079034	8.345937	0.0000
Ln(GDP _j)	0.396995	0.063134	6.288167	0.0000
Ln(Pop _i)	0.969578	0.075946	12.76673	0.0000
Ln(Pop _j)	1.063514	0.060670	17.52963	0.0000
Ln(Distance _{ij})	-2.443746	0.066641	-36.67026	0.0000
Landlocked	-1.026948	0.092590	-11.09134	0.0000
Island	-0.102953	0.077292	-1.332003	0.1831
Border	0.588880	0.121075	4.863774	0.0000
Language	0.747568	0.137171	5.449899	0.0000
R ²	0.899463	1.117655	1278.366 (F-stat)	0.000
No. Observations	1296			

These results are all as expected. First of all, the larger both GDPs are, the more bilateral trade occurs between the two countries. This is coherent with the theory of larger economic masses attracting each other. These variables are both significant at a 1% level. Next, also relating to the size of the countries, are the population variables. These are also both highly significant positive variables, which means that the larger the countries involved in the bilateral trade are, the more trade occurs. The third traditional gravity variable is distance between the two countries trading. As expected this variable clearly shows that countries further apart trade less than countries close to each other. The high negative coefficient of -2.443746 is again highly significant.

The next four variables are all rather traditional dummy variables added to the gravity equation. It is expected that landlocked countries and islands trade less. This is due to the fact that landlocked countries are deprived of using shipping and islands cannot use train and trucks in the same way as other countries. Both these coefficients also turn up to be negative, as expected, however the island variable is insignificant even at the 10% level. This might be explained by the fact that only two islands (UK and Ireland) occur in the regression. The last two variables for common border and common language also show to have a positive influence on trade amongst countries, and both at a highly significant level. This is again as expected, as common borders can be an indication of good

neighbor relationships and common language of course eases the process of trading.

The gravity equation for intra-EU trade has a very high R^2 of nearly 0.9. This is well above the traditional level of gravity equations from previous studies². There are many possible explanations for such a high R^2 value, the best of them of course being the existence of the internal market in the EU. The internal market has removed all trade barriers that might exist between all other EU countries including both tariff and non-tariff barriers.

So to conclude on this first attempt of the gravity equation it seems to work perfect for intra-EU trade. Now the challenge will be to extend it to Africa-EU trade.

7.2 Africa-EU trade

The gravity equation approach used for the intra-EU analysis is not to any use when performing the next test. In theory it could be quite interesting to include bilateral trade between all African and EU countries, and this would presumably also yield the best and most precise results. However due to difficulties of obtaining reliable data for intra-Africa trade this approach has been made impossible to conduct. Instead the analysis will be looking at each African country's trade with the EU-15 as a whole. The argument for using this approach is that intra-Africa trade as such does not explain anything about the influence of the CAP, although these observations would provide excellent control variables. This problem will be discussed and resolved later in the analysis process. The idea is to make two gravity equations, one for agricultural goods and one for all commodities, and then compare the results of these regressions.

The variables used in this gravity equation have changed a bit from the traditional variables used in the intra-EU regression. The GDP of the individual African countries is still used while the GDP for the trading partner has changed to be that of the EU-15. This means that the GDP for country j in the regression will remain constant among all the African countries for each year and only change as the year changes. This might turn up to be a problem, but will most likely just result in an insignificant variable as the values do not change among countries and therefore should have little impact on the level of trade.

The same situation is evident for the population variables, where the EU population again is constant amongst countries for every year. Again the likely outcome is a highly insignificant variable. Distance between the individual African countries and the EU-15 is measured as the distance from the capital of the African country to Bruxelles. Bruxelles is chosen for two main reasons. First of

² See for example Coe and Hoffmaister 1999, Kirkpatrick and Watanebe 2005, Baier and Bergstrand 2006.

all, it is, if any, the capital of the EU. Second, and at least as important, it is located fairly central in the EU-15 states and therefore works as a good proxy.

Dummy variables for landlocked countries and islands are added as in the intra-EU regression. Furthermore two other sets of dummy variables are added. One set consisting of 7 different variables and denoting former colonization ties to European countries. One for each of the following countries: United Kingdom, France, Spain, Portugal, Germany, Italy and Belgium. Obviously some of these countries have had more colonial activity in Africa than other, and the few colonies Germany and Italy have had were handed over to other countries after World War II. However, these two countries set aside; pretty much all former colonies now speak the language of their former colonizer. Therefore these variables are not only an indication of direct colonial influence but also language ties, and thereby also information costs.

The other set of dummy variables is for which FTA the African countries belong to. As earlier discussed these are divided into: CEMAC, EAC, SADC and UEMOA. Furthermore a dummy variable for membership of the WTO is added. As not all African countries are members, and some become members during the analysis period, it can prove to have a very significant influence on the trade.

After this the model looks as follows:

$$\begin{aligned} \ln(TT_{ijt}) = & \beta_0 + \beta_1 \ln(GDP_{it}) + \beta_2 \ln(EU\ GDP_t) + \beta_3 \ln(pop_{it}) + \beta_4 \ln(EU\ pop_t) \\ & + \beta_5 \ln(distance_{ij}) + \delta_6 landlocked + \delta_7 island + \delta_8 british\ colony \\ & + \delta_9 french\ colony + \delta_{10} spanish\ colony + \delta_{11} portuguese\ colony \\ & + \delta_{12} german\ colony + \delta_{13} italian\ colony + \delta_{14} belgian\ colony + \delta_{15} CEMAC \\ & + \delta_{16} EAC + \delta_{17} SADC + \delta_{18} UEMOA + \delta_{19} WTO + u_{ijt} \end{aligned}$$

where all variables are as explained above. This yields the results in table 7.2

Several things come to mind when looking at these results. First of all, the regression has a relatively low R^2 of only 0.22. This is very low for a gravity equation, and is as such not acceptable for explaining trade properly. Furthermore many of the variables are highly insignificant. Therefore this model can already now be rejected as it does not work as intended. The same regression has been run for agricultural products only, and obtains a R^2 of only 0.27, so a bit higher than for all commodities, but still not good enough. Similar gravity estimations have been run for both import and export individually for both agricultural and all commodities, again without producing useful re-

sults. In order to move on to the next model I will review what may be the problem. Results from all these regressions can be found in appendix B.

Table 7.2

Cross section gravity equation for Africa-EU trade, in all commodities

Variable	Coefficient	Std. Error	T-statistic	P-value
Constant	-17.01115	219.9367	-0.077346	0.9384
Ln(GDP _i)	-0.215046	0.154226	-1.394361	0.1637
Ln(EU GDP)	0.107175	0.194218	0.551827	0.5813
Ln(Pop _i)	0.650327	0.145849	4.458918	0.0000
Ln(EU Pop)	3.456481	11.33277	0.304999	0.7605
Ln(Distance _{ij})	-2.806388	0.933015	-3.007870	0.0027
Landlocked	2.495911	0.304555	8.195260	0.0000
Island	3.019008	0.579134	5.212968	0.0000
British colony	0.774533	0.336972	2.298505	0.0219
French colony	1.258840	0.483123	2.605630	0.0094
Spanish colony	4.554413	1.080208	4.216238	0.0000
Portuguese colony	2.941041	0.559010	5.261162	0.0000
German colony	0.306300	0.394547	0.776334	0.4379
Italian colony	0.573728	0.714615	0.802849	0.4224
Belgian colony	-1.642743	0.653259	-2.514688	0.0122
CEMAC	0.333516	0.539123	0.618626	0.5364
EAC	1.296960	0.587031	2.209354	0.0275
SADC	1.016412	0.493227	2.060737	0.0398
UEMOA	-1.336078	0.481847	-2.772828	0.0057
WTO	0.315578	0.408096	0.773293	0.4397
R ²	0.222960	2.776863	9.121512 (F-stat)	0.000
No. Observations	624			

To start out with, many of the insignificant variables were expected to be insignificant. As discussed both the EU GDP and population variable suffers from being constant across countries for each year. Also, the dummies for German and Italian colonies are insignificant as discussed. More surprisingly is that the GDP of the individual African countries is highly insignificant. This is one of the cornerstones of the gravity model and therefore a solution to this problem must be found in order to estimate a useful gravity equation.

7.2.1 Deriving a new model

For a solution to this problem I have been inspired by Baier and Bergstrand (2006) and Fratianni (2007) who use the method of scaling the trade to the product of the GDPs. This model actually comes again in several other papers, and has its base in the basic gravity model from physics. By dividing the product of the masses on both sides of the equation we reach a scaled version of the bilateral trade. Although their goal is a completely different than mine, it gave me an idea. By dividing the value of trade with the product of the GDPs we obtain a ratio of how much the trade constitutes of the output of the countries involved. This is in fact an analysis of the trade openness between the African and European countries. Although this is not the traditional approach to the gravity equation, it still analyses which variables have an impact on trade, in this instance trade openness instead of trade in value.

The next problem is that a traditional gravity equation does not isolate the effect of the CAP in any way. The previous model gave two different equations, one for agriculture and one for total trade. But it is not as such possible to draw any conclusions about the influence of CAP from comparing these two gravity equations. In order to solve this problem I had to come up with some way of including a variable that shows a coefficient for when CAP has influence on the trade, hence when the trade is in agriculture. My solution to this problem is to divide each observation for each country into two observations; one for agriculture and one for non-agriculture. In this way one observation has data for total trade in agriculture and output of agriculture, and the other observation has data for total trade in non-agriculture and output in non-agriculture³. Now, in order to include a CAP variable, a dummy variable is included for all the agriculture observations. This solution works perfect with the decision to analyze the trade openness by taking ratio of trade to output, as we can then see the openness of the agricultural sector compared to all other sectors.

Finally the new approach of using ratios has resulted in a new issue. When calculating the ratios it became quite apparent that small countries have quite unusual high ratios of trade, often constituting more trade than output. Because of these unusual numbers, I have filtered out countries of below 1.2 million inhabitants as of 2007. This excludes 9 countries in the equation. Because of these exclusions the dummy variable for former Spanish colonies has also been dropped, as there no longer are any in the observations used.

³ An example of this data entry can be seen in appendix C.

7.3 A new model for Africa-EU trade

In order to apply the new model, the few mentioned changes are made to the dataset. If the model works as intended, it should be interesting to see whether agricultural goods are traded relatively more or less than other goods. In theory Africa has a comparative advantage in the agricultural sector, but theory of the existing policies also tell us that this sector is distorted in trade between the two regions.

The model obtained looks as following:

$$\ln\left(\frac{TT_{ijt}}{Output_{it} * EU Output_t}\right) = \beta_0 + \beta_1 \ln(pop_{it}) + \beta_2 \ln(EU pop_t) + \beta_3 \ln(distance_{ij}) + \delta_4 landlocked + \delta_5 island + \delta_6 british colony + \delta_7 french colony + \delta_8 portuguese colony + \delta_9 german colony + \delta_{10} italian colony + \delta_{11} belgian colony + \delta_{12} CEMAC + \delta_{13} EAC + \delta_{14} SADC + \delta_{15} UEMOA + \delta_{16} WTO + \delta_{17} Agriculture + u_{ijt}$$

Where the new variables are:

$Output_{it}$ which is the output of either agricultural sector or non-agriculture depending on the observation.

$EU Output_t$ which is the EU output of the equivalent sector.

$Agriculture$ is a dummy variable which is 1 if the observation is for the agricultural sector, and 0 if for non-agricultural.

Table 7.3 shows the results of this regression.

Now we have obtained a model with a sufficient high R^2 of 0.69, but several other results of the model are also interesting and perhaps unexpected. The high R^2 tells us that the included variables explain a great deal of how open the trade is between African countries and the EU. However the most interesting variable is the newly introduced $Agriculture$ dummy. The dummy turns out to be highly significant which means that there is a difference in trade with agricultural and non-agricultural commodities. However this agriculture dummy is positive, which means that there is more trade openness within the agricultural sector than the non-agricultural sectors. This can perhaps be explained by using Ricardian theory of comparative advantages. But another explanation could also be that countries in general trade more in agricultural commodities. This issue will be part of the next step to the final model.

Table 7.3

Cross section gravity equation for Africa-EU trade, Ratio: Trade/Output w. Agriculture dummy

Variable	Coefficient	Std. Error	T-statistic	P-value
Constant	288.1268	58.66989	4.910983	0.0000
Ln(Pop _i)	-0.417778	0.049567	-8.428524	0.0000
Ln(EU Pop)	-13.98787	2.954248	-4.734832	0.0000
Ln(Distance _{ij})	-4.456535	0.416042	-10.71173	0.0000
Landlocked	1.755601	0.117744	14.91029	0.0000
Island	2.623858	0.284216	9.231917	0.0000
British colony	-0.493061	0.152548	-3.232165	0.0013
French colony	-0.425099	0.242155	-1.755485	0.0795
Portuguese colony	2.559118	0.247986	10.31959	0.0000
German colony	0.589839	0.155961	3.781977	0.0002
Italian colony	2.303574	0.294518	7.821501	0.0000
Belgian colony	-0.182048	0.255978	-0.711188	0.4771
CEMAC	0.502739	0.241634	2.080575	0.0377
EAC	0.615863	0.227345	2.708936	0.0069
SADC	0.715168	0.204693	2.060737	0.0398
UEMOA	-0.661276	0.199109	-3.321178	0.0009
WTO	0.854501	0.202588	4.217924	0.0000
Agriculture	3.578574	0.093098	38.43874	0.0000
R ²	0.692791	1.480816	131.8578 (F-stat)	0.000
No. Observations	1012			

Four coefficients in the model raise questions compared to traditional gravity equation theory. This is first of all the population coefficients which are both negative in this case. What is important to remember is that the dependent variable is now trade relative to output, and it is therefore not given that large countries trade more with each other. On the contrary smaller countries might have the need to trade relatively more, as they may not produce all commodities themselves. Another logical explanation is that population is highly correlated with output which now is in the denominator of the dependent variable. This means that the larger the population is, the larger the output which increases the product of the denominator hence making the ratio smaller.

The next two variables that have unexpected values is the landlocked and island variables. These both obtain a positive coefficient at a highly significant level, and therefore suggest that these type of countries trade relatively more. There is no logical statistical explanation for this, other than these countries actually trade more.

Finally, the coefficients for the colony and trade union dummies can also be discussed. The colony coefficients surprisingly show the two largest colonial relationships, the United Kingdom and France, to have negative impact on relative trade, even though the coefficient for France is weakly significant, while weaker colonial ties as Germany and Italy seem to have a positive effect. The coefficient for former Belgian colonies is highly insignificant, but this might just be explained by the fact that Belgium did not have that many colonies in Africa.

The dummies for trade unions show that three of the African trade unions and WTO membership have positive effect on relative trade, while the last, UEMOA, has a negative impact. This is an interesting observation which will be looked into later in the discussion of the reasons behind the results.

In general there are quite a few deviations from the traditional gravity equation in the estimation of this model, and therefore it might be important to stress that this no longer is a traditional gravity equation, and the abnormalities can simply be a result of this different approach.

7.4 Using a control group for Africa-EU trade

In spite of some abnormalities in the results, I feel the model is on the right track to explaining the difference in agricultural trade, especially due to the agriculture dummy variable. The next goal is to test whether it is simply normal for countries to trade more in agricultural goods than other commodities. This can be done by introducing a control group into the estimation and see if African agricultural trade is significantly different from agricultural trade in other countries. The original interest was to examine the effect of CAP on trade with Africa, so in order to make the model show what is intended, the control group must consist of countries that are not affected by the CAP in trade. The only set of countries where CAP does not have this effect is the EU countries. Therefore these will be chosen as control group. Another good approach would be to simply use trade between African countries and other countries such as Australia and New Zealand, which have liberalized their agricultural sector. However, I have not had any success in finding reliable data for conducting this experiment.

To obtain consistency in the estimation each observation for the EU-15 countries will be of each country's trade with the remaining 14 countries. In this way the observations are the same as the African countries. In order to achieve further consistency the distance variable has to be changed. The new variable is calculated as the average distance to the EU-15 countries, or in the case of the EU observations to the remaining 14 countries.

Two new dummies are also added to the model, one for EU and one for Africa. Because these off course are mutually exclusive the Africa dummy will only be used for interaction purposes. On the basis of these continent specific dummies two interaction terms are created, one for EU and agriculture, and likewise one for Africa and agriculture. This should show the difference in agricultural trade from non-agricultural trade. Because of these new dummy variables the African trade union dummies are excluded for time being.

Finally, the colonial dummies are changed as these cannot be used in a sensible way for the EU countries. The new dummies represent a relationship to the countries that were present in the colonial dummies, and are mostly based on language. This means for instance that both Germany and Austria obtain the value 1 for the German dummy along with the former German colonies in Africa. Also the French and Belgian dummies are merged together because of a high degree of common language.

This gives the following model:

$$\ln\left(\frac{TT_{ijt}}{Output_{it} * EU Output_{jt}}\right) = \beta_0 + \beta_1 \ln(pop_{it}) + \beta_2 \ln(EU pop_{jt}) + \beta_3 \ln(distance_{ij}) + \delta_4 landlocked + \delta_5 island + \delta_6 english + \delta_7 french + \delta_8 portuguese + \delta_9 german + \delta_{10} italian + \delta_{11} WTO + \delta_{12} EU + \delta_{13} EU * Agriculture + \delta_{14} Africa * Agriculture + u_{ijt}$$

Before looking at the results a few remarks are necessary. Because of the inclusion of the EU-15 countries, some of the expected values have changed. First of all, the constant is expected to fall dramatically as the product of the output for the EU countries observations will be much higher than the African countries. For this reason the EU dummy will most likely become negative, as the dependent variable will become smaller as the product of output becomes smaller, even though the total trade between the countries most certainly will rise as well.

Otherwise the coefficients are expected to be similar to the previous estimation. The results of the estimation are shown in table 7.4.

Table 7.4

Cross section gravity equation for Africa-EU and intra-EU trade, Ratio: Trade/Output w. Agriculture dummy

Variable	Coefficient	Std. Error	T-statistic	P-value
Constant	80.08637	21.15397	3.785879	0.0002
Ln(Pop _i)	-0.480106	0.038797	-12.37478	0.0000
Ln(EU Pop)	-4.279267	1.068184	-4.006116	0.0001
Ln(Distance _{ij})	-2.392057	0.193182	-12.38239	0.0000
Landlocked	1.233430	0.093164	13.23930	0.0000
Island	1.113714	0.187078	5.953198	0.0000
English	-0.418344	0.108779	-3.845829	0.0001
French	-0.346219	0.122551	-2.825108	0.0048
Portuguese	1.688078	0.170316	9.911437	0.0000
German	0.053425	0.104220	0.512615	0.6083
Italian	1.088095	0.198039	5.494343	0.0000
WTO	0.693592	0.158261	4.382589	0.0000
EU	-2.593897	0.337456	-7.686626	0.0000
EU*Agriculture	5.441627	0.145285	37.45479	0.0000
Africa*Agriculture	3.578539	0.088889	40.25833	0.0000
R ²	0.755610	1.413873	303.8821 (F-stat)	0.000
No. Observations	1391			

The results obtained in this equation actually prove exactly what was intended; that agricultural trade with Africa is relatively less. The coefficients both show that agricultural trade is relatively higher than non-agricultural trade, both at highly significant levels. As mentioned earlier the African countries might have a comparative advantage in this area, but this is not the case for the EU countries. What is really interesting is whether the two coefficients differ significantly from each other.

This is tested by a simple hypothesis test (calculations in appendix D). The result is that the difference between the two interaction terms is highly significant at the 1% level. Therefore it can be concluded that the EU trades relatively less in agricultural goods with African countries than with other EU countries. Since this was the objective of the gravity equation analysis this can now be determined to be the final model.

Otherwise the results are more or less as expected. The deviations from standard gravity equational theory are the same as explained in previous estimation, and the other changes are as expected as well.

7.5 Difference in import and export of agricultural goods

After obtaining the final model it would be interesting to look if the results differ between import and export. This is simply done by replacing total trade with import and export, respectively, in the final model. Because of the accusations of dumping agricultural goods in Africa, it will be interesting to take a look at the import of agricultural goods for African countries. Likewise the trade barriers into the European market should show up in the export model, if this theory holds. This might be difficult to test directly, but a good indication is how large the constant terms are. If these two statements are to be true the import constant will in general be larger than the export constant, however this will not show anything specific for agricultural goods, but for import and export of all commodities. This could of course be tested much more simple by simply compare the mean of ratio of agricultural import with that of agricultural export. This might lead to us missing out on any changes in other variables that might occur, as well as have an influence on any difference found.

7.5.1 Import

First we take a look at the results for import. Import is here meant as import from EU-15, for both the African countries and the individual EU countries.

Table 7.5

Cross section gravity equation for Africa-EU and intra-EU trade, Ratio: Import/Output w. Agriculture dummy

Variable	Coefficient	Std. Error	T-statistic	P-value
Constant	65.01163	19.56743	3.322441	0.0009
Ln(Pop _i)	-0.413401	0.035887	-11.51941	0.0000
Ln(EU Pop)	-3.317006	0.988070	-3.357055	0.0008
Ln(Distance _{ij})	-3.008398	0.178694	-16.83551	0.0000
Landlocked	1.154989	0.086177	13.40252	0.0000
Island	0.839751	0.173047	4.852717	0.0000
English	-0.559228	0.100620	-5.557806	0.0000
French	-0.340431	0.113359	-3.003113	0.0027
Portuguese	1.603077	0.157542	10.17552	0.0000
German	-0.343173	0.096404	-3.559747	0.0004
Italian	1.436560	0.183186	7.842066	0.0000
WTO	0.623256	0.146391	4.257462	0.0000
EU	-3.637607	0.312147	-11.65351	0.0000
EU*Agriculture	5.472555	0.134389	40.72178	0.0000
Africa*Agriculture	2.824679	0.082223	34.35400	0.0000
R ²	0.768348	1.307833	325.9966 (F-stat)	0.000
No. Observations	1391			

Many of the coefficients are very similar to the ones for total trade. Therefore we will only take a look at the interesting ones for the purpose. First of all, the constant has become smaller, but this can be due to small changes in coefficients with large averages such as EU population. The constant is not of interest before it can be compared with that of export. Furthermore we see the two interaction variables have moved even further from each other which may indicate that African countries import even less agricultural goods than EU countries. This is opposite of what might be expected if dumping of agricultural goods took place.

On the other hand, the theory of comparative advantages and the role agriculture plays in the economy, suggests that we would expect agricultural goods to be imported relatively less than non-agricultural goods in Africa. This is not the case, as agricultural imports are still relatively higher. Finally, the R^2 is still quite high, and has actually increased from the total trade regression.

7.5.2 Export

The estimation is repeated for exports from the single countries to the EU-15. The results are as shown in table 7.6.

Table 7.6

Cross section gravity equation for Africa-EU and intra-EU trade, Ratio: Export/Output w. Agriculture dummy

Variable	Coefficient	Std. Error	T-statistic	P-value
Constant	102.5096	32.53983	3.150281	0.0017
Ln(Pop _i)	-0.530749	0.059679	-8.893361	0.0000
Ln(EU Pop)	-5.540167	1.643120	-3.371737	0.0008
Ln(Distance _{ij})	-2.202174	0.297160	-7.410733	0.0000
Landlocked	1.449275	0.143309	10.11296	0.0000
Island	1.437880	0.287771	4.996617	0.0000
English	-0.434284	0.167327	-2.595418	0.0095
French	-0.495582	0.188512	-2.628917	0.0087
Portuguese	1.927233	0.261987	7.356228	0.0000
German	0.476236	0.160315	2.970619	0.0030
Italian	1.088491	0.304631	3.573144	0.0004
WTO	0.969630	0.243443	3.982991	0.0001
EU	-1.866881	0.519087	-3.596469	0.0003
EU*Agriculture	5.337860	0.223483	23.88485	0.0000
Africa*Agriculture	3.514176	0.136733	25.70101	0.0000
R^2	0.587399	2.174871	139.9243 (F-stat)	0.000
No. Observations	1391			

Again all of the coefficients are not all that different from the total trade estimation without testing them for significant differences. The constant term has however changed quite a bit from 80.09 in total trade and 65.01 in imports to 102.51 for exports. Many things can explain this change in the constant but one of the most likely is an actual change in the value of the dependent value. As argued, a lower numerator (value of import, export or total trade) will lead to a lower ratio, as the product of output does not change between the three estimations. Therefore a lower ratio will lead to a lower constant term. In this case the export constant is higher than the import which suggests that countries export relatively more than they import. This is of course for all countries and for all commodities, but is an indication of what lies behind the trade patterns. To support this trend the two interaction variables have again moved closer to each other.

As with the interaction term for agricultural imports in Africa, we would also expect that the EU countries export relatively less agricultural goods than other. But the coefficient is still highly significant, and higher than the equivalent African coefficient. This is in contradiction to theory of comparative advantages.

Also, it is worthy of noting that the R^2 for the export estimation has dropped a bit to 0.59.

7.6 Conclusions of the gravity equations

So to conclude there seems to be a difference between import and export to and from the EU-15. This difference also appears to be in favor of export, which means more is exported than imported. Again this might contradict beliefs of dumping on the African market and high barriers of trade to the EU market. Many factors can contribute to these results, but it is not unexpected looking back at the descriptive statistics, especially not if we focus on the agricultural sector. One must keep in mind that African countries still have a comparative advantage in agricultural goods, so it seems natural that they export more than they import in this sector. What we still do not know is how these levels would have been in a totally free trade environment without the CAP.

The most important conclusion to come out of this gravity equation analysis is the evidence that agricultural trade with Africa is significantly smaller than that of EU countries, despite the theoretical comparative advantage to the African countries. The next section will investigate the possible reasons behind this and other results of the gravity equations.

8 Interpretation of results

The trade situation between Africa and the EU has in many ways been described in the review of the trade agreements and the CAP. However, I will now take a look at the situation through the perspective of the results of the gravity equations. First of all, this will of course concern the difference in the level of agricultural trade with the EU and Africa, which is the main focus of the thesis. In relation to this it will also be relevant and interesting to look at the difference between import and export which was found.

Second, I will also look at other interesting findings in the analysis. For one the regression for Africa still using the FTA dummies show that UEMOA was negatively correlated with trade, while the three other FTAs were positive. I will figure out if there is a good reason behind this difference. Another interesting observation is that the former English and French colonies are negatively correlated with trade. Since the UK and France were the two largest colonizers in Africa, it is quite interesting why these countries have less trade than countries with other colonizers. And finally, I will look for reasons why the variables for landlocked countries and islands are both positive, while general theory suggest they should be negative.

8.1 Difference in level of agricultural trade

Many reasons for distortions in trade have already been presented. The main reasons are most likely to be the requirements to the agricultural goods imported into the EU market, the export subsidies paid to the EU farmers, and in general the support schemes to the EU farmers.

Although the Cotonou Agreement practically removes all tariffs, the EU has set up some standards in the negotiations they would like fulfilled. These relate to competition policy, protection of intellectual property rights, standardization and certification, sanitary and phytosanitary measures, environment, labor standards, investment, public procurement, and data protection (Goodison, 2007a). These all represent some degree of non-tariff restrictions and therefore have a negative effect on free trade. As Goodison (2007a) notes, meeting the EU food safety standards requires an enormous effort for ACP countries, including creating new government departments and abnormal investments. The minimum initial cost to set legislature and establishing the framework is set to €187 million. The EU has even set the standards so high that they will need to invest €250 million to comply with these standards themselves. As Goodison (2007a) goes on to conclude: “Meeting this food safety challenge effectively in ACP countries is essential, for any failure in this area could lead to the closure of EU markets to food-and-agricultural exports from the ACP country concerned”.

This is also remarked by Bertow and Schultheis (2007) that argue that reduction of tariffs have little

impact as long as these non-tariff barriers still exist to such a high degree. So it seems quite obvious that other challenges than pure tariff barriers play a large role in trade between Africa and EU. However, it seems quite clear that Goodison and others are negatively biased towards the agreement. This should of course be kept in mind, but since nearly all academic papers seem negative towards the development prospects of the agreement they may have a point.

As Bertow and Schultheis (2007) also remark, supply restraints for the African producers mean that the liberalization undergone does not benefit them. Although prices might rise due to the tariff free import to the EU market, small producers have limited land access, and can therefore not expand production any further. Other constraints also apply to the African farmers that hinder them in benefiting from the trade liberalization. This includes the lack of storage facilities which means agricultural produce needs to be sold directly after harvest, sometimes at very low prices (Bertow and Schultheis, 2007).

These are just some of the non-tariff barriers that still exist. So even though tariffs have practically been removed, many obstacles to trade still exist, and the CAP and Cotonou Agreement seem to be the main reasons behind these distortions.

8.2 Difference in import and export

The results show that countries (both African and EU) in general export more to the EU than they import from the EU. If more research was done more conclusive evidence might be found that export is larger than import, but descriptive statistics already suggests that this is true.

One reason already briefly mentioned is the comparative advantage of agriculture in Africa. But as the EU countries also are represented in the regression, strong conclusions cannot be drawn from this theory. However it can also be seen as evidence that some of the trade agreements actually do work in the intended way. To test this it would of course be necessary to test the difference before and after policy changes, as this might also have been the trade levels before these reforms.

The matter of fact is that even if African countries export more to the EU than they import from them, the level of exports is presumably still artificially low compared to a free trade setting. In a free trade setting the EU countries would most likely produce very little agricultural products and import most of the food needs from Africa, amongst others.

8.3 Impact of FTAs

The results in one of the earlier models interestingly show that the UEMOA FTA has a negative correlation with trade, while the three others have a positive. Secondary literature has offered no explanation into why this situation could exist, so further research is necessary if this issue is of any interest. Simple explanations could be a difference in which agricultural goods are produced, the relative factor endowments, or how resources are utilized. Since negotiations are conducted on an EU-EPA level, it could also be due to differences in agreements with the EU.

8.4 Former colonies

There is no obvious reason for why the former English and French colonies apparently trade less with EU than other countries. One reason could simply be that their trade is so much focused on their former colonizers that the rest of the EU countries are neglected. No research has been found in this area, so therefore further research would need to be conducted to see if this result actually is significant for trade, and what the reasons are.

8.5 Landlocked countries and islands

Again there seems to be no obvious explanation for these results, and further research may be necessary if the results have any interest in future work with the area. The fact that the final model is in trade ratio might have an impact, otherwise these types of countries in Africa might have uncommon attributes that contribute to trade.

9 Future research steps

Evidence has been found that the CAP in fact has an effect on agricultural trade with Africa. But research into this area is rather scarce, so what can be done if there is an interest of learning more about the subject?

9.1 Development aid

The ultimate goal of this issue will be to put it into the context of development aid paid by the EU. This will require much research into the area, but will give answer to many interesting questions, such as if financial resources are being used in the correct way.

In order to conduct such a research it will be relevant to measure the exact economic effects the CAP has on African countries and their development. This should be held up against how much is used on financing the CAP and how much is paid out in development aid. This might be a very

comprehensive and difficult task but will most likely yield some very interesting results. If the long term goal in fact is to help Africa out of poverty, a plan could be made so policies do not contradict each other, which indications show they might do currently.

9.2 Regions and Free Trade Agreements

Many other interesting subjects also deserve further research, some of them have been discovered within my research, and others have been left out from the start.

One of the unanswered but interesting questions that have arisen during the research is the difference that may exist between African regions and FTAs. It would be really interesting to discover what might cause these differences. This could be done by looking closer at the individual agreements that exist with the EU, or policy differences within each region. Also a comprehensive look at which agricultural goods are being produced would be relevant. Various crops may be easier to export than others and factor endowments may also be different between the regions. As a subsection to this issue, it might also be interesting to look at the differences between former colonizers. If something is hindering trade for some countries, it might be possible to change in the future.

9.3 Policy changes

Another issue that has been more or less ignored in the statistical research is the policy changes described in the theory sections. It could be interesting to see any significant statistical changes in the reforms of the CAP and the ACP-EU agreements. It has already been discussed what effects these changes have in theory, but a quantitative research of how they have actually affected trade could be quite interesting. As policy changes take some time to have an effect, time-lagged models will have to be used in the research. Besides showing effects of previous policy changes, it can help to show which measures had the desired effect and assist in developing future policy changes.

9.4 World trade

If the effect of the CAP were to be examined closer it might be relevant to expand the research to a global scale. This is of course depends on available statistics. If all countries were included in a gravity equation analysis it would be easier to isolate the CAP effect. Many different approaches may be used, but it might be relevant to focus on trade with such countries as Australia and New Zealand, who have recently removed agricultural support systems, and basically employ free trade. A research with this perspective could also be used in a more global policy development, perhaps in the Doha Round or future WTO negotiations.

10 Conclusion

The research of the trade situation between Africa and the EU has shown several things, theoretically as well as empirically. It is hard to put numbers on the economic consequences of the CAP, but theory suggests that African countries are worse off economically due to the CAP. Theory also suggests that African countries have a comparative advantage in agricultural goods, and therefore should export more of these goods than the EU countries, however empirical research has shown a different relation, namely that African countries trade relatively less with agricultural goods than intra-EU trade in these commodities. This is very substantial proof that the CAP has a negative effect on agricultural trade with Africa.

Although it has not been analyzed to depth, it can be concluded that agriculture does play a large role in economic development of a country. Therefore the negative effect the CAP has on agricultural trade must also have a negative effect on the development of African countries. Theory says that if a free trade environment existed between the two regions, the African countries would export a substantial part of the EU consumption of agricultural goods, while little, if any, would be imported. Trade figures show that more is exported than imported, but not to the degree that might be expected according to theory. At the same time the import of agricultural goods has increased relatively more than exports in the time period analyzed. A free trade situation would therefore in theory give an enormous boost to the agricultural sector in Africa, perhaps moving the region closer to industrialization and away from poverty. This is however something that will need further research in order to be confirmed.

It might look as if several steps have been made in order to move closer to this free trade environment with reforms of the CAP and agreements between Africa and the EU. However, when theory is applied to these policy changes it shows that little, if any, effects really come from them. As suggested by some researchers the EU is simply changing the system to fit within the WTO policies, while the outcome is still more or less the same. The removal of all tariffs on imports into the EU sounds like a very good initiative, but these tariff boundaries are substituted by non-tariff barriers that might be even worse for trade. The increased price for meeting the EU standards combined with the lower selling price on the EU market leads to harder conditions for the African farmers. So the effects of the CAP are felt both at the micro- and macroeconomic level, as both farmers and countries as a whole are affected.

Results from the gravity equations show that agricultural goods in general are traded relatively more than non-agricultural goods in both EU and African countries. If we look at the agricultural share of GDP in the two regions this relation might not be surprising for exports for African countries and imports for EU countries. But when both exports and imports for both regions show relative more trade it is an interesting result. As African countries do not produce as many non-agricultural goods it might be expected that they would import more of these goods compared to agricultural goods. So the evidence that agricultural goods are imported relatively more than other goods, suggests that there might be some form of dumping going on, or at least an unnatural competitive situation.

The most important conclusion of the analysis is that there can be found a statistical significant difference in agricultural trade with Africa. This clearly suggests that the existence of the CAP in the EU market has an effect on the trade outcome. However, the research does not give any clear answer to what causes this difference. Several different explanations have been found, but the main focus has been on explaining it from a CAP perspective. Other external reasons might exist that give a perhaps natural explanation to the findings. But one thing can be concluded for certain, the results obtained differ from the theory of a free trade outcome and is pretty much coherent with theory on trade intervention. So in spite of the effort to remove tariffs, much distortion still exists in the agricultural trade relationship between Africa and the EU.

These distortions can perhaps be explained by the subsidies paid to the EU farmers both in direct support and export subsidies, as well as the non-tariff barriers into the EU market, such as high food quality standards. The first can explain the unnatural high import into the African market, while the latter can explain the relatively low export to the EU market.

So overall, the combination of theoretical and empirical evidence strongly suggests that the CAP has a negative economic effect on sub-Saharan African countries, and that the agricultural trade is different due to the complex trade structure made up by the CAP and trade agreements.

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Appendix A

Discussion of gravity equation assumptions

The most common problem in gravity equation is endogeneity bias, especially in regard to omitted variables. As many different things presumably influence bilateral trade, it is nearly impossible to include all these variables in the model. This might cause correlation between the independent variables and the omitted variables included in the error term. Baier and Bergstrand (2006) mention the problem in relation to the FTA dummies, in their paper examining the effects of FTAs. Many different parameters determine why countries chose to form a FTA, and not all of these are included in the model. Specific issues regarding to the countries in question may apply, and can be hard to include in the observed variables. This problem can be generalized to why two specific countries trade with each other. Politics, special relationships, focused marketing into specific countries, and so on, can all have great effect on the trade outcome, but are not observed in the gravity equation model. If these omitted variables are correlated with the independent variables, it will result in bias in the estimates of the coefficients.

For the specific Africa-EU gravity equation in this thesis, the important independent variables are the two agriculture variables. Several omitted variables can have a possible biased effect on these two crucial variables. Examples of omitted variables could be specific policies, the agricultural percentage of GDP, or a look at how goods are traded (bulk, differentiated etc.). However this bias is most likely to influence both of the agricultural variables, and therefore does not pose a large threat to the results. The main purpose is to investigate if a difference between the two variables exists, so unless the bias turns out to be very unequal to the variables, the results will be accepted.

Another problem that has been mentioned is the consistency of the EU GDP and population in the estimation. These variables only change by year, and are constant across all observations in each year. However it seems that the only problem to come out of this is insignificant variables. As these variables are not of any direct interest the insignificant variables are not of any problem to the estimations.

All other standard Multiple Linear Regression assumptions are in general fulfilled in the regressions.

Appendix B

Table B.1

Cross section gravity equation for Africa-EU trade, in agricultural goods

Variable	Coefficient	Std. Error	T-statistic	P-value
Constant	318.0033	231.6864	1.372559	0.1704
Ln(GDP _i)	0.139114	0.162772	0.854660	0.3931
Ln(EU GDP)	0.201039	0.204852	0.981388	0.3268
Ln(Pop _i)	0.390012	0.153677	2.537867	0.0114
Ln(EU Pop)	-14.62567	11.93822	-1.225113	0.2210
Ln(Distance _{ij})	-1.620327	0.983189	-1.648032	0.0999
Landlocked	2.379826	0.320827	7.417797	0.0000
Island	4.065145	0.610414	6.659656	0.0000
British colony	0.352112	0.355111	0.991555	0.3218
French colony	2.106842	0.508944	4.139631	0.0000
Spanish colony	6.712712	1.138795	5.894574	0.0000
Portuguese colony	2.986725	0.588879	5.071879	0.0000
German colony	1.195810	0.415629	2.877107	0.0042
Italian colony	2.721660	0.754299	3.608199	0.0003
Belgian colony	-3.712807	0.688213	-5.394850	0.0000
CEMAC	0.184356	0.567963	0.324593	0.7456
EAC	1.223261	0.618431	1.978009	0.0484
SADC	0.609167	0.519581	1.172418	0.2415
UEMOA	-1.340480	0.507604	-2.640800	0.0085
WTO	1.528545	0.432221	3.536488	0.0004
R ²	0.268457	2.925207	11.64660 (F-stat)	0.000
No. Observations	624			

Table B.2

Cross section gravity equation for Africa-EU trade, import of all commodities

Variable	Coefficient	Std. Error	T-statistic	P-value
Constant	-82.95411	98.24949	-0.844321	0.3988
Ln(GDP _i)	-0.124787	0.068895	-1.811251	0.0706
Ln(EU GDP)	0.050107	0.086761	0.577527	0.5638
Ln(Pop _i)	0.267567	0.065153	4.106740	0.0000
Ln(EU Pop)	5.518650	5.062540	1.090095	0.2761
Ln(Distance _{ij})	-1.264718	0.416794	-3.034398	0.0025
Landlocked	1.116061	0.136050	8.203307	0.0000
Island	0.915510	0.258709	3.538761	0.0004
British colony	0.369009	0.150531	2.451377	0.0145
French colony	0.985623	0.215819	4.566892	0.0000
Spanish colony	2.597613	0.482547	5.383128	0.0000
Portuguese colony	1.405819	0.249719	5.629601	0.0000
German colony	-0.292197	0.176251	-1.657849	0.0979
Italian colony	0.466067	0.319231	1.459969	0.1448
Belgian colony	-0.495007	0.291822	-1.696265	0.0904
CEMAC	-0.199879	0.240836	-0.829939	0.4069
EAC	0.678886	0.262237	2.588829	0.0099
SADC	0.456904	0.220333	2.073696	0.0385
UEMOA	-0.585114	0.215249	-2.718310	0.0068
WTO	0.133573	0.182304	0.732693	0.4640
R ²	0.228768	1.240472	9.429626 (F-stat)	0.000
No. Observations	624			

Table B.3

Cross section gravity equation for Africa-EU trade, export of all commodities

Variable	Coefficient	Std. Error	T-statistic	P-value
Constant	65.94296	135.2913	0.487415	0.6261
Ln(GDP _i)	-0.090260	0.094870	-0.951404	0.3418
Ln(EU GDP)	0.057068	0.119471	0.477675	0.6331
Ln(Pop _i)	0.382760	0.089717	4.266313	0.0000
Ln(EU Pop)	-2.062169	6.971207	-0.295812	0.7675
Ln(Distance _{ij})	-1.541670	0.573932	-2.686154	0.0074
Landlocked	1.379850	0.187343	7.365354	0.0000
Island	2.103498	0.356247	5.904607	0.0000
British colony	0.405524	0.207284	1.956366	0.0509
French colony	0.273217	0.297187	0.919342	0.3583
Spanish colony	1.956800	0.664476	2.944877	0.0034
Portuguese colony	1.535221	0.343868	4.464570	0.0000
German colony	0.598497	0.242700	2.465992	0.0139
Italian colony	0.107661	0.439586	0.244915	0.8066
Belgian colony	-1.147736	0.401844	-2.856172	0.0044
CEMAC	0.533395	0.331635	1.608379	0.1083
EAC	0.618074	0.361105	1.711618	0.0875
SADC	0.559508	0.303402	1.844111	0.0657
UEMOA	-0.750964	0.296402	-2.533602	0.0115
WTO	0.182005	0.251035	0.725019	0.4687
R ²	0.218077	1.708152	8.866032 (F-stat)	0.000
No. Observations	624			

