LUND UNIVERSITY
School of Economics and Management

Safer food equals market access?

A gravity study of GlobalGAP certification and its effect on the export potential of the fresh produce sector in Africa

Master Essay

Course: NEKM01

Author: Sofie Bredberg

Tutor: Joakim Gullstrand

Presentation: 18th of April 2011

Acknowledgments

I would like to thank my tutor Joakim Gullstrand for his support and guidance during the writing of this thesis. I am also grateful to Annika Marking for being a valuable discussant when handling the econometrics of this study and a great help when working out the basics of Stata10. Furthermore I would like to thank Anna Andersson for useful comments and the provision of GlobalGAP data. Finally I would like to thank Will Oldfield for his comments on English grammar but most importantly for his encouragement and support.

Abstract

This is a study on how the widespread use of GlobalGAP standards, a food safety certification scheme commonly used by the large food retailers, affects African countries' propensity to export fruit and vegetables. The theoretical framework for this study is based on the ongoing debate on whether standards work as a catalyst or a non-tariff barrier to trade. The question at issue for this paper focuses on GlobalGAP certification of fruit and vegetables among European retailers, and its effect on bilateral trade between 52 African countries and EU-27. The method used is a gravity model approach where the GlobalGAP variable is modeled as a bilateral trade resistance term using five different specification methods. For this cross sectional data for the year of 2008 was used. The results generated are highly significant and the main conclusions are that the more GlobalGAP agriculture in the exporting country the greater is the importing country's willingness to import fruit and vegetables. Furthermore this positive correlation between the incidence of GlobalGAP agriculture in the exporting country and bilateral trade is particularly strong when looking at willingness to import amongst countries belonging to EU-27.

Key words: GlobalGAP, Certification, Private standard, Food Safety, Bilateral Trade, Gravity Model, Fruit, Vegetables.

Abbreviations

ACP	African Caribbean Pacific
CES	Constant Elasticity of Substitution
EBA	Everything But Arms
EPA	Economic Partnership Agreement
EU	European Union
GDP	Gross Domestic Product
GFSI	Global Food Safety Initiative
GlobalGAP	Global Good Agricultural Practice
GM	Gravity Model
GSP	Generalised System of Tariff Preferences
MFN	Most Favored Nation
MRT	Multilateral Resistance Term
OECD	Organisation for Economic Cooperation and Development
OLS	Ordinary Least Squares
PIP	Pesticide Initiative Program
ROW	Rest of the World
SPS	Sanitary and Photo sanitary measures
UNCTAD	Nations Conference on Trade and Development
WTO	World Trade Organization
WTP	Willingness To Pay

.

Table of contents

1 Introduction

In this Chapter an introduction will be presented as well as the purpose of this dissertation. Furthermore the question at issue is presented followed by method and delimitation

The World Bank points out market access to be one of the most important aspects in the process of enabling developing countries to use the built-in potential of the agriculture sector for generating economic growth and development. High value agriculture products such as fruit and vegetables are in this case of particular interest as these commodities has the potential of generating a higher return relative to more traditional agricultural products. During 2003-2007 the value of fruit and vegetables world import increased by 60 %. This increase can be partly explained by higher incomes, lower transport costs and better technology. The European market plays an important role in this as it is the second largest importer of fruit and vegetables after the United States. Increasing demand in combination with a limited domestic production due to the cold climate makes the European market dependent on developing countries' export of fruit and vegetables. [1]

Trade talks have generated tariff reductions and increased import quotas which to some extent have improved market access for African countries.[2] At the same time the use of food safety standards has increased.[3] Food safety standards can work as a trade enhancing policy as it can be a way of providing consumers with information. Also, standards can be an opportunity for producers to add value, improve their products and find new ways of cooperating among actors in a specific industry or country. However, if the costs of implementing these standards are too high, the entry barrier faced by new producer's increases and existing producers may be pushed out of the market. [4] The protectionist potential of food safety called for harmonized regulation and in 1995 during the Uruguay Round the Sanitary and photo sanitary measures (SPS) agreement was signed.

[1] Jordbruksverket (2010) p. 69
[2] ATPC (2005) p. 5
[3] Ponte and Gibbon (2005)
[4] Ponte (2007) p. 181

The SPS agreement regulates when and how countries may set national standards regarding food safety. These public standards must be based on scientific proof, they can't be used in a discriminatory way and if conflict arise countries can complain and get their case tested by the World Trade Organization (WTO). [5]
At the same time as the design, use and motif of the SPS agreement is debated, private actors have started to use their own standards in order to, differentiate their product, signaling quality and food safety and improve or maintain their reputation.[6] The resistance of governments regulating the market and in this case the market for food safety together with the role of information, quality and reputation has been suggested as the basic elements for explaining the growing occurrence of private standards. [7]

Global Good Agricultural Practice (GlobalGAP) former Eurep was founded in 1989 by retailers, mergers and buyers, as a way of harmonizing different types of standards prevalent on the market[8]. Today a large share of the major food retailers in the OECD countries requires GlobalGAP certification from their fruit and vegetables suppliers.[9] This is the dominating certification scheme for agricultural products in general. It is also the most commonly used certification scheme when looking at import from developing countries.[10]

With the fruit and vegetable production value chain being characterized by a high level of buyer power[11], it could be argued that GlobalGAP has gone from being a voluntary standard to being a requirement for farmers in developing countries wanting access to the European market.[12] GlobalGAP is a set of voluntary food safety standards. However, with limited possibilities for developing countries to formally appeal certain measures it is important to investigate whether the

---

[5] WTO (1998)
[6] Henson and Jaffee (2006) p. 596
[7] Fulponi (2006) p. 4
[8] GlobalGAP (2011)
[9] Fulponi (2006)
[10] Konkurrensverket (2009) p. 27
[11] Ponte and Gibbon (2005) p. 5
[12] Konkurrensverket (2009) p. 8

widespread use of GlobalGAP among food retailers affects countries' propensity to export fruit and vegetables.

1.1 Purpose and question at issue

The purpose with this dissertation is to examine whether the widespread use of GlobalGAP standards amongst European food retailers affects African countries' propensity to export fruit and vegetables. Also, I aim to explain the channels through which GlobalGAP certification may affect bilateral trade. So far most of the studies focusing on GlobalGAP certification have been case specific. By including multiple countries in the study I aim to draw some more general conclusions regarding the effect of GlobalGAP certification.

The questions at issue for this paper is therefore:

Does the widespread use of GlobalGAP certification of fruit and vegetables among European food retailers affect bilateral trade between Africa and EU-27?

1.2 Method

Prior research results from case specific studies of food standards and GlobalGAP certification in combination with various literature addressing the dynamics of food safety standards and bilateral trade work as the foundation for this study. Furthermore the empirical method consists of a gravity model approach where cross section data was used and estimated with Ordinary Least Squares (OLS). A detailed statement on the methodology used for this study is provided in chapter 5.

1.3 Outline of the thesis

In chapter 2 a brief summary of previous research on food safety standards and in particular GlobalGAP standards is given. Chapter 3 consists of a general overview of the world market for fruit and vegetables and a basic review of the

implications of foods safety followed by a presentation of GlobalGAP as a certification scheme. Chapter 4 explores the theory behind standards as catalysts or non-tariff barriers to trade. In Chapter 5, The Gravity model is introduced as well as the methodology and data used for this study. Also, five specifications are presented and discussed. Subsequently the results are presented in Chapter 6 as well as a discussion regarding the substance of these results. In Chapter 7 the main conclusions are presented and Chapter 8 contains a list of the references used for this paper. Finally, Chapter 9 contains appendixes.

2 Previous research

In qualitative interviews with developing-country members of the WTO or Codex Alimentarius, the SPS mandates in developed countries were pointed out as the most significant constraint for exporting food products to Europe. [13] Furthermore, private food safety standards for fruit and vegetables, used by a majority of the food retailers in the OECD countries have been showed to be more stringent than the public standards. [14] With GlobalGAP being one of these more stringent set of private food standards, it is important to study how this certification scheme affects developing countries propensity to export fruit and vegetables.

There is a prevalent dissent amongst researchers regarding the quantification of private as well as public standards when estimating their effect on bilateral trade. Furthermore there are difficulties accessing extensive detailed micro data on implement costs on a farm level and price transmissions within the food production value chain etcetera. Therefore most studies focusing on GlobalGAP certification available so far are case specific. [15] Despite these restrictions, some attempts to perform a more general econometric analysis of how the GlobalGAP standards affect trade has been made. Two of these will be presented below.

Firstly, Moenius (2004) use a gravity model when regressing bilateral trade flows on standards over the period 1980-1995, focusing on 8 countries within the EU as well as Switzerland, Australia, Poland, Turkey, US and Japan. [16] The general hypothesis for this study was that country specific standards were expected to impede trade and shared standards were expected to increase trade as shared

[13] Henson and Loader (2001) p. 99
[14] Fulponi (2006)
[15] International Institute for Environment and Development (2009) p. 23-37
[16] Moenius (2004)

standards remove underlying cost differences. Data from the Perinorm database[17] was used and a distinction between importer specific, exporter specific and shared standards was made. By grouping sectors at one SITC level Moenious (2004) found that importer specific standards significantly reduces imports for the non manufacturing sectors and increases trade significantly in the manufacturing sector . Exporter specific standards on the other hand were positively associated with most grouped trade flows. [18]

Criticism has been leveled against private food safety standards such as GlobalGAP certification for being discriminatory towards producers outside the EU. Reason being, the costly production measures and the exclusion of developing countries in the negotiations regarding focus and design of these standards. Even though Moenious (2004) does not focus on GlobalGAP standards specifically his distinction between exporter, importer and shared standards makes the above conclusion relevant for the question at issue in this study.

Secondly, focusing on Sub Saharan exporters of fresh produce between 2000 and 2006, Henson et al (2009) provides a quantitative analysis of what the main drivers for GlobalGAP certification are as well as an estimate of the returns gained by firms joining the certification scheme. [19] The authors does this by deriving data from a survey on the Pesticide Initiative Program (PIP) [20] such as volume, value of sales, destination markets, market requirements and types of customer supplied. One of the focal points for stimulating trade between EU and the African Caribbean Pacific countries is to enhance firms' food safety controls and prepare them for certifications such as GlobalGAP; this is partly done by providing technical support through programs such as the PIP. The study shows that returns in terms of export growth sales on investments associated with GlobalGAP requirements are considerable. It is also suggested that GlobalGAP certification is not only a way of maintaining access to high value markets it can also yield significant gains in export. The study illuminates how countries with

---

[17] Perinorm is a world leading bibliographic database of national, European and international standards from 23 countries, a total of more than 1,100,000 records.
[18] Moenius (2004)
[19] Henson et al (2009)
[20] PIP aims at maintaining and/or enhance export of fresh produce from African Caribbean Pacific (ACP) countries to the EU

well established horticulture export sectors are more likely to achieve GlobalGAP certification. Also, the provision of technical assistance is of great importance when it comes to letting emergent exporters use the growth potential of fresh produce export.

3 Background

This chapter contains a short description of the world market for fruit and vegetables as well as a review of the trade preference groups prevalent in EU's development strategy for developing countries. An introduction to the functions of the food safety market is provided followed by a presentation of GlobalGAP.

3.1 Fruit and vegetables - A market with potential

In 2008, World Bank estimates show that three out of four people living in developing countries lives in rural areas with most of them depending directly or indirectly on agriculture for their livelihoods.[21] This is one of the reasons for why agriculture is seen as a sector with great potential of being an important engine for development, particularly poverty reduction. The reason being various cross country studies indicating Gross Domestic Product (GDP) growth in the agricultural sector to be twice as efficient in regards to poverty reduction compared to growth in any other sector. [22]

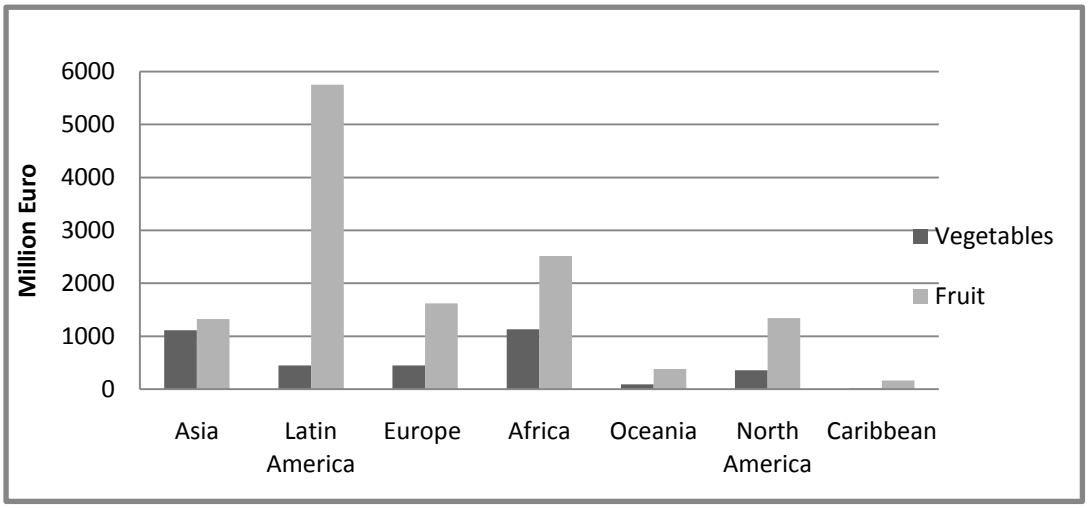
From mainly exporting traditional agricultural products, an increasing share of developing countries' export in agriculture products comes from fresh produce such as fruit and vegetables.[23] Farmers' access to these markets involves an opportunity of higher returns as the world market price for these products are in general higher relative to more traditional agricultural products. World Trade of fruit and vegetables amount for close to 110 billion dollars. Counted as import value, 60 % of this figure is represented by fruit and the rest by vegetables.[24] The European Union is the second largest importer of fruit and vegetables after the United State. At the same time as these trade volumes are largely consisting of

[21] World Bank (2008) p. 26-27
[22] Ibid p. 29
[23] Johansson (2009) p. 61-62
[24] Jordbruksverket (2010) p. 69

trade between member countries, the increasing demand for products which cannot be produced domestically all year around such as exotic fruit has increased.

In 2008 about 43 % of Europe's total import of fruit and vegetables came from countries outside the EU.[25] Bar Chart 3.1 shows that after Latin America when it comes to fruit, and after Asia when it comes to vegetables, Africa, with South Africa, Morocco and Egypt in the forefront, plays an important role for European import. [26]

(Bar Chart 3.1)



Trade talks have to some extent generated improved market access for developing countries.[27] However, agriculture products remain a very sensitive issue when negotiating tariff reductions, yet tariffs are not the only trade impeding obstacles for producers in developing countries wanting to export to markets such as Europe. The imposition of higher standards in the export market implies the risk of lost trade. The African countries are particularly in a danger zone as these countries often depend on only one or two primary commodities for the majority of their export earnings,[28] with limited resources to change their production methods. Despite the potential of fruit and vegetable export being an engine for

[25] Jordbruksverket (2010) p. 72
[26] Ibid.
[27] ATPC (2005) p. 55
[28] Ibid. p. 27

development, African countries have frequently suffered the consequences of stringent food safety standards through lost export markets.[29]

The implications of food safety can be analyzed from various perspectives, which will be briefly presented in the following paragraph.

3.2 Food safety

Food safety plays an important role in the increasingly buyer driven food production chain and the reason for this will be explained below. Furthermore the increased use of standards as a warranty for certain values is discussed followed by a review of the origin, purpose and design of the GlobalGAP standards.

3.2.1 A market characterized with market failures

Today's consumers are often completely disconnected from the food production chain apart from their weekly visit to their local super market. At regular intervals new findings regarding food safety are revealed and media as well as policy makers give some findings more attention than others. Most consumers would not buy food they consider being dangerous but the way individual consumers value risk when it comes to food safety varies on the basis of their information, past experience, habit, preferences and so forth. [30]

With demand being consumers' willingness to pay (WTP) for increased food safety and supply being determined by the cost of this risk reduction, food safety can be analyzed as any other good with a market clearing where demand equals supply. This equilibrium represents an "acceptable" level of risk. A risk level of zero would not be economically efficient as the total cost would exceed both the private and public cost of zero risk, based on the assumption of perfect information. [31] However, it is extremely difficult for consumers to weed out the relevant from the irrelevant information hence there is a risk they base their

[29] Defra (1999) p. 3-5
[30] Ibid
[31] Ibid

consumption decisions on information that do not value the risk correctly.[32] Due to limited cognitive capacity, individuals tend to absorb information that supports their existing opinion whilst dismissing conflicting information. Individuals also tend to underestimate low risk outcomes and over estimate high risk outcomes. Other factors that tend to affect individuals probability estimation of risk are, the perceived level of control, degree of voluntariness, immediacy of effects, levels of consumer dread, likely hood of unknown effects, availability of alternatives and reversibility of consequences. Based on the above, consumers are likely to wrongly estimate the risk of consumption even if they have access to the right information. Consumers will either take more risks that they would ideally like or they have to pay more for food safety than they would ideally prefer, making it impossible to maximize utility. [33]

We can also find explanations for the prevailing market failures by looking at the supply of information. The fact that all food-borne risks are related to goods with experience characteristics and credence characteristics makes it extremely difficult for the consumer to evaluate the risk before consumption. The public good characteristics of information, where suppliers do not take in to account the social benefit of information generates an under supply of information. This is an often observed market failure on the food-safety market. One can also expect that producers, manufacturers and retailers posses more information than the consumer. With one group being more informed than another there is always a risk that this difference can be used to the consumers disadvantage. If consumers can't distinguish between a safe product and a less safe product, the producers will not be able to charge a higher price for the safer alternative. Subsequently they will only provide the less safe product, creating a sub-optimal market. Excess supply of information driven by marketing competition and firm differentiation can also generate market failures as it can distort consumers' behavior.[34]

---

[32] Defra (1999) p. 3-5
[33] Defra (1999) p. 5-7
[34] Henson and Traill (1993) p 157-158

3.2.2 Correcting market failures

With a market structure where consumers aren't capable of maximizing their utility because of information constraints and where suppliers can use information to their advantage, a third party is needed to correct these market failures.

When it comes to food safety standards, critique has been given as these standards are considered to be one of the major factors limiting developing countries export of agricultural and food products. This is particularly the case for export to the EU[35]

In general there are four different types of possible interventions that the government can use in order to correct the above described market failures. Governments can stimulate supply of information by providing their own public information and by subsidizing other actors providing this kind of service. They can also introduce mandatory labeling on content and origin. By doing this, the government can to some degree correct market failures caused by lack of information an asymmetry. The weakness of this strategy goes back to consumers' limited cognitive ability. It also involves a cost and if the individual doesn't value food safety the cost will make them ignore the information provided.[36]

When it comes to food safety the effect of information campaigns and mandatory labeling is regarded to be limited as it depends on consumers' ability to process information. Such strategy is also discriminating towards some socioeconomic groups. Therefore regulation might be the only efficient way of targeting the negative externalities caused by consumption of certain goods. [37]

EU legislation is based on caution and prefers better safe than sorry when it comes to food safety. [38] However, reducing risk to zero is as previously mentioned not economically efficient, and even if governments do not aim at achieving a zero level risk, their taxes and standards might push the risk level below what's "acceptable". This leads to undesirable and unnecessary costs.[39]

---

[35] Ponte (2007) p.182
[36] Henson and Traill (1993) p. 160-162
[37] Defra (1999) p. 11-14
[38] Konkurrensverket (2009) p. 23
[39] Henson and Traill (1993) p. 160 - 162

The policy makers are faced with the challenge of identifying what's "acceptable" and they must have a well functioning control system as well as a way of enforcing their decisions. These requirements are sometimes difficult to implement.

All interventions imply a cost which can be both monetary and political. Some are more costly than others and the difference between what's socially acceptable and what's politically acceptable, matters for the outcome. An economically feasible intervention will not be implemented unless the government can prove that it's politically feasible. Policymakers must therefore be able to demonstrate how the total benefit of their planned intervention will exceed the total cost of not intervening. [40] On a global level differences between nations regarding food safety are regulated by the SPS agreement, and scientific proof is the key determinant for settling conflicts between countries. However, with food safety being a relatively abstract good, the requirement for scientific proof and the process of demonstrating that benefits will exceed costs when enforcing a standard makes the application of the SPS agreement a complicated task. Governments are as discussed above limited when it comes to the regulation of food safety. The outcome of this is governments' common use of minimum quality standards. [41]
Many of the European private standards have gone further than the EU legislation by requiring even more strict standards to be fulfilled. With an increasing demand, price is therefore joined by other aspects such as variety, quality and safety when it comes to the competition between firms. [42]
Increased use of private and voluntary standards regulating food safety may well be a response to the limitations governments are facing when it comes to food safety regulation, as well as the short-comings of the SPS agreement.

[40] Defra (1999) p. 11-12
[41] Fulponi (2006) p. 4
[42] See Henson and Reardon (2005) in Konkurrensverket (2009) p. 23

3.2.3 Private standards

Global value chains are becoming increasingly buyer driven, especially chains such as the fruit and vegetable value chains which are characterized by the structure of retailers, branded marketers, international traders and industrial processers being the driving force. [43] In a study by Dobson et al (2001) the firm concentration prevalent in the European food retailing market in 1993-1999 was surveyed. It showed how the five largest food retailers in Sweden, Finland and Portugal in 1999 had 78.2 % respectively 68.4 % and 63.2 % of their national market and in most countries the five largest retailers had 50 % of the market or more. [44] These retailers are to an increasing extent using private standards in order to guaranty consumers that their products possess various qualities and values demanded by consumers. Firms use labeling as advertisement, to create goodwill, to inform consumers about the attributes of the goods as well as to diversify their product. If the benefits of doing this exceed the costs, firms will choose to label their product voluntarily.

The presence of labeling also creates pressure on firms. If they do not label their products consumers will assume that the product is lacking certain qualities.[45] Furthermore private quality standards are becoming more specific, focusing on production and process methods rather than the product itself. This indicates how retailers' use of voluntary standards is not only a strategy for guaranteeing food safety it is also a way of competing against other firms. [46]

With food safety and competiveness being two of the motives for using private and voluntary certification schemes one could think there would be a shift towards increased vertical integration in the supply chain, yet this is not what's happening. [47] Instead firms are to a larger extent using third party certification. By doing this they can distance themselves from the actual control and transfer the

[43] Ponte and Gibbon (2005) p.5
[44] See appendix A for the complete table
[45] Golan et al (2001) p.7
[46] Ponte and Gibbon(2005) p.5
[47] Ibid.

cost of the quality control to the supplier. [48] Business to business standards (B2B) are of particular interest when focusing on fresh produce, as these are often unbeknown by the consumers hence no price premium is generated. With retailers having strong buyer power the voluntariness of these standards could be questioned. [49]

GlobalGAP is a B2B standard regulating food safety, with fruit and vegetables being the main sector for intervention. Paragraph 3.3 looks closer at this certification scheme.

3.3 GlobalGAP

Global Good Agriculture Practice (GlobalGAP) is a set of standards commonly used by food retailers regulating how agricultural products should be produced.

In Table 3.1 the areas of concern for producers wanting to become GlobalGAP certified are presented.

(Table 3.1)

Record keeping & Internal self-inspection	Produce handling
Fertilizer use	Waste & pollution management, recycle & reuse
Irrigation/Fertigation	Worker health, safety & welfare
Crop protection	Environmental issues
Harvesting	Complaint forms

Source: Yudin and Schneider (2008) p. 4

GlobalGAP started in as a set of private and voluntary standards for European producers. [50] The idea was to harmonize different standards prevalent on the world market for agricultural products and in 1999 17 retailers took the initiative to create a joint and independent verification system for all suppliers to comply with. [51] GlobalGAP standards focus on the production on the farm gate level, taking the

[48] Ponte and Gibbon (2005) p. 18
[49] Konkurrensverket (2009) p.15
[50] Yudin and Schneider (2007) p.1
[51] GlobalGAP (2008) p. 3

whole on farm production process into consideration, including farm inputs and farm activity. [52] Out of all the control points regulating the qualification requirements for GlobalGAP certification, 58 % regulates aspects dealing with food safety. The other 42 % regulates animal welfare (16 %), Environment (14 %) and worker health & safety (12 %). [53]
This is a business to business (B2B) standard and therefore, having GlobalGAP certified products on the shelves is not something retailers in general use as an argument when marketing themselves to consumers [54]

The certification scheme was approved in 1997 by the Global Food Safety Initiative (GFSI). This made GlobalGAP certification equivalent to five other leading certification standards. [55] In 2000 the partnership principle between retailers and producers was established and the first protocol for fruit and vegetables was presented. As any certification system credibility is essential and in 2001 ISO 65 accreditation was received, soon after the first grower certificates were granted.[56] Since 2000 the fruit and vegetable protocol has been revised several times and the variety of products eligible for certification has been extended to include Flowers & Ornamentals, coffee, Aquaculture and livestock. [57]

In a study by Fulponi (2006) quality and safety directors of major retailers accounting for almost 70 % of retail food sales in the OECD- countries were interviewed about their reasons for using GlobalGAP certification. The answers were consentient as they all report reputation as the main incentive for using GlobalGAP standards. 85 % of the respondents report their standards to be more

---

[52] GlobalGAP (2011)
[53] GlobalGAP (2008) p. 21
[54] GlobalGAP (2011)
[55] The other standards are for primary production Safe Quality Food 1000, and for refined food products, British Retail Consortium, Global Food standard, HACCP,FSSC 22000,International Food Standard, and Safe Quality Food 2000
[56] ISO 65 (EN 45011) is the leading internationally accepted norm for certification bodies operating a product certification system. It is accepted all over the world as the strongest indicator that a certification body is competent. (Definition of ISO 65 according to FLO-CERT)
[57] GlobalGAP (2008) p. 3

stringent than public regulation and 50% report their standards to be significantly higher. Also, all firms collectively aim for zero tolerance for food safety failure.[58]

It is today often required by fruit and vegetables producers to comply with these standards if they want to export their products to the European Union, Switzerland and Norway. [59] This is something particularly observed when it comes to accessing the Northern European market[60]. The increasing demand for high value agricultural products such as fresh produce in combination with the market power possessed by food retailers have lead to a situation where this set of European voluntary standards have become a global requirement. The transition from being a standard for European producers to being a global standard was acknowledged in 2007 by the name change from EurepGAP to GlobalGAP. [61]

3.3.1 GlobalGAP in figures

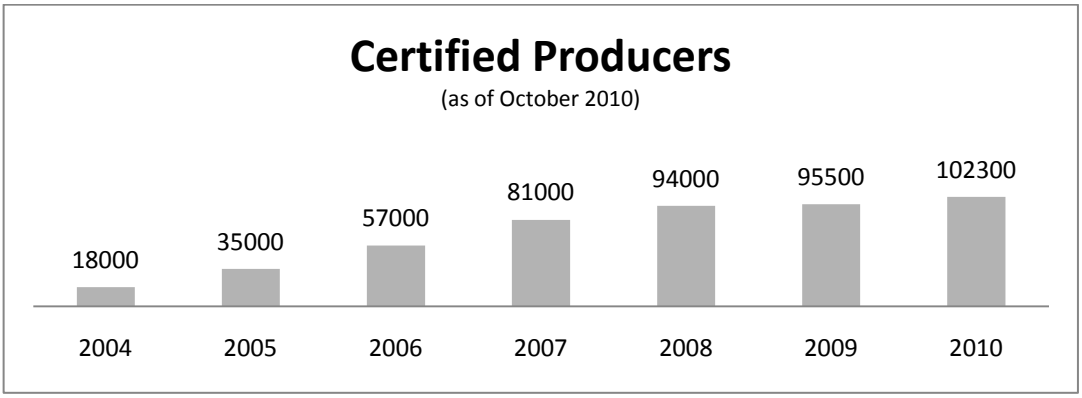
GlobalGAP is today represented in 80 countries. There are 130 approved certification bodies and certificates have been issued in over 100 countries worldwide. [62] Today, retailers and producer/supplier members are equally on the organizations committees and GlobalGAP board and apart from Europe there are also representatives from Latin America, Asia and Africa. [63]

Out of the respondents in the study by Fulponi (2006) 75 % of the safety directors reported that 50-70 % of all their fruit and vegetables is EurepGap or SQF1000 certified, and the goal within 2-5 years is to reach a 90 % certification level.[64] Furthermore the livestock and aquaculture sector is seen as sectors of great potential when it comes to expanding the GlobalGAP certification scheme. However, fruit and vegetables are at this stage the leading product groups when it

[58] Fulponi (2006) p. 6
[59] Yudin and Schneider (2007) p.1
[60] Konkurrensverket (2009)
[61] GlobalGAP (2011)
[62] GlobalGAP (2010) p. 54
[63] Henson et al (2009)
[64] Fulponi (2006) p. 6-9

comes to number of GlobalGAP certified producers. [65] In Bar chart 3.2 data collected from the GlobalGAP Annual Report 2010 illustrates the rapid increase of certified producers since 2004.

(Bar Chart 3.2)



Source: GlobalGAP (2010)

In order to get a more detailed picture of the drivers behind this increase and the situation for the countries in the sample for this study we look at Table 3.1, where each country and its number of GlobalGAP certified producers are presented for the years of 2008, 2009 and 2010.

(Table 3.1)

Country	2008	2009	2010	Country	2008	2009	2010
Austria	880	2302	2228	Lithuania	1	1	1
Belgium	3366	3111	3306	Madagascar	1145	50	190
Bulgaria	1	8	9	Mali	337	188	91
Burkina Faso	182	323	295	Malta	775	16	109
Cameroon	11	2	2	Morocco	417	383	415
Côte d'Ivoire	264	157	238	Mozambique	0	2	2
Croatia	67	77	84	Namibia	9	14	13
Cyprus	506	876	855	Netherlands	4774	5581	5510
Czech Republic	19	44	89	Poland	351	737	1048
Denmark	58	63	99	Portugal	243	361	411
Egypt	298	322	377	Senegal	9	97	167
Ethiopia	8	7	11	Slovakia	15	15	16
France	2278	2673	3009	Slovenia	8	11	9
Gambia	0	1	2	South Africa	1555	1951	1841
Germany	5464	8271	8571	Spain	9113	16498	20833
Ghana	0	149	426	Swaziland	3	4	6
Gibraltar	0	1	0	Sweden	14	15	17

[65] GlobalGap (2010) p. 38

Greece	13967	12110	11193	Tanzania	1	10	70
Guinea	16	42	40	Tunisia	229	248	242
Ireland	49	34	32	Uganda	0	3	5
Italy	12875	16922	18353	United Kingdom	79	1795	50
Kenya	133	207	395	Zambia	1	3	3
Latvia	1	1	1	Zimbabwe	1	24	18

Source: GlobalGAP (2010)

In 2010 Spain stands out as the country with the largest number of certified producers followed by Italy, Greece, Germany and the Netherlands. African countries like Ghana, Tanzania and Madagascar were in the 2010 annual report called shooting stars by GlobalGAP as they had gone from having only a few certified farms to more than 50 within 12 months. [66] Most of the countries show an increase in the number of certified producers between 2008 and 2010 yet there are also countries like Mali, Cameroon and Greece which experienced a decrease in the number of certified producers. In 2008 Greece, Spain and Germany had the largest number of certified producers within Europe and in Africa South Africa, Madagascar and Morocco ranked the highest. Countries like Gibraltar, Gambia, Mozambique and Zambia have had a relatively stable number if certified producers with small positive and negative changes. Furthermore it is interesting to note how the Northern European countries previously mentioned as having relatively more extensive claims for fresh produce to be GlobalGAP certified are not, which one could expect topping the list when it comes to the number of certified producers.

In the following chapter, theory regarding the relation between trade and standards such as GlobalGAP certification scheme will be explored.

[66] GlobalGAP(2010) p. 38

4 Theory

4.1 Standards – Catalyst or trade barrier

Food safety standards can be designed in a way that facilitates production and gives producers access to previously unexplored markets as standards provides consumers with information and quality guaranty. The use of standards can reduce transaction costs and it can work as a way of providing public goods [67]

In the trade debate these effects have been presented as ways of enhancing trade hence standards are argued to work as catalyst to trade.

However, the trade enhancing potential of standards is also questioned as the producer who wants to meet the standards will face costs. These costs are not only generated by the redesigning of products and for setting up a functioning administrative system, there are also continuous costs for maintaining quality control testing and certification. These compliance costs can be to the advantage of larger firms when it comes to global competition, as larger firms will have more capacity to met the standards and therefore have access to the export market.[68] These costs depend on the type and stability of the standards as well as the competition situation within the food production value chain. However, if the costs for implementing these standards are too high the higher entry barrier imposed by increased costs may stop new entries to the market and push out existing firms from the market.

The conflicting opinions about standards being a catalyst to trade versus standards being a non- tariff barrier to trade can both be supported by theory and empirical studies.

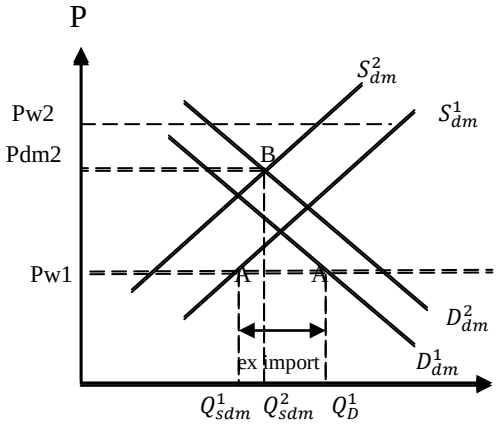
---

[67] Maskus et al (2001)
[68] Maskus et al (2001) p. 20

In order to analyze how certification affects foreign producers Mitchell (2003) distinguished between certification which foreign producers can afford to implement and certification which is too expensive for the exporting foreign firms to comply with. She shows graphically how the implementation costs of standards determine whether import to the domestic market from the foreign market is impeded or enhanced. The two scenarios which are based on a two country model where the starting point is free trade and both countries trade for the world market priceP_w^1, will be presented in paragraph 4.1.1 and 4.1.2.

4.1.1 Standards which foreign producers can't afford

The reasoning in paragraph 4.1.1 and 4.1.2 is based on the assumption that the standards have to be fulfilled by all producers and consumers do not have the option to buy a product which does not fulfill the standard. Initially, the world market price equals Pw1 and the domestic producers are only capable of supplying Q_{sdm}^1 of the total demand Q_D^1 leaving domestic demand to be partly reliant on import.



Where:
S = Supply D = demand
P = Price Q = Quantity
dm = domestic w = world

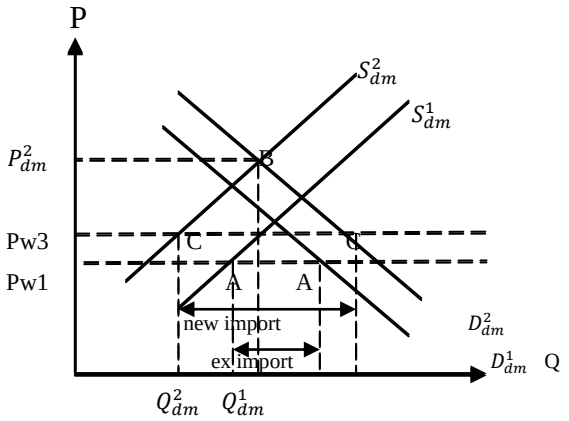
Source: Konkurrensverket (2009)

The introduction of standards invokes costs for domestic as well as foreign producers, making the domestic supply curve shift inwards as supply is constrained. Parallel to this shift the domestic demand curve will shift outwards as consumers will start to demand products that meet the standard. Subsequently higher quality requirements are posed by the consumers on the product being standardized. Furthermore, if the costs of implementing the standard are at a level which foreign producers cannot afford the shift in the foreign supply is expected to be even greater than at the domestic market. This generates new world market

equilibrium in point B with a world market price of Pw2, a price which is higher than the domestic price Pdm2. With this price difference there will be no import to the domestic market from the foreign market, making domestic suppliers to supply the domestic market for price Pdm^2. [69]

4.1.2 Standards which foreign producers can afford

When the implement costs required by domestic standards are at a level which foreign producers can afford the foreign supply curve will not shift inwards to the same extent making the difference in world market price smaller than in the previous example. The foreign export market will in this case remain open and import to the domestic market from the foreign market can continue to compete with domestic production, a scenario which is beneficial for consumers. As the increase in costs due to the new standards generates an even larger gap between domestic supply and demand compared to previous example import from foreign producers will be enhanced. The world market equilibrium in point B will now invoke more import than prior to the introduction of a standard. Furthermore consumers will have the benefits of competition at a lower price than in the previous example making consumer better off if standards are designed in a way that foreign producers can handle cost wise.



Source : Konkurrensverket (2009)

[69] Mitchell (2003)

4.2 Productivity matters for the export potential

It is relevant to add the assumption of heterogeneity among firms to the above way of reasoning as it extends the framework to include consideration for firms' differences in productivity. Based on the assumption of productivity being the main determinant for why firms produce for the foreign/export market or only for the domestic market, Melitz (2003) provides us with important insights to how the implementation of standards will affect bilateral trade based on the assumption that standards invoke a fixed export cost. The starting point for Melitz's reasoning is two countries practicing free trade prior to the introduction of a certification scheme and only some firms are at a high enough productivity level to be able to afford to fixed cost of exporting. Firms with a lower productivity are therefore only supplying the domestic market. As certification requirements are introduced the costs of export increases, fewer producers will be able to afford their supply to the export market, and the productivity threshold is increased. This makes firms leave the export sector and it also makes it more difficult for new firms to enter the export market. Hence it becomes important for the future weather a company has been exporting prior to the introduction as it gives the firm an advantage when it comes to future export potential. With fewer firms supplying the export market a larger number of firms are competing for the profits in the domestic market, making less productive firms on the domestic market having to exit. [70]

This model does originally assume the two countries to be at a similar productivity level. However, extensions of this model show how only the more productive country will benefit from introducing certification when considering a situation with asymmetric countries. [71] Furthermore this may led to a situation where the world market is dominated by the most efficient country as even the most productive producers in the less productive country won't be productive enough to handle the costs of implementing standards. [72] Standards which are

[70] Melitz (2003)
[71] See Falvey et al (2004) in Konkurrensverket (2009) p. 59
[72] See Jean (2002) Konkurrensverket (2009) p. 59

enforced as requirements for market access may with this implicate a total exclusion of less productive countries from the world market. [73]

In a situation where GlobalGAP standards are becoming more of a requirement for producers wanting access to the European market than a voluntary way of guaranteeing certain qualities one can expect the pressure of becoming GlobalGAP certified to increase. This pressure is also likely to be intensified with an increasing number of producers joining the certification scheme as a product without the GlobalGAP warranty may become not only a product without this particular label, it also risks being seen as a products lacking all the qualities required for being certified. In other words, perfectly safe food may be seen as not safe unless it fulfills the specific requirements set by GlobalGAP. The question is if the increased use of these standards has an effect on import. In order to investigate this I have used a gravity model approach which will be further explained in Chapter 5.

[73] Konkurrensverket (2009) p. 59

5 Empirical method – A gravity model approach

5.1 Introduction of the gravity model

The Gravity Model (GM) in the most basic form provides us with a framework for explaining bilateral trade flows based on economic mass and distance. Trade between two countries is with this framework an increasing function of economic mass and a decreasing function of distance illustrated by equation 5.1 [74]

(Eq.5.1) $$X_{ij} = \frac{G_i^{\alpha} G_j^{\beta}}{D_{ij}^{\theta}}$$

Where X_{ij} represent trade between country i and j, G is the economic mass of country i respectively j which is often estimated by using GDP, finally D_{ij} is the distance between country i and j. In order to control for trade effects not captured by economic mass and distance, other variables expected to affect trade has been added to the GM. Examples of previously used variables are population, Free Trade Agreements, tariffs, language barriers, common border, and colonial history among others which extends the basic GM to what's been called the augmented GM [75] The popularity of the GM can be explained by its success in explaining trade flows with only a few explanatory variables. It is extremely popular among policy makers and it can provide information to more complicated computable general equilibrium models.

The theoretical foundation of the GM has through contributions from different theories gone from being week to more solid. The Heckscher-Ohlin model applied

[74] Head (2003) p.2
[75] Ibid. p.3

the insight of preferences varying across countries as well as the assumption that variety is preferred. The Ricardo model included the assumption that we will get full specialization. The Armington assumption allowed the model to differentiate demand for goods based on the origin of the good making it possible derive the relation between transport costs and distance. Finally, new trade theory incorporated assumptions about imperfect competition, scale economies, differentiated products and trade costs which are of increasing importance when analyzing bilateral trade flows.[76]

5.1.1 Distance – Relative and not only about transport costs

The role of transport costs have been further developed into what's called the "relative distance effect". This implies that after controlling for bilateral distance as well as economic size, trade is more likely to be of a larger extent between two peripheral countries than between two core countries. [77] Researchers have suggested different methods for estimating the relative distance of a country and the method used by Anderson and Van Wincoop (2003) provides a framework relevant for this study. They incorporated a so called multilateral resistance term (MRT). In order to estimate the MRT variables Anderson and Van Wincoop (2003) assume consumers to have homothetic preferences and they use the constant elasticity of substitution (CES) function when estimating these. Instead of only concentrating on quantity when analyzing the utility of consuming, the core of the CES function takes this concept further and incorporates variety. By assuming CES, utility will increases with quantity of each variety consumed. Anderson and Van Wincoop (2003) also acknowledge all goods to be differentiated by place of origin. The authors use these assumptions to create a CES price index which is used to aggregate across varieties. A budget constraint is inserted and the following reduced form of an intra –industry trade model is derived:

(Eq. 5.2) $$X_{ij} = \frac{y_i y_j}{y^w}\left(\frac{t_{ij}}{P_i P_j}\right)^{1-\sigma}$$

[76] Greenaway and Milner (2002) p. 578-580
[77] Ibid

In equation 5.2 t_{ij} represent the bilateral trade resistance and $P_i P_j$ represent the multilateral trade resistance of a country. [78] Bilateral trade resistance is determined by specific characteristics of each country. Variables such as trade agreements, common border, common language and distance are expected to have an effect on bilateral trade and have been used to control for bilateral trade resistance.

In order to understand the implications of the MRT as well as the intuition of this model consider the following scenario. Country j wants to import from country i. In a situation where tariffs between these countries remain constant whilst tariffs between country j and the rest of the world (ROW) increases the multilateral resistance of country j increases. As import from country i will be cheaper than import from ROW import to country j from country I will increase.

5.2 Methodology

This section describes the methodology and data used for this study. Initially the methodology applied is explained followed by a discussion about the rationale for using a group specific fixed effect method when estimating MRT's. I provide a review of the rationale for my choice of variables, the expected signs of their coefficients and a discussion regarding my method for estimating these variables. The data section includes the justification for using cross section data for the year of 2008 as well as a review of the sources from which data has been collected.

Subsequently I present three main regressions using different specifications of MRT's as well as two additional versions of the third main regression.

5.2.1 The Empirical Model

The aim with this study was to investigate if the use of GlobalGAP certification affects African countries propensity to export fruit and vegetables. The sample

[78] See Appendix B for derivation

selection therefore included 52 African countries presented in appendix C. As Europe is not only an important importer on the world market for fruit and vegetables but also the market from which the GlobalGAP certification scheme originates, countries belonging to the EU-27 was included, making the total sample selection to consist of 79 countries.

The model was estimated using annual cross section data for the year 2008 at a product level. I focused on bilateral trade between EU-27 and Africa by collecting data for international import of fruit and vegetables to all the countries included in the sample. Economic mass and distance were controlled for as well as multilateral and bilateral trade resistances. I differentiated between multilateral trade resistance and bilateral trade resistance hence my model is in line with the model derived by Anderson and Van Wincoop (2003).[79] As trade flows in this study are based on reported import, the importing country will in some of the following paragraphs be referred to as the reporter and the exporting country will be referred to as the partner.

Solving MRT's as a function of observable price differences suggested by Anderson and Van Wincoop (2003) is complicated as they use estimates with non linear least squares. Also it requires detailed and extensive data which is not available for the countries included in the sample selection of this study.

In order to control for MRT's I instead used a group specific effect method. This is a version of the country fixed effect method used by Eaton and Kortum (2002), Asier Minondo (2002), Andrew Rose and van Wincoop (2002), and Hummels (2001)[80] where each country is denoted a reporter as well as a partner specific dummy. With this method OLS can be used and internal distances required in the above mentioned method are not needed. This way of specifying MRT's makes it possible for the MRT variable to pick up all the other factors affecting bilateral trade when controlling for factors varying with the importer. With MRT's being fixed in a cross-section analysis and with multiple successful outcomes when it comes to yielding consistent estimations this fixed effect method made up a useful

[79] See derivation in appendix B
[80] Andersson and Van Wincoop (2004) p. 712.

framework for this study. It is also argued to be a relatively simple method to implement. [81]

However, for this study the country fixed effect method was not directly applicable as it would have created a problem of correlation between the country specific dummy variable and the GlobalGAP variable which implies a risk of multicollinearity.

In order to avoid this problem multilateral resistance was estimated by using a group specific effect method. Useful categories could be to group countries according to their geographical location, their income level or by the size of their agricultural sector. However, as this thesis investigates GlobalGAP certification and its effect on bilateral trade I used groups contingent on the European "Generalised System of Tariff Preferences "(GSP), a developmen stratgey initially launched during the United Nations Conference on Trade and Development (UNCTAD) in 1968, with the aim of getting developed countries to grant trade preferences to developing countries in order to stimulate trade. [82]

I believe this is an adequate grouping method not only from an econometric perspective but also from a more intuitive perspective as GlobalGAP standards can be seen as a non-tariff barrier to trade and has been argued to be a response to tariff reductions and increased quota allowances.[83] The rationale for the introduction of group dummies (i.e. for the importer and exporter) was that individual features of different groups, which can make their import function to differ, will be controlled for. With the introduction of a group-specific dummy all these group specific characteristics could be taken into account. The different group characteristics are more extensively explained in paragraph 5.3

Furthermore, bilateral resistance was controlled for by denoting dummies to variables recognized by the augmented gravity model such as common language and colonial history. As the incidence of GlobalGAP certification among partner countries as well as the requirements for GlobalGAP certification imposed by

[81] Feenstra (2002) p. 503
[82] EU (2005)
[83] Fulponi (2006) p. 3

reporting countries is expected to vary in the sample the GlobalGAP variable was modeled as a bilateral resistance term.

5.2.2 Explanatory Variables – Rationale and Calculation

The purpose of this study is to investigate whether GlobalGAP certification work as a catalyst or barrier to trade. GlobalGAP standards has been criticized for their built in potential of being non-tariff barriers to trade for some countries depending on their design and will therefore be modeled as a bilateral trade resistance term. In the following section my explanatory variables are presented and the rationales for using these as well as their expected direction of significance are discussed.

- **Economic Mass (MASS)**

  This variable was estimated using equation 5.3

  (Eq. 5.3) $$\boldsymbol{MASS} = ln\,(GDPreporter * GDPpartner)$$

  Economic mass is expected to have a positive effect on bilateral trade as large economies are expected to have a larger demand for import and a larger supply of export. MASS was estimated using Nominal GDP.

- **Distance (DIST)**

  Since the beginning of the gravity model, distance has been included as an estimate of transport costs with the expectations of bilateral trade being negatively correlated with distance. When it comes to fresh fruit and vegetables less fragile products are mostly transported by shipping whilst exotic fruit and other fragile fresh produce with short durability are transported by air.[84] The intuition behind using the distance variable origins from a time when shipping was the most common way of transport. With shipping not being the only way of transport of fresh produce one could question the accuracy of distance as a barrier to trade.

[84] Livsmedelsverket (2011)

However, for this study I assumed distance to affect the cost of air transport to some extent hence it was included as an explanatory variable.

- **Global GAP certification (GlobalGAP)**

  The GlobalGAP variable was estimated with equation 5.4 where the numbers of GlobalGAP certified producers were related to the size of the agricultural sector in the partner country.

(Eq. 5.4) $$\boldsymbol{GlobalGAP = ln\left(\frac{Nr\ of\ GlobalGAP\ certified\ producers_{partner}}{Size\ of\ Agricultural\ sector_{partner}}\right)}$$

This was based on the intuition that the number of certified producers affects the country's export potential of fruit and vegetables. The size of the agricultural sector was estimated by value added of agriculture as a percentage of GDP, with agriculture corresponding to ISIC divisions 1-5, including forestry, hunting, and fishing, as well as cultivation of crops and livestock production.[85]

It is originally a standard set up by European retailers and with countries in EU-27 being important importers on the world market for fruit and vegetables I expected the GlobalGAP variable to be either subtly positively or subtly negatively correlated with import when including all the reporters in the sample. Furthermore, I expected the GlobalGAP variable to have a stronger positive or negative correlation with bilateral trade when only looking at EU-27 import as this is where the certification scheme originates.

- **Multilateral Resistance terms (MRT)**

  This variable was estimated by denoting region specific dummies to the reporter and partner countries. These will pick up all the characteristics of the group affecting the countries' trade propensity. I used three different

[85] World Bank (2010)

specification methods for the denotation of these dummies which are explained in detail under paragraph 5.4.

- **Colonial history (Comcol)**

  I denoted a dummy variable which is equal to 1 when the two trading countries share a colonial history and equal to 0 when they don't. The intuition behind this is that a colonial history between the reporter and partner is likely to have developed trade channels which remain present even after decolonization.

- **Common language (Comlang)**

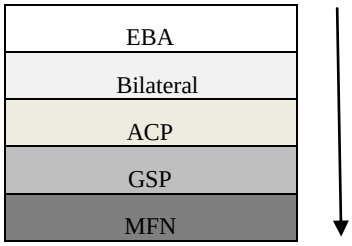
  I introduced a dummy variable equal to 1 if the two trading countries use the same language, otherwise equal to 0. The intuition is that a common language will reduce transaction costs hence be positively correlated with bilateral trade.

5.3 Data

Data on fruit and vegetable import is from 2008 and was collected from United Nations Commodity Trade Statistics Database, COMTRADE via WITS. WITS is a database provided by the World Bank where commodities are categorized according to the Harmonized Standard (HS) system. Commodity groups used for this study were 07 for vegetables and 08 for fruit.

The country groups used are prevalent on the European GSP system which is well illustrated by Karlsson (2010) in figure 3.2, where countries are divided into groups descending from the most generous trade preferences i.e Everything but Arms (EBA) to the group of countries with least generous preferences i.e Most Favoured Nation (MFN). In order to better understand the differences between these groups a summary of the group review performed by Karlsson (2010) is presented below.

Figure (3.2)



All countries and regions outside of the EU belong to the MFN group for which the rule of non-discrimination prevails. This means that EU is held to use the same level of tariffs towards all MFN classified countries as the one used for the most favored nation. The GSP group consists of middle income countries as well as a few developing countries. GSP status entitles countries to export non-sensitive products at a tariff level of zero. Furthermore, products competing with European production, so called sensitive products are allowed to be exported with a tariff reduction of 3.5 %. Countries within the Africa, Caribbean, Pacific (ACP) group were in 1963 given free access to EU's market by the Yaoundé agreement. In order to fit better with the WTO's set of rules the agreement was revised and re launched. Since the 2000 negotiations regarding Economic Partnership Agreements (EPA's) are taking place between the ACP countries and the EU. The aim with EPA's is to create regional integration within groups of ACP countries as a first step towards opening up the ACP market to the EU. Next group of countries following picture 3.2 are the countries which have signed bilateral trade agreements with the EU. These agreements are intended to stimulate trade, create relations and stability and through cooperation generate profits. Finally, the group where we find the least developed countries, the EBA group. By being EBA classified the country face a zero tariff for everything but arms. [86]

Continuing the review of data used for this study the sample is made up by 79 countries where the group EU-27 represents the European market and the rest of the countries, divided into the 5 groups discussed above, represent the African market. If a country falls into two groups it was in Karlsson (2010) placed in the most favorable group as it is most likely to use these preferences, this was also done in this study making the MFN group to be excluded. Furthermore the group EU-27 was added as the most favorable group.

[86] Karlsson (2010) p. 10-15

The statistics for nominal GDP expressed in current $US as well as value added of agriculture (% of GDP) used for the GlobalGAP variable was collected from the World Bank. Due to insufficient data on the size of the agricultural sector data for the year of 2002 was used. This is to some extent a shortcoming, however one can expect this variable to be relatively stable hence it was used as a proxy for 2008. Furthermore, the number of GlobalGAP certified producers in each country was collected from GlobalGAP's annual report 2008. Finally, the variables distance, common language and colonial history were gathered from CEPII.

5.3.1 Why 2008?

Cross section data was used for the year of 2008 as this was the first year detailed data on the number of producers being certified with GlobalGAP became available. However, this data does not specify in what sector these producers were active. With fruit and vegetables historically being the main sector for GlobalGAP certification the exclusion of data from 2009 and 2010 is an attempt to isolate the developments on the fruit and vegetables market from the recent developments of other sectors such as Flowers & Ornamentals, coffee, Aquaculture and livestock [87] within the GlobalGAP certification scheme.

5.4 Specifications

In order to get a linear model applicable for using OLS the variables MASS, DIST and GlobalGAP were logged. As a test of robustness, three main regressions were run using three different estimation methods for the MRT's. These regressions are globalc_v1, globalc_v2 and globalc_v3 which will be further explained below. Furthermore the different methods resulted in different sample sizes hence data consists of 5548 observations for regression global_v1 and global_v2, and 1776 observations for regression global_v3. Also, a sensitivity analysis of regression globalc_v3 was performed in order to investigate whether the results varies

[87] GAP år 2008 p 3

depending on the specification method used for the GlobalGAP variable. These additional regressions are presented as globalc_v3_1 and globalc_v3_2

5.4.1 – globalc_v1

I estimated MRT by denoting region specific dummies (rep* and part*) to the reporter respectively partner country which yielded equation 5.5.

$$\begin{aligned}\mathrm{Imp_r} = {} & \beta_0 + \beta_1 \mathrm{MASS} + \beta_2 \mathrm{GlobalGAP} + \beta_3 \mathrm{DIST} + \beta_4 \mathrm{Comcol} + \beta_5 \mathrm{Comlang} \\ & + \beta_6 \mathrm{part\,GSP} + \beta_7 \mathrm{partBilateral} + \beta_8 \mathrm{partACP} + \beta_9 \mathrm{EBA} \\ & + \beta_{10} \mathrm{repGSP} + \beta_{11} \mathrm{repBilateral} + \beta_{12} \mathrm{repACP} + \beta_{13} \mathrm{repEBA} \\ & + \varepsilon_{\mathrm{rp}}\end{aligned}$$

(Eq.5.5)

The variable $\mathrm{Imp_r}$ represents fruit and vegetable import to reporting country r from partner country p, MASS represents economic mass of the trading countries and GlobalGAP is the variable controlling for the correlation between import and GlobalGAP incidence in country p. The DIST variable represents the distance between country r and p. Comcol and Comlang are dummies where β_4 = 1 if the two countries share a colonial history and 0 if they don't and β_5 = 1 if the trading countries have a common language and 0 if they don't. MRT's are in this regression estimated by denoting region specific dummies where $part* = \beta_6 - \beta_9$ and $rep* = \beta_{10} - \beta_{13}$ with definitions of $part*$ and $rep*$ being specified in Table 5.1. on the following page. Finally ϵ_{rp} is the error term.[88]

[88] See Appendix D for further details

Table 5.1

part*	1	if r is in group GSP	rep*	1	if r is in group GSP
	0	if r is not		0	if r is not
	1	if r is in group Bilateral		1	if r is in group Bilateral
	0	if r is not		0	if r is not
	1	if r is in group ACP		1	if r is in group ACP
	0	if r is not		0	if r is not
	1	if r is in group EBA		1	if r is in group EBA
	0	if r is not		0	if r is not

When using dummies for qualitative variables containing a multiple number of categories one must only introduce (*number of categories-1*) dummy variables in order to not fall into a dummy trap, which is a situation where perfect multicollinearity arise among the dummy variables.[89] Therefore region EU-27 was excluded from part* and rep* in regression global_v1 and from part* in regression global_v2 and global_v3 hence it works as a reference category.
The difference between the three regressions lays in the estimation method of MRT's. Therefore the explanations for the variables MASS, GlobalGAP, DIST, Comcol and Comlang are unchanged in regression global_v2 and global_v3.

5.4.2 – global_v2

Just like in regression global_v1 MRT's for the partner counties were estimated with region specific dummies i.e. part*. In contrast to global_v1 the MRT's of the partner countries were in this case estimated by using country specific

[89] Gujarati (2006) p. 295

dummies i.e. repdum*. This yielded regression global_v2, estimated in equation 5.6.[90]

$$\begin{aligned}\mathrm{Imp_r} = \beta_0 &+ \beta_1\mathrm{MASS} + \beta_2\mathrm{GlobalGAP} + \beta_3\mathrm{DIST} + \beta_4\mathrm{Comcol} + \beta_5\mathrm{Comlang} \\ &+ \beta_6\mathrm{partGSP} + \beta_7\mathrm{partBilateral} + \beta_8\mathrm{partACP} + \beta_9\mathrm{partEBA} \\ &+ \beta_{10\ \mathrm{to}}\,\mathrm{repdum} * + \epsilon_{\mathrm{rp}}\end{aligned}$$

(Eq.5.6)

5.4.3 – globalc_v3

In this regression MRT's for the partner countries were estimated by denoting region specific dummies i.e. part*. Furthermore only import to reporting countries belonging to the EU-27 was included i.e. repEU-27=1 where the partner country could be a part of the EU-27 or one of the other regions. This yielded the following regression:

$$\begin{aligned}\mathrm{Imp_r} = \beta_0 &+ \beta_1\mathrm{MASS} + \beta_2\mathrm{GlobalGAP} + \beta_3\mathrm{DIST} + \beta_4\mathrm{Comcol} + \beta_5\mathrm{Comlang} \\ &+ \beta_6\mathrm{partGSP} + \beta_7\mathrm{partBilateral} + \beta_8\mathrm{partACP} + \beta_9\mathrm{partEBA} \\ &+ \varepsilon_{\mathrm{rp}}\end{aligned}$$

(Eq. 5.7)

Below two versions of regression globalc-v_3 are presented.

- globalc_v3_1

  As a sensitivity analysis, the GlobalGAP variable was in this regression excluded. The effect of GlobalGAP certification was instead estimated by including the number of GlobalGAP certified producers (**AgriGAPpart**) and the size of the agricultural sector (**Agri**) in the partner country as two separate variables. This yielded regression globalc_v3.1 which is illustrated in equation 5.8 below.

[90] See Appendix D for details

$$\mathrm{Imp_r} = \beta_0 + \beta_1 \mathrm{MASS} + \beta_2 \mathrm{AgriGAPpart} + \beta_3\ \mathrm{Agri} + \beta_4 \mathrm{DIST} + \beta_5 \mathrm{Comcol} + \beta_6 \mathrm{Comlang} + \beta_7 \mathrm{partGSP} + \beta_8 \mathrm{partBilateral} + \beta_9 \mathrm{partACP} + \beta_{10} \mathrm{partEBA} + \varepsilon_{\mathrm{rp}}$$

(Eq.5.8)

- globalc_v3_2

In this regression I kept my original specification of the GlobalGAP variable and extended the specification by controlling for **Agri**. The yielded regression is presented in equation 5.9

$$\mathrm{Imp_r} = \beta_0 + \beta_1 \mathrm{MASS} + \beta_2 \mathrm{GlobalGAP} + \beta_3\ \mathrm{Agri} + \beta_4 \mathrm{DIST} + \beta_5 \mathrm{Comcol} + \beta_6 \mathrm{Comlang} + \beta_7 \mathrm{partGSP} + \beta_8 \mathrm{partBilateral} + \beta_9 \mathrm{partACP} + \beta_{10} \mathrm{partEBA} + \varepsilon_{\mathrm{rp}}$$

(Eq. 5.9)

5.4.4 Tests

STATA10 was used for running the five regressions and for doing the econometric tests which will be read up on in this paragraph.

Multicollinearity may generate unstable coefficients and inflated standard errors. Even though the selection of independent variables was not intuitively indicating a risk of multicollinearity, as an assurance it was controlled for by looking at the variance inflation factor (VIF). The VIF is a measure of how much the coefficient of an independent variable is inflated by multicollinearity, where a value of 10 indicates the variable to be a linear combination of other variables making the coefficient 10 times greater than if the variable was linearly independent of the other independent variables. The mean VIF value for all three regressions range from 1.76 to 2.42 and therefore there is no problem of multicollinearity. [91]

[91] O'Brien (2007)

In order to generate unbiased and consistent variances and covariances of the regression coefficients heteroscedasticity was corrected for with the robust variance-covariance estimation performed by the STATA command “vce(r)”. Also, the risk of model specification errors was analyzed using a Ramsey Reset Test performed by the STATA command “ovtest”. With p-values of 0,000 the null hypothesis could be rejected for all the three regressions, hence there are no omitted variables.

6 Results

In Table 5.2 below, a summary of the coefficients and their level of significance from the three regressions are presented. The MRT coefficients i.e. the region specific dummies for partner and reporter as well as the country specific reporter dummies are presented in Appendix D.

Table 5.2	globalc_v1	globalc_v2	globalc_v3
No. of observations	5548	5548	1776
R-squared	0.5205	0.5974	0.7213
Mean VIF	1,76	2,08	2,42
Constant	1.1183965	1.1183965	-.86251431
MASS	.20277743***	.07845557***	.24115247***
GlobalGAP	.30335202***	.34945424***	.77889744***
DIST	-1.0140427***	-1.1932648***	-.8632169***
Comcol	.00259268	.01661395	1.8199474***
Comlang	.48501944***	.43654395***	1.4855812***
* p < . 1 ; ** p<.05; *** p<.01			

A high explanatory significance of the model is indicated by high R-squared values in all three regressions. This is particularly prominent for the globalc_v3 regression with its R-squared value of 0.7213 indicating regression globalc_v3 as well as its two versions to be of a higher explanatory significance than regression globalc_v1 and globalc_v2.

The **MASS** coefficient is for all regressions highly significant as well as positively correlated with bilateral trade. This is in line what's expected with the gravity model. Likewise the **DIST** coefficient is as expected negatively correlated with bilateral trade. This effect is slightly smaller when looking at regression globalc_v3 compared to the other two, which indicate distance to be less of a key determinant for import to countries within EU-27 compared to the rest of the countries in the sample.

When looking at the coefficient for **Comcol** it is not significant in the two first regressions, however in regression globalc_v3 it takes a huge jump on the determinant factor scale as it becomes highly significant and positively correlated with import to countries within EU-27. This is also something to be expected as the colonizers of the African continent are represented in the group EU-27. Furthermore the **Comlang** coefficient is significant in all regressions. However in the third regression it has a relatively higher coefficient, indicating language barriers to be more of a determinant factor for import to the EU-27 countries than for all groups in general.

A brief look at the MRT variables shows how the dummies for partGSP and partBilateral are highly significant and negatively respectively positive correlated with import in all three regressions. When it comes to partACP it is not significant in the two first regressions yet in the third regression it shows a positive coefficient at a 0.1 significance level. The partEBA dummy is only significant in regression 2 and 3, indicating a negative correlation with import.
Coefficients and their level of significance for the country and reporter specific dummies are presented in Appendix D.

Now to the **GlobalGAP** variable which is the focus for this study. The results in Table 5.2 show how the GlobalGAP coefficient turned out to be highly significant in the three main regressions. The coefficient is positive in all regressions indicating how GlobalGAP agriculture as a share of the total agricultural sector in the partner country is positively correlated with bilateral trade. This effect is of the same magnitude in regression globalc_v1 and globalc_v2 where a 1% increase in the GlobalGAP variable would increase the partner countries' export with 0.30335202 % respectively 0.34945424 %. When only including the EU-27 countries as reporter country which is the case in regression globalc_v3 the GlobalGAP coefficient almost doubles in size compared to the other two regressions. Thus a 1 % increase in the GlobalGAP variable would increase the partner countries' export with 0.77889744 % when the importing reporter country is a part of the EU-27 group.
In the two versions of globalc_v3 the R-squared was slightly reduced to 0.7417 respectively 0.7302. In version globalc_v3_1 the coefficient for the AgriGAPpart

variable was 0.66332579 and highly significant. Also the Agri variable turned out to be highly significant, with a coefficient of 0.23673903. In version globalc_v3_2 the Agri variable does not change significantly compared to version globalc_v3_1. There is no significant difference between the GlobalGAP variable in globalc_v3 and globalc_v3_2 and the two versions indicate no significant difference in how GlobalGAP affects bilateral trade. More detailed results can be found in Appendix D.

6.1.1 Commenting on results

In this study the GM has once and again showed to be a suitable model when explaining bilateral trade. However, as any other economic model, the results' validity depends upon the quantity and quality of data.
This study included 5548 respectively 1776 observations. By using a log linear function, observations of 0 were dropped from the sample and the OLS was run on positive values. This implies a loss of information and for future studies it would be favorable to try another method for handling the zeroes, as it could contribute with further insights. Despite the shortcomings of excluding information I believe the quantity of data is sufficient enough for the above results to be relevant. Furthermore the use of cross section data implies the five regressions to not control for variables changing over time. Researchers have started to argue for panel data as a more suitable dataset when using GM's compared to cross section or time series on its own. For this study, sufficient panel data was not available, yet it would be of interest to use the specifications applied in this study for running panel data regressions as soon as such data is available.

Subsequently the estimation method is of great importance for the results. When it comes to the common used variables in the GM i.e. MASS, DIST, Comcol and Comlang these were estimated in line with methods used by previous researchers. However, the GlobalGAP variable was a newcomer and therefore attention should be given to potential improvements of the estimation method. The GlobalGAP variable was in this study estimated by relating the number of GlobalGAP certified producers with the size of agricultural sector in the partner country. This

has its shortcomings as it might generate unbalanced estimates. Potential improvements would be to control for the total number of producers, the number of producers in the exporting sector as well as data on how this has changed over time. Also, it is of importance to consider how the demand for GlobalGAP certification differs among countries within the EU. With Northern Europe having more stringent requirements about import having to be GlobalGAP certified, the results from regression global_v3 (and its two versions) should be interpreted with caution. By including all countries as reporters in regression global_v3 there is a risk for the GlobalGAP effect to be underestimated for the reporters of Northern Europe.

The results illuminate GlobalGAP's capability to affect bilateral trade flows of fruit and vegetables. However, whether the widespread use of this certification schemes among retailers impedes African countries propensity to export depends on the costs of implementing the GlobalGAP measures. It is therefore of importance to further investigating the costs of fulfilling GlobalGAP standards.

Furthermore it's important to understand how the estimation of the GlobalGAP variable might pick up other things than the importance of GlobalGAP. For example, it may be that a higher productivity level is prevalent in the countries getting this certification and an increased number of certified producers might not in itself be trade enhancing.

GlobalGAP certification does have an impact on bilateral trade in the way that the more certified producers a country has the greater is Europe's willingness to trade with them. In order to draw any conclusions regarding GlobalGAP certification being a catalyst or barrier to trade one must control for accessibility for farmers to become GlobalGAP certified. Saying this one must also remember the critique which has been given to GlobalGAP and this study show how there is potential of GlobalGAP being a non-tariff barrier to trade, especially when exporting to Europe.

7 Conclusion

The aim with this study was to illuminate the general channels through which food safety standards such as GlobalGAP can affect bilateral trade. Furthermore and most importantly was to investigate how the widespread use of GlobalGAP certification among food retailers affects African countries propensity to export fruit and vegetables. For this a gravity model approach was used and significant results were generated both for the commonly used variables such as MASS, DIST, Comlang, Comcol as well as for the GlobalGAP variable. Based on the results from these regressions the following conclusions regarding the effect of GlobalGAP certification were drawn:

- The widespread use of GlobalGAP certification among European retailers affects trade to some extent for all countries included in the sample selection. GlobalGAP certification of fruit and vegetables is positively correlated with bilateral trade between Africa and EU-27. Furthermore, compared to the other groups in this study GlobalGAP certification is more of a key determinant for the willingness to import for countries belonging to the group EU-27.

- The incidence of GlobalGAP agriculture in the exporting country is positively correlated with the exporting countries propensity to export fruit and vegetables. Again this is particularly the case when the importing country belongs to EU-27.

With food retailers aiming for a zero level risk and with GlobalGAP already being a key determinant for fruit and vegetable producers getting access to the European market, there is a need for technical assistance and information to be a part of any trade enhancing strategy. I believe it is important to follow developments regarding this issue as the GlobalGAP certification does have the potential of impeding trade.

8 References

Anderson, J. Van Wincoop, E. (2003). *"Gravity with Gravitas: A Solution to the Border Puzzle"*, American Economic Review, vol. 93, issue 1, pp 170-192

Anderson, J. Van Wincoop, E. (2004) *"Trade Costs"* Journal of Economic Literature, Vol. 42, No. 3. pp. 691-751.

ATPC (2005)*"Non-Tariff Barriers –Their Prevalence and Relevance for African Countries"* African Trade Policy Centre, Work in Progress, No. 25, Economic Commission for Africa

Defra (1999) "*The rationale for government intervention"* Department for Environment, Food and Rural Affairs, Economic Evaluation of UK Policy on Chemical Contaminants in Food, section 2: available at: *http://www.defra.gov.uk/evidence/economics/foodfarm/evaluation/chemcont/sec_ii.pdf*

Dobson, P. Clarke, R. Davies, S. Waterson , M. (2001) *"Buyer Power and Its impact in the Food Retailing Distribution Sector of the European Union"* Journal of Industry, Competition and trade , 1:3 , 247-281, 2001, Kluwer Academic Publisher

EU (2005)
http://www.eu-un.europa.eu/articles/fr/article_4337_fr.htm (2011-01-12)

Frankel, J. Rose, A (2002)"*An Estimate of the Effect of Common Currencies on Trade and Income"* The Quarterly Journal of Economics, Vol. 117, No. 2, pp. 437-466

Fulponi, L. (2006)*"Private voluntary standards in the Food system: The perspective of major food retailers in OECD countries"* Food policy Volume 31, Issue 1 p. 1-13

GlobalGAP (2008) Annual Report issued in October 2008, *www.globalgap.org*

GlobalGAP (2009) Annual Report issued in October 2009, *www.globalgap.org*

GlobalGAP (2010) Annual Report issued in October 2010, *www.globalgap.org*

GlobalGAP (2011) http://www.globalgap.org/cms/front_content.php?idcat=19 (2011-01-03)

Golan,E. Kuchler,F. Mitchell,L. Greene,C. Jessup,A. (2001) *"Economics of Food Labeling"* Journal of Consumer policy 24:117-184, Kluwer Academic Publishers, Netherlands

Greenaway, D. and C. Milner (2002) "*Regionalism and Gravity"*, Scottish Journal of Political Economy 49:574-585.

Gujarati, D. (2006)*"Essentials of Econometrics"* Third edition, MC Graw Hill, New York

Head, K. (2003) *"Gravity for beginners"* available at : www.econ.ubc.ca/nmalhotra/490/Articles/KHead%20on%20**gravity**.pdf

Henson, S. Jaffee, S. (2006) *"Food Safety Standards and Trade: Enhancing and Avoiding Exclusion of Developing Countries"* The European Journal of Development Research, Vol.18, No4, p 593-621

Henson, S. and Traill, B. (1993), *"The Demand for Food Safety"* Food Policy, Volume 18 issue 2

Henson, S. Masakure, O. Cranfield,J (2009) *"Do Fresh Produce Exporters in Sub-Saharan Africa Benefit from GlobalGAP Certification ? "* InFERG Working Paper No. 2_FT, International Food Economy Research Group, Department of Food, Agricultural and Resource Economics University of Guelph, CANADA

International Institute for Environment and Development (2009)*"Standards bearers: Horticulture exports and private standards in Africa"* available at: *http://pubs.iied.org/16021IIED.html* (2011-01-09)

Johansson, H. (2009) *"Vad uppnås med rättvisemärkning?"* Rapport 2009:1 AgriFood Economics Centre, Lund

Jordbruksverket (2010)*"Marknads översikt – Färska frukter och grönsaker"* Enheten för Handel och Marknad, Rapport 2010:22, Jordbruksverket, Jönköping

Karlsson, K. (2010) *"EU:s import av Frukter och Grönsaker; En studie av politik, preferenser och multilateral liberalisering"*Kandidatuppsats, Nationalekonomiska Institutionen, Lunds Universitet.

Konkurrensverket (2009) *"Certifiering, Konkurrens och Handel"*, Anderson, A. and Gullstrand, J. ISSN-nr 1652-8069, Stockholm available at: http://www.kkv.se/t/IFramePage____1500.aspx (2010-11-15)

Livsmedelsverket (2011) http://www.slv.se/sv/grupp1/Mat-och-miljo/Frukt-och-bar-gronsaker-och-baljvaxter/ (2011-01-03)

Mitchell, L (2003) "*Economic Theory and Conceptual Relationships Between Food Safety and International Trade"*, s. 10-27 in Buzby, J (red) International Trade and Food Safety: Economic Theory and Case Studies, Agricultural Economic Report 828,Economic Research Service, United States Department of Agriculture

Moenius, J. (2004) *" Information versus Product Adaption : the role of standards in trade"* available at: http://ssrn.com/abstact=608022 (2010-11-22)

O'Brien, R. (2007) *"A Caution Regarding Rules of Thumb for Variance Inflation Factors Quality & Quantity"* (2007) 41:673–690, Springer

Ponte, S. (2007)*"Bans, tests and alchemy: Food safety regulation and the Uganda fish export industry"*. Agriculture and Human values 24:179-193

Ponte, S. Gibbon, P. (2005)*"Quality standards, conventions and the governance of global value chains"* Economy and Society Volume 34 p.1-31, Taylor and Francis Group Ltd.

Yudin, R. Schneider, K (2008) *"European Food Safety Certification – The "GlobalGAP" Standard and its Accredited Certification Program"* Document FSHN0801 in the series of the Food Science and Human Nutrition Department, Food and Agricultural Sciences, University of Florida.

WTO (1998) http://www.wto.org/english/tratop_e/sps_e/spsund_e.htm (2011-01-03)

World Bank (2008) World Development 2008: Agriculture for Development www.worldbank.org (2011-02-01)

World Bank (2010) http://search.worldbank.org/data?qterm=Agriculture%20GDP&language=EN&format=html (2011-01-03)

9 Appendix

9.1 Appendix A

Five-Firm concentration (%) in grocery and daily goods retailing for EU member states 1993-1999			
Country	**1993**	**1996**	**1999**
Austria	54.2	58.6	60.2
Belgium+Luxembourg	60.2	61.6	60.9
Denmark	54.2	59.5	56.4
Finland	93.5	89.1	68.4
France	47.5	50.6	56.3
Germany	45.1	45.4	44.1
Greece	10.9	25.8	26.8
Ireland	62.6	64.2	58.3
Italy	10.9	11.8	17.6
Netherlands	52.5	50.4	56.2
Portugal	36.5	55.7	63.2
Spain	21.6	32.1	40.3
Sweden	79.3	77.9	78.2
UK	50.2	56.2	63.0
EU-15 weighted average	40.7	47.3	48.9

Source : Dobson et al (2001) p. 261

9.2 Appendix B

Step 1 *The Expenditure identity share*

$P_{ij}X_{ij} = S_{ij}E_j$ where P_{ij}= import price

Step 2 *Relative prices are the determinants of shares assuming constant elasticity of substitution (CES- function) as well as all goods being traded.*

$S_{ij} = \left(\frac{p_{ij}}{P_j}\right)^{1-\sigma}$ where $P_j = \sum_i n_i \left(\left(p_{ij}\right)^{1-\sigma}\right)^{1/(1-\sigma)}$ is the CES price index

Step 3 *Adding the pass-through equation*

$p_{ij} = p_0^i t_{ij}$ Where 0 is a subscript denoting producer price and t is the bilateral trade cost

Step 4 *Aggregating across varieties*

$$X_{ij} = n_i s_{ij} E_j = n_i \left(\frac{p_{0i} t_{ij}}{P_j}\right)^{1-\sigma} E_j$$

Step 5 *Using the general equilibrium condition*

$Y_i = \sum_i X_{ij}$ By solving for $n_i p_i$ and substituting this into equation in step 4 the following equation is yielded

Step 6 *The reduced form of an intra–industry trade model*

$X_{ij} = \frac{y_i y_j}{y^w}\left(\frac{t_{ij}}{P_i P_j}\right)^{1-\sigma}$ *Where* t_{ij} *represent the bilateral resistance and* $P_i P_j$ *represent the multilateral trade resistance.*

Source: Anderson and Van Wincoop (2003)

9.3 Appendix C

Country sample	
Angola	Libyan Arab Jamahiriya
Austria	Lesotho
Burundi	Lithuania
Belgium	Luxembourg
Benin	Latvia
Burkina Faso	Morocco
Bulgaria	Madagascar
Botswana	Maldives
Central African Republic	Mali
Côte d'Ivoire	Malta
Cameroon	Mozambique
Congo	Mauritania
Cape Verde	Mauritius
Cyprus	Malawi
Czech Republic	Namibia
Germany	Niger
Djibouti	Nigeria
Denmark	Netherlands
Algeria	Poland
Egypt	Portugal
Eritrea	Rwanda
Spain	Sudan
Estonia	Senegal
Ethiopia	Sierra Leone
Finland	Somalia
France	Sao Tome and Principe
Gabon	Slovakia
United Kingdom of Great Britain and Northern Ireland	Slovenia
Ghana	Sweden
Gibraltar	Swaziland
Guinea	Seychelles
Gambia	Chad
Guinea-Bissau	Togo
Equatorial Guinea	Tunisia
Greece	United Republic of Tanzania
Ireland	Uganda
Italy	South Africa
Kenya	Zambia
Kiribati	Zimbabwe
Liberia	

9.4 Appendix D

9.4.1 Regression globc_v1

Linear Regression globc_v1		**No of observations 5548**	**F(13, 5534) 263.05**	**Prob>F 0.0000**	**R-squared 0.5205**	**Root MSE 2.14**
lnimp	**Coef.**	**Std.Err**	**t**	**P>t**	**(95% Conf Interval)**	
lnmass	.20277743***	.0155747	13.02	0.000	.1722449	.23331
lnGlobalGAP	.30335202***	.0176907	17.15	0.000	.2686712	.3380328
lndist	-1.0140427***	.0449157	-22.58	0.000	-1.102095	-.9259903
comcol	.00259268	.0875729	0.03	0.976	-.1690846	.17427
comlang	.48501944***	.0852456	5.69	0.000	.3179045	.6521344
partGSP	-.53190847***	.1700362	-3.13	0.002	-.8652462	-.1985708
partBilate~l	.73902128***	.1672114	4.42	0.000	.4112212	1.066821
partACP	.13859983	.1137883	1.22	0.223	-.0844698	.3616695
partEBA	-.11257152	.0963501	-1.17	0.243	-.3014555	.0763125
repGSP	-2.5406443***	.1764454	-14.40	0.000	-2.886547	-2.194742
repBilateral	-1.9526313***	.1414614	-13.80	0.000	-2.229951	-1.675311
repACP	-2.6417349***	.0987388	-26.75	0.000	-2.835302	-2.448168
repEBA	-2.5149507***	.088276	-28.49	0.000	-2.688006	-2.341895
_cons	1.1183965	.9357342	1.20	0.232	-.7160101	2.952803
Legend: * p<.1;** p<.05;***p<.01						

9.4.2 Regression globc_v2

Linear Regression globc_v2		**No of observations 5548**	**F(83, 5464) 58.45**	**Prob>F 0.0000**	**R-squared 0.5974**	**Root MSE 1.9735**
lnimp	**Coef.**	**Std.Err**	**t**	**P>t**	**(95% Conf. Interval)**	
lnmass	.07845557***	.01986	3.95	0.000	.039522	.1173891
lnGlobalGAP	.34945424***	.017256	20.25	0.000	.3156256	.3832829
lndist	-1.1932648***	.0475544	-25.09	0.000	-1.28649	-1.100039
comcol	.01661395	.0864589	0.19	0.848	-.15288	.1861079
comlang	.43654395***	.0811829	5.38	0.000	.2773932	.5956947

partGSP	-.70732213***	.1740619	-4.06	0.000	-1.048553	-.3660916
partBilate~l	.71261819***	.1497283	4.76	0.000	.4190911	1.006145
partACP	-.02604573	.1020916	-0.26	0.799	-.2261859	.1740944
partEBA	-.41003867***	.0937458	-4.37	0.000	-.5938178	-.2262595
_repdum2	4.1241526***	.3128971	13.18	0.000	3.51075	4.737556
_repdum3	.12707301	.2136464	0.59	0.552	-.291759	.5459051
_repdum4	5.2561318***	.3863638	13.60	0.000	4.498705	6.013559
_repdum5	-.20110231	.2169673	-0.93	0.354	-.6264446	.22424
_repdum6	-.16802694	.2170369	-0.77	0.439	-.5935057	.2574518
_repdum7	1.9940434***	.252004	7.91	0.000	1.500015	2.488072
_repdum8	.24884673	.2035788	1.22	0.222	-.1502487	.6479422
_repdum9	-.02910893	.2088564	-0.14	0.889	-.4385507	.3803329
_repdum10	1.3739963***	.2847825	4.82	0.000	.8157091	1.932284
_repdum11	-.38619739*	.2015772	-1.92	0.055	-.781369	.0089742
_repdum12	-.08172445	.197262	-0.41	0.679	-.4684366	.3049877
_repdum13	1.2575943***	.2513752	5.00	0.000	.7647989	1.75039
_repdum14	1.7804503***	.2737319	6.50	0.000	1.243827	2.317074
_repdum15	3.862473***	.361505	10.68	0.000	3.153779	4.571167
_repdum16	5.0167559***	.4202974	11.94	0.000	4.192806	5.840706
_repdum17	.26932526	.2176925	1.24	0.216	-.1574387	.6960892
_repdum18	3.0638664***	.3163327	9.69	0.000	2.443728	3.684004
_repdum19	1.503543***	.3054072	4.92	0.000	.9048233	2.102263
_repdum20	2.0115325***	.3083573	6.52	0.000	1.407029	2.616036
_repdum21	.19839117	.2150754	0.92	0.356	-.2232423	.6200246
_repdum22	4.4562221***	.3858231	11.55	0.000	3.699855	5.212589
_repdum23	2.7201883***	.2924362	9.30	0.000	2.146897	3.29348
_repdum24	.90760527***	.2408039	3.77	0.000	.4355338	1.379677
_repdum25	3.3017593***	.3203248	10.31	0.000	2.673795	3.929723
_repdum26	5.8808378***	.3770761	15.60	0.000	5.141618	6.620057
_repdum27	-.18012207	.2019187	-0.89	0.372	-.5759632	.2157191
_repdum28	4.1375664***	.4456126	9.29	0.000	3.263988	5.011145
_repdum29	-.24734011	.2021577	-1.22	0.221	-.6436497	.1489695
_repdum30	0					
_repdum31	.02322173	.2228579	0.10	0.917	-.4136685	.460112
_repdum32	.19067422	.2322673	0.82	0.412	-.2646621	.6460106
_repdum33	.2880162	.2336904	1.23	0.218	-.1701101	.7461425
_repdum34	-.24981756	.2064505	-1.21	0.226	-.6545428	.1549077
_repdum35	2.6471756***	.3452223	7.67	0.000	1.970402	3.323949
_repdum36	2.1393709***	.2872942	7.45	0.000	1.57616	2.702582
_repdum37	4.5726027***	.3882981	11.78	0.000	3.811384	5.333822
_repdum38	1.1989269***	.2647238	4.53	0.000	.6799629	1.717891
_repdum39	2.0575403***	.2457254	8.37	0.000	1.575821	2.53926
_repdum40	.16545726	.2243497	0.74	0.461	-.2743575	.6052721

_repdum41	-.26119232	.240273	-1.09	0.277	-.7322231	.2098385
_repdum42	.53821034**	.2180466	2.47	0.014	.1107522	.9656685
_repdum43	2.8463956***	.3282119	8.67	0.000	2.202969	3.489822
_repdum44	1.1097627***	.2646054	4.19	0.000	.5910307	1.628495
_repdum45	2.356658***	.2747643	8.58	0.000	1.818011	2.895305
_repdum46	-.23020587	.2386817	-0.96	0.335	-.6981171	.2377053
_repdum47	1.0014289***	.1851048	5.41	0.000	.6385498	1.364308
_repdum48	1.6818466***	.2151282	7.82	0.000	1.26011	2.103583
_repdum49	.78366586***	.2564413	3.06	0.002	.2809388	1.286393
_repdum50	0					
_repdum51	.40914891**	.1978302	2.07	0.039	.021323	.7969748
_repdum52	.17132178	.2267224	0.76	0.450	-.2731444	.615788
_repdum53	1.381974***	.234724	5.89	0.000	.9218215	1.842126
_repdum54	.44586166**	.2033339	2.19	0.028	.0472462	.8444772
_repdum55	.6949846***	.2083599	3.34	0.001	.2865162	1.103453
_repdum56	.60178539**	.2475427	2.43	0.015	.1165031	1.087068
_repdum57	-.44264659**	.1983655	-2.23	0.026	-.8315219	-.0537712
_repdum58	5.5983277***	.4194621	13.35	0.000	4.776015	6.42064
_repdum59	4.2658482***	.3250856	13.12	0.000	3.628551	4.903145
_repdum60	2.5885382***	.3285178	7.88	0.000	1.944512	3.232564
_repdum61	.24220039	.2051394	1.18	0.238	-.1599545	.6443553
_repdum62	1.3542512***	.2985032	4.54	0.000	.769066	1.939436
_repdum63	1.2955083***	.2913307	4.45	0.000	.7243841	1.866632
_repdum64	.09376055	.2209256	0.42	0.671	-.3393416	.5268627
_repdum65	0					
_repdum66	.2855117	.2312608	1.23	0.217	-.1678516	.738875
_repdum67	2.9650549***	.3371095	8.80	0.000	2.304186	3.625924
_repdum68	1.7377805***	.2561924	6.78	0.000	1.235541	2.24002
_repdum69	3.2253918***	.3299784	9.77	0.000	2.578503	3.872281
_repdum70	.4505299**	.2127486	2.12	0.034	.0334578	.867602
_repdum71	.50445102**	.2131129	2.37	0.018	.0866649	.9222372
_repdum72	-.19502069	.2063051	-0.95	0.345	-.5994608	.2094194
_repdum73	-.12843148	.2222894	-0.58	0.563	-.5642072	.3073443
_repdum74	.91720836***	.2452579	3.74	0.000	.4364052	1.398012
_repdum75	.65177569***	.2013585	3.24	0.001	.2570329	1.046518
_repdum76	.46806473**	.2197669	2.13	0.033	.037234	.8988954
_repdum77	2.6610444***	.3392034	7.84	0.000	1.996071	3.326018
_repdum78	.54105794***	.2088049	2.59	0.010	.1317172	.9503987
_repdum79	0					
_cons	5.5076718***	1.126477	4.89	0.000	3.299328	7.716016
Legend: * p<.1;** p<.05;***p<.01						

9.4.3 Regression globc_v3

Linear Regression globc_v3		**No of observations 1776**	**F(32, 1743) 239.67**	**Prob>F 0.0000**	**R-squared 0.7213**	**Root MSE 2.2441**
lnimp	**Coef.**	**Std.Err**	**t**	**P>t**	**(95% Conf. Interval)**	
lnmass	.24115247***	.0403773	5.97	0.000	.1619595	.3203454
lnGlobalGAP	.77889744***	.032074	24.28	0.000	.71599	.8418049
lndist	-.8632169***	.1273335	-6.78	0.000	-1.112959	-.6134744
comcol	1.8199474***	.5741519	3.17	0.002	.6938484	2.946046
comlang	1.4855812***	.2663109	5.58	0.000	.9632586	2.007904
partGSP	-1.9926071***	.3142466	-6.34	0.000	-2.608947	-1.376267
partBilate~l	1.1050913***	.2993175	3.69	0.000	.5180321	1.69215
partACP	.55338065*	.3153301	1.75	0.079	-.0650844	1.171846
partEBA	-.65735834**	.2721365	-2.42	0.016	-1.191107	-.1236099
_repdum2	-1.1124386***	.382252	-2.91	0.004	-1.862159	-.3627179
_repdum3	0					
_repdum4	-.37789781	.4406074	-0.86	0.391	-1.242073	.4862769
_repdum5	0					
_repdum6	0					
_repdum7	-2.9381382***	.396474	-7.41	0.000	-3.715753	-2.160523
_repdum8	0					
_repdum9	0					
_repdum10	0					
_repdum11	0					
_repdum12	0					
_repdum13	0					
_repdum14	-3.4906243***	.4340042	-8.04	0.000	-4.341848	-2.639401
_repdum15	-1.2589951***	.4249937	-2.96	0.003	-2.092546	-.4254439
_repdum16	-.57209744	.4355246	-1.31	0.189	-1.426303	.2821082
_repdum17	0					
_repdum18	-2.1661047***	.381427	-5.68	0.000	-2.914207	-1.418002
_repdum19	0					
_repdum20	0					

_repdum21	0					
_repdum22	-1.0002694**	.4238967	-2.36	0.018	-1.831669	-.1688697
_repdum23	-2.1900547***	.4288351	-5.11	0.000	-3.03114	-1.348969
_repdum24	0					
_repdum25	-1.9837091***	.3855144	-5.15	0.000	-2.739829	-1.22759
_repdum26	0					
_repdum27	0					
_repdum28	-1.7324002***	.4593637	-3.77	0.000	-2.633362	-.8314384
_repdum29	0					
_repdum30	0					
_repdum31	0					
_repdum32	0					
_repdum33	0					
_repdum34	0					
_repdum35	-2.5589237***	.4015997	-6.37	0.000	-3.346592	-1.771256
_repdum36	-3.4191296***	.3671925	-9.31	0.000	-4.139314	-2.698946
_repdum37	-.89277869**	.420973	-2.12	0.034	-1.718444	-.0671133
_repdum38	0					
_repdum39	0					
_repdum40	0					
_repdum41	0					
_repdum42	0					
_repdum43	-2.1439214***	.4205937	-5.10	0.000	-2.968843	-1.319
_repdum44	-4.1998481***	.4047695	-10.38	0.000	-4.993733	-3.405963
_repdum45	-2.5899539***	.4051359	-6.39	0.000	-3.384557	-1.79535
_repdum46	0					
_repdum47	0					
_repdum48	0					
_repdum49	0					
_repdum50	0					
_repdum51	0					
_repdum52	0					
_repdum53	0					
_repdum54	0					
_repdum55	0					
_repdum56	0					
_repdum57	0					
_repdum58	.25328032	.4648602	0.54	0.586	-.658462	1.165023

_repdum59	-1.0048231***	.3827373	-2.63	0.009	-1.755496	-.2541505
_repdum60	-2.6754393***	.4004748	-6.68	0.000	-3.460901	-1.889978
_repdum61	0					
_repdum62	0					
_repdum63	0					
_repdum64	0					
_repdum65	0					
_repdum66	0					
_repdum67	-2.0383688***	.4201194	-4.85	0.000	-2.86236	-1.214378
_repdum68	-3.1644525***	.382797	-8.27	0.000	-3.915242	-2.413663
_repdum69	-2.1137879***	.3854853	-5.48	0.000	-2.86985	-1.357726
_repdum70	0					
_repdum71	0					
_repdum72	0					
_repdum73	0					
_repdum74	0					
_repdum75	0					
_repdum76	0					
_repdum77	0					
_repdum78	0					
_repdum79	0					
_cons	-.86251431	2.551677	-0.34	0.735	-5.867185	4.142157
Legend: * p<.1;** p<.05;***p<.01						

9.4.4 Regression globc_v3_1

Linear Regression globc_v3_1		**No of observations 1776**	**F(33, 1742) 263.71**	**Prob>F 0.0000**	**R-squared 0.7417**	**Root MSE 2.1609**
lnimp	**Coef**	**Std.Err**	**t**	**P>t**	**(95% Conf. Interval)**	
lnmass	.23663654***	.0374252	6.32	0.000	.1632335	.3100396
lnAgriGAPp~t	.66332579***	.0263667	25.16	0.000	.6116121	.7150395
lnAgri	.23673903***	.0705065	3.36	0.001	.0984527	.3750253

lndist	-.74731155***	.1290747	-5.79	0.000	-1.000469	-.494154
comcol	1.9315012***	.5900371	3.27	0.001	.7742456	3.088757
comlang	1.6747715***	.2481224	6.75	0.000	1.188122	2.161421
partGSP	-2.2025719***	.3154791	-6.98	0.000	-2.82133	-1.583814
partBilate~l	-.06999364	.2951117	-0.24	0.813	-.6488042	.5088169
partACP	-.79493069**	.3183345	-2.50	0.013	-1.419289	-.1705726
partEBA	-1.6762258***	.3039085	-5.52	0.000	-2.27229	-1.080162
_repdum2	-1.06108***	.3351932	-3.17	0.002	-1.718503	-.4036567
_repdum3	0					
_repdum4	-.40194868	.3896756	-1.03	0.302	-1.16623	.3623326
_repdum5	0					
_repdum6	0					
_repdum7	-2.8762317***	.3697735	-7.78	0.000	-3.601478	-2.150985
_repdum8	0					
_repdum9	0					
_repdum10	0					
_repdum11	0					
_repdum12	0					
_repdum13	0					
_repdum14	-3.4872392***	.4131049	-8.44	0.000	-4.297473	-2.677005
_repdum15	-1.1926829***	.3762392	-3.17	0.002	-1.930611	-.454755
_repdum16	-.52472732	.3803388	-1.38	0.168	-1.270696	.2212413
_repdum17	0					
_repdum18	-2.1171634***	.3631101	-5.83	0.000	-2.829341	-1.404986
_repdum19	0					
_repdum20	0					
_repdum21	0					
_repdum22	-.94537978**	.3735826	-2.53	0.011	-1.678097	-.2126623
_repdum23	-2.1705204***	.3966769	-5.47	0.000	-2.948533	-1.392507
_repdum24	0					
_repdum25	-1.9597582***	.3498267	-5.60	0.000	-2.645883	-1.273634
_repdum26	0					
_repdum27	0					
_repdum28	-	.4210143	-4.16	0.000	-2.577286	-

	1.7515399***					.9257932
_repdum29	0					
_repdum30	0					
_repdum31	0					
_repdum32	0					
_repdum33	0					
_repdum34	0					
_repdum35	-2.5013637***	.3809062	-6.57	0.000	-3.248445	-1.754282
_repdum36	-3.4420039***	.3512045	-9.80	0.000	-4.130831	-2.753177
_repdum37	-.82806674**	.3825775	-2.16	0.031	-1.578426	-.0777073
_repdum38	0					
_repdum39	0					
_repdum40	0					
_repdum41	0					
_repdum42	0					
_repdum43	-2.1055202***	.3968458	-5.31	0.000	-2.883865	-1.327176
_repdum44	-4.2183787***	.392816	-10.74	0.000	-4.988819	-3.447938
_repdum45	-2.5570442***	.3847439	-6.65	0.000	-3.311653	-1.802436
_repdum46	0					
_repdum47	0					
_repdum48	0					
_repdum49	0					
_repdum50	0					
_repdum51	0					
_repdum52	0					
_repdum53	0					
_repdum54	0					
_repdum55	0					
_repdum56	0					
_repdum57	0					
_repdum58	.30636822	.4084574	0.75	0.453	-.4947502	1.107487
_repdum59	-.94138023***	.3400975	-2.77	0.006	-1.608423	-.2743379
_repdum60	-2.645085***	.3797131	-6.97	0.000	-3.389826	-1.900343
_repdum61	0					
_repdum62	0					
_repdum63	0					
_repdum64	0					

_repdum65	0					
_repdum66	0					
_repdum67	-1.982352***	.3864781	-5.13	0.000	-2.740362	-1.224342
_repdum68	-3.0969217***	.3685875	-8.40	0.000	-3.819842	-2.374001
_repdum69	-2.0693756***	.3672295	-5.64	0.000	-2.789633	-1.349119
_repdum70	0					
_repdum71	0					
_repdum72	0					
_repdum73	0					
_repdum74	0					
_repdum75	0					
_repdum76	0					
_repdum77	0					
_repdum78	0					
_repdum79	0					
_cons	-1.867734	2.443506	-0.76	0.445	-6.660247	2.924779
Legend: * p<.1;** p<.05;***p<.01						

9.4.5 Regression globc_v3_2

Linear Regression globc_v3_2		**No of observations 1776**	**F(33, 1742) 248.94**	**Prob>F 0.0000**	**R-squared 0.7302**	**Root MSE 2.2084**
lnimp	**Coef.**	**Std.Err**	**t**	**P>t**	**(95% Conf. Interval)**	
lnmass	.25094242***	.0399112	6.29	0.000	.1726635	.3292213
lnGlobalGAP	.79400274***	.0315111	25.20	0.000	.7321992	.8558063
lnAgri	.62763623***	.07473	8.40	0.000	.4810662	.7742062
lndist	-.72144308***	.1298008	-5.56	0.000	-.9760248	-.4668614
comcol	1.9207479***	.5884354	3.26	0.001	.7666338	3.074862
comlang	1.6204132***	.2583333	6.27	0.000	1.113737	2.127089
partGSP	-2.3927***	.3116338	-7.68	0.000	-3.003916	-1.781484
partBilate~l	.34415424	.3072774	1.12	0.263	-.2585171	.9468256
partACP	-.47869603	.325819	-1.47	0.142	-1.117734	.1603415
partEBA	-1.926902***	.3021466	-6.38	0.000	-2.51951	-

						1.334294
_repdum2	-1.0462787***	.3672803	-2.85	0.004	-1.766635	-.325922
_repdum3	0					
_repdum4	-.36847745	.4237923	-0.87	0.385	-1.199673	.4627176
_repdum5	0					
_repdum6	0					
_repdum7	-2.849829***	.3879954	-7.35	0.000	-3.610815	-2.088843
_repdum8	0					
_repdum9	0					
_repdum10	0					
_repdum11	0					
_repdum12	0					
_repdum13	0					
_repdum14	-3.4429338***	.4266115	-8.07	0.000	-4.279658	-2.606209
_repdum15	-1.18149***	.4071716	-2.90	0.004	-1.980087	-.3828935
_repdum16	-.53540632	.4197185	-1.28	0.202	-1.358611	.2877988
_repdum17	0					
_repdum18	-2.1124038***	.3762359	-5.61	0.000	-2.850325	-1.374482
_repdum19	0					
_repdum20	0					
_repdum21	0					
_repdum22	-.95560835**	.4087226	-2.34	0.019	-1.757247	-.1539698
_repdum23	-2.1274888***	.4200943	-5.06	0.000	-2.951431	-1.303547
_repdum24	0					
_repdum25	-1.9532678***	.3752972	-5.20	0.000	-2.689348	-1.217187
_repdum26	0					
_repdum27	0					
_repdum28	-1.7473693***	.4421065	-3.95	0.000	-2.614485	-.8802539
_repdum29	0					
_repdum30	0					
_repdum31	0					
_repdum32	0					
_repdum33	0					
_repdum34	0					
_repdum35	-2.4922939***	.3921703	-6.36	0.000	-3.261468	-1.72312
_repdum36	-3.4211715***	.3612281	-9.47	0.000	-4.129658	-2.712685
_repdum37	-.8385574**	.4092394	-2.05	0.041	-1.64121	-

						.0359052
_repdum38	0					
_repdum39	0					
_repdum40	0					
_repdum41	0					
_repdum42	0					
_repdum43	-2.0732036***	.4127901	-5.02	0.000	-2.88282	-1.263587
_repdum44	-4.1682823***	.4012983	-10.39	0.000	-4.955359	-3.381205
_repdum45	-2.5211918***	.3976063	-6.34	0.000	-3.301028	-1.741356
_repdum46	0					
_repdum47	0					
_repdum48	0					
_repdum49	0					
_repdum50	0					
_repdum51	0					
_repdum52	0					
_repdum53	0					
_repdum54	0					
_repdum55	0					
_repdum56	0					
_repdum57	0					
_repdum58	.30782702	.4462078	0.69	0.490	-.5673323	1.182986
_repdum59	-.94192418**	.3665609	-2.57	0.010	-1.66087	-.2229785
_repdum60	-2.63363***	.3921815	-6.72	0.000	-3.402826	-1.864434
_repdum61	0					
_repdum62	0					
_repdum63	0					
_repdum64	0					
_repdum65	0					
_repdum66	0					
_repdum67	-1.9586675***	.4095463	-4.78	0.000	-2.761922	-1.155413
_repdum68	-3.0682317***	.3766467	-8.15	0.000	-3.806959	-2.329505
_repdum69	-2.0751255***	.3777343	-5.49	0.000	-2.815986	-1.334265
_repdum70	0					
_repdum71	0					
_repdum72	0					
_repdum73	0					
_repdum74	0					

_repdum75	0					
_repdum76	0					
_repdum77	0					
_repdum78	0					
_repdum79	0					
_cons	-3.3745709	2.561958	-1.32	0.188	-8.399407	1.650266
Legend: * p<.1;** p<.05;***p<.01						