AGRICULTURE, GDP AND INEQUALITY IN SUB-SAHARAN AFRICA: CROSS-COUNTRY ANALYSIS OF THE IMPACT OF AGRICULTURAL PRODUCTION AND EXPORTS ON INCOME INEQUALITY

By

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To all who’ve supported and inspired me throughout the years and let me travel high above the skies.

May the ladder of development never get kicked away.

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Over the past decades, global measures of income inequality have become a focal point in analyses of development. While a vast amount of global studies have supported the popular belief of a rise in both within- and between-nations income inequality over the past century, fewer studies have dealt with an in-depth analysis of income inequality in sub-Saharan Africa. A plethora of studies on the other hand has investigated patterns of growth, finding that increases in trade resulted in increases in growth. My research bridges these two bodies of work by focusing on agricultural (export) production and its impact on inequality and development in sub-Saharan Africa.

My study provides an overview of the applicable theories and literature on development and income-inequality, agricultural export strategies and trade liberalization in the sub-Saharan African realm. Using the most recent UN-WIDER database on World Income Inequality, I develop an empirical cross-national regression model of agriculture's relationship with development and inequality measures at the national scale, as well as a qualitative comparative case study analysis of select African countries. Finally, I discuss policy implications of the findings for agricultural-exporting nations, especially in the context of the continuing World Trade Organization's (WTO) Doha Round negotiations.

CHAPTER 1
INTRODUCTION

Karl Polanyi brilliantly remarked on capitalism half a century ago in *The Great Transformation* that "laissez-faire was planned, planning was not" (Polanyi 1957, 141). Through this succinct, yet powerful exclamation, he highlighted to several generations of scholars the importance of actors and their actions for the current state of our economies and dominant ideologies. Entering the twenty-first century, our so-called age of globalization, a heated debate has emerged concerning the current dominant system's multidimensional impact on developing nations and the respective winners and losers (O'Brien and Leichenko 2003). Just as during Polanyi's era, most current studies analyze globalization's forces through the traditional measurements of growth and, for the more socially inclined, poverty. It has become increasingly clear that analogous to laissez-faire, globalization itself is a social construct, shaped and supported by its own movement of actors, such as characterized by Beneria as the gendered *Davos Man* (Beneria 1999; O'Brien and Leichenko 2003).

Traditional studies of agricultural development in Africa have focused most prominently on the relationship between measures of agricultural production (i.e. yield per hectare) and development (i.e. growth in Gross Domestic Product (GDP) per capita ppp). More recently, these studies have added trade as a key force impacting development in sub-Saharan Africa and beyond. With the latest (stalled and currently revived) World Trade Organization (WTO) Doha development round's foci on agricultural liberalization, the significance of crop exports on African nations is most likely to increase accordingly, especially in countries with "agricultural export potential to the markets that liberalize most (that is East Asia and Europe)" (Hertel and Winters 2006, 26). At a global scale, the long term, conservative estimate of the impact of the Doha Development Round for developing countries are projected to be a reduction of the poor

living under US$ 1 per day by 9.7 million in 2015 (Hertel and Winters 2006, 27).[1] Consequently, the rationale for my focus on agricultural exports rests on their (projected and) continued importance in relationship with development (i.e. growth) in sub-Saharan Africa, as the largest sector in terms of employment for most African countries.

Granted the focus on agricultural exports, a key additional indicator has gradually risen to the forefront of these debates concerning the so-termed winners and losers of globalization: inequality. With increases in accessible data, such as the World Income Inequality Distribution database from the World Institute for Development Economics Research (WIDER) by the United Nations (UN), a plethora of work has contributed to this growing body of interdisciplinary scholarship (Beer and Boswell 2001; Kayizzi-Mugerwa 2001; Paluzie 2001; Dollar and Kray 2002; Wade 2002). The scholarship largely builds upon and critiques the theoretical foundation laid by Simon Kuznets' infamous inverted u-shaped curve of inequality and development (Kuznets 1955).[2] These complex studies differ all chronologically and chorologically, investigating both multiple time periods and scales of analyses. The inequality debate has also entered the mainstream realm of policymakers, reflected both in the publishing of the 2006 World Development Report by the World Bank entitled *Equity and Development* (World Bank 2005), as well as the links created towards global security in the post 9/11 arena (Sachs 2001). In terms of scale, they range from household micro-level surveys (Adams 1995), regional studies (Silva 2007) to global assessments (Krugman and Venables 1995). Inequality as a result from

[1] Coupled with gains in productivity in both the manufacturing and agricultural sector from increasing trade liberalization, the number of people living under US$ 2 per day by 2015 would be reduced under a Doha scenario over the long term by an estimated 29.6 million people, and under "full liberalization" scenario by 193.2 million people, or 4.9% (Hertel and Winters 2006).

[2] Kuznets argues that inequality follows an inverted u-shape that increases as countries shift from agriculture to manufacturing, and decreases once they enter the more developed stages of economic development. Given the problematic data availability, he remarks that this 1955 landmark paper "is perhaps 5 per cent empirical information and 95 per cent speculation, some of it possibly tainted by wishful thinking" (Kuznets 1995, p.26).

trade also plays a key role in the concept of the "new economic geography", as put forth by Krugman (1991). Out of all these works, with a few exceptions (Collier and Gunning 1999; Kayizzi-Mugerwa 2001), an abysmal geographical gap appears upon closer review: Sub-Saharan Africa.

Not only has Sub-Saharan Africa, as a region, received the least attention, the attention that it has received has usually only been superficial. Focusing on numerous explanatory variables, ranging from geography (landlocked), institutions (ethnicities, education) to policy (trade openness, rule of law) to economics (manufacturing), scholars have struggled to disaggregate the diversity and complexities found amongst inequality measurements in this most impoverished region of the world (Bloom and Sachs 1998; Collier and Gunning 1999; Dollar and Kray 2002; Easterly 2006). Subsequently, while they broadly agree that Sub-Saharan Africa is a special case, as reflected in the statistically significant regional dummy variables found in Dollar and Kray (2002, 207) and Easterly and Levine (1997, 1210), the search for the 'missing link' for explaining the variations of inequality still appears to be ongoing for the African continent. This thesis consequently is an attempt at providing a new perspective on an old variable, agriculture, focusing specifically on exports, to highlight the importance (or lack thereof) of that sector on development and inequality.

My study consists of six main sections. It provides an overview of the literature on agricultural development and inequality in sub-Saharan Africa and beyond. The hypotheses are articulated and methodology is presented, as well as the data sources. Of the seventeen African nations included in the dataset, ten representative country-level case studies were examined more closely regarding their agricultural development post-1990. These, mostly qualitative, case studies are followed by the findings of the quantitative analysis, involving the development of a

regression model explaining patterns of inequality in sub-Saharan Africa. By focusing ultimately on agricultural export policies, my study fits well in the vast body of work that has shown that policies are key in determining growth and inequality (Persson and Tabellini 1991; Cramer 1999). My study's ultimate goal is to take a forward-looking stance, trying to provide additional quantitative insights to policy makers on the importance (or lack thereof) of the agricultural sector and its respective policies for achieving the goal of sustainable and equitable development. My study concludes with the policy implications of this research and highlights future avenues of study.

CHAPTER 2
REVIEW OF LITERATURE

Agricultural Development and Inequality

Agriculture plays the key role across multiple scales in sub-Saharan Africa: local, national and international. At the local scale, it remains the most important source of formal (traded) or informal (subsistence/consumption) income for the livelihoods of a vast majority of people in sub-Saharan Africa. Agricultural export commodities account for a large share of most farmers' incomes, given its prime role as the main source of foreign exchange in sub-Saharan Africa. For an analysis of exports' impact on inequality, it is important to identify them by type, as one would expect that "exporting primary commodities may increase or decrease income inequality, depending on the pattern of ownership and *the resources concerned*" (Wood 1994, 14; italics added).

At the national scale, from a governmental perspective, agriculture provides the main source of foreign exchange and revenue for a majority of non-oil and mineral exporting governments, even in the current age of globalization. Gains from agriculture thus still rest to a great extent at the heart of their national development strategy (Wood and Mayer 2001, 392).

At the international scale, given the fact that 30 African nations have become net-food importers instead of net-food exporters over the last thirty years (Peacock 2005), changes in both global supply and demand are of highest importance for two main reasons. They influence the volatile commodity markets, especially in sectors where commodities are heavily dominated by one importer or producer and a great degree of dependency exists (e.g. cashew nuts in India, cotton in China) (Cramer 1999; FAO 2004). Especially during years of widespread severe droughts, an increase in global price for crops, such as maize, can have devastating consequences as the governments are unable to pay for the much-needed food imports (Wines 2005).

Overall, experts and scholars alike agree that agriculture is an extremely complex sector, shaped by myriad economic, political, social and environmental forces. Consequently, the literature review has been subdivided into various interlinked sectors dealing with agricultural export production.

Impact of Commodities

One of the most important distinctions in agricultural export production is between processed versus unprocessed agricultural goods, with the former leading to greater inequality as their industries have historically sought cheap inputs in order to make up for their overall inefficiencies and mismanagements. As argued by Bates, "the larger the fraction of output consumed by domestic processing firms, the greater the pressures on governments to keep down the prices offered to farmers" (2005, 124). Considering growth, it is however unclear whether or not a focus on processed goods would lead to its increase or decrease (Mozambican case study) (Cramer 1999). This is most likely to depend upon the degree of inefficiency within the industry and the potential imperfections of the international market, as the processed goods are theoretically gaining a larger share of the goods' commodity-chains value, and subsequently are able to garner higher profit margins (FAO 2004). This efficiency is likely to be correlated with the skill level available within the country, as "countries with higher levels of skill per worker tend to export more of their primary products in processed form" (Wood and Mayer 2001, 375). If the expected negative impact of processed goods on inequality holds true, it would appear to support Kuznets' hypothesis on the inverted u-shaped relationship between inequality and development. Consequently it would appear to go against the emerging tenor, which has argued that "the Kuznets hypothesis […] no longer holds up to empirical and theoretical tests" (Ackerman et al. 2000, 299).

The importance of focusing on processed goods has increased over the past years, with the gap between processed and unprocessed agricultural goods widening during the era of globalization, as "exports of processed agricultural products grew 6% per year during the period 1981-2000, compared with 3.3% for primary products" (FAO 2004, 26). Disaggregated along the levels of development, it becomes however clear that developed countries have harvested the largest share of this increase in growth, as the global share of developing countries of processed agricultural exports "decreased from 27% in 1981-1990 to 25% in 1991-2000" (ibid., 26). This figure is even more abysmal for Least-Developed Countries (LDCs), whose share "fell from a negligible 0.7% to 0.3% over the same period" (ibid., 26). The inability to maintain or actual decrease in share of processed goods by these lesser developed countries is an indication of a vast problem of inequality that is penetrating agricultural commodity chains, as they have become "increasingly dominated by a few transnational enterprises and distribution companies with significant market power" (ibid., 27).

Unfortunately, as a common thread throughout this discussion, there is a clear shortage of studies investigating this relationship. Conventional wisdom is however that a shift from subsistence farming to the market-oriented, cash-crop, production of goods results in an average increase in incomes, with an analogous increase in inequality, as the wealthy are best able to reap the benefits of this transition (at the initial stages) through their improved capital availability and bargaining power. The opposing view, mostly argued for by proponents of the Green Revolution, however continues to exist, stating "that cash crops can (and do) have a favorable impact on rural income distribution by providing the poor with new employment and income-earning opportunities" (Adams 1995, 467). Overall, as discussed by Moradi and Baten, "due to

missing data, this hypothesis was never tested comprehensively in the previous literature" (2005, 1235).

The general importance of the type of agricultural exports however is further highlighted by Easterly, who suggests in his recent finding by focusing on sugarcane and wheat, "that agricultural endowments – specifically the relative abundance of land suitable for wheat to that suitable for sugarcane – predict structural inequality and that structural inequality predicts development outcomes" (Easterly 2006, 32).[3] These findings that cash crops, in his case sugar cane, lead to rural inequality is further discussed by Adams, who undertakes a very solid in-depth study of inequality in rural Pakistan (1995). Coincidently, the leading cash-crop of his region, sugarcane, "has a large and negative impact on income distribution" (ibid., 468). In addition, while too small to be significant, cotton has also been observed to have a negative impact. Contrastingly, strengthening the emphasis on the *type* of crop exported, he found that "income from the main food (wheat, rice) and livestock crops (fodder, barley) has an equalizing effect on income distribution" (ibid., 468).

Finally, in addition to the previous evidence that export crops are more likely to increase inequality than food crops, institutions also seem to have treated crops differently and subsequently either enhanced or lessen their purely economic distributional impact. Cooksey, focusing on the case of maize in Tanzania, finds that the price of maize, the main staple of the urban poor, was "too important politically to be left to the mercies of marketing board and co-operative lobbyists" (2003, 76). Export crops, on the other hand, given their reduced national

[3] Structural inequality is different, according to Easterly, than market inequalities, with the former reflecting "such historical events as conquest, colonization, slavery, and land distribution by the state or colonial power; it creates an elite by means of these non-market mechanisms." (Easterly 2006, p.2)

political importance, could be more easily accommodated through “national-local patronage politics and systematic rent-seeking” (ibid., 76).

In summary, while case studies exist supporting respective points of view, the overwhelming consensus appears to state that the type of export crops clearly matters when analyzing income inequality as well as growth. The types of export commodities produced were historically greatly influenced by colonial policies, and continue to be impacted by policies well into the 21st century.

Impact of Policies

Sidestepping path dependency, much of the structure of agricultural production, such as inputs, subsides, tariffs and taxation policies provided, is dependent on institutional policies. Two contrasting institutional features found in sub-Saharan African countries are marketing boards, which generally regulated export crops through a quasi monopoly, and structural adjustment policies (SAP) and liberalization strategies undertaken in the 80s and 90s, with their ultimate goal of trimming government’s ability to regulate the agricultural market. A potential shift in a country from one ‘market’ ideology to the other has a significant impact on whether or not investments are made by the government in agriculture, ultimately affecting inequality and growth.

It was under policies of import substitution, that the belief reigned that a “peasant path based on intensified, agrarian based rural livelihoods was still a possible and conceivable development option” (Bebbington 1999, 2024). However, since the early and mid-1990s, an observable shift has occurred towards that “of neoliberal economic reforms [where] significant part of the peasant economy is in many instances ‘not viable’” (ibid., 2024).

Overall, both SAP and marketing boards thus are clear examples of (inter)national policies and ideologies governing agriculture and impacting local farmers. Structural adjustment policies

have increasingly become unpopular since their implementations in the early 1980s, as they have failed to achieve their ultimate goals of increasing growth through a wide-array of toolsets: budget cuts, privatization programs, deregulation of markets, trade liberalization, easing of controls on foreign investment, shifts from import substitution to export promotion development models (Beneria 1999, 67ff). While their intentions were to also increase food security, as in the case of southern Africa, the results are more ambiguous. Leichenko and O'Brien find that especially "national-level price reforms that eliminate price controls on agricultural commodities have allowed some farmers to earn higher profits, [while leaving] many farmers vulnerable to both price instability and drought" (2002, 11-12).

Increasingly, a vocal body of critics has argued that another main goal of SAPs, increases in trade openness, has not lead to increases in growth and standard of living. As a matter of fact, focusing on globalization, "new estimates that incorporate measurement of inequality both between and within countries suggest that inequality has grown even more rapidly in recent years than previously thought" (O'Brien and Leichenko 2003, 95). It has been argued, from a political-economic perspective, that liberalization and privatization "promote specific interest groups' economic interests, [... which] were favored before such schemes were deployed" (Ackerman et al. 2000, 322-323). Hence, opposite to conventional neoliberal wisdom, countries that intervened in the aftermath of the SAP experienced more economic growth, not less. According to World Bank studies, countries that strongly intervened "experienced both higher rates of growth in domestic manufacturing and lowered rates of manufacturing imports. Intervention, therefore, is not universally 'bad'" (Grant and Agnew 1996, 734).

The shift from marketing boards to SAPs consequently is not a clear linear one, as some countries have resorted back to interventionist policies. As highlighted in the case of Tanzania,

both the market for agricultural inputs and outputs were gradually liberalized in their initial stages, resulting in a collapse of the "internal maize market, large falls in the production of traditional export crops, and a consequent increase in subsistence agriculture and rural poverty" (Cooksey 2003, 70). These reforms however were reversed by a later 'generation', "as export crop liberalization in particular, have been hotly resisted by significant players in 'the system' who consider there has been enough externally-driven liberalization […]" (ibid., 70). This trend of non-linearity of the process of liberalization has also been observed by Oyejide et al. (1999) who found it to have "reversed in seven out of ten African countries, in many cases (again including Kenya) more than once" (cited in Gunning 2000, 9).

On the other hand, the picture is not entirely negative, as SAP reforms appear to have worked in Uganda since their implementation in 1987,

> rais[ing] incomes in urban and especially rural areas at the same time. Civil service wages were increased from a low level. Reforms provided incentives for production, especially in the coffee sector, through greater use of the market, removal of export taxes and related exchange rate reforms and resulted in higher coffee and food production in the southern parts of the country, raising incomes. At the same time, world coffee prices improved (Kayizzi-Mugerwa 2001, 24).

These findings are furthermore supported by Deininger and Okidi. (2003).

Impact of Dependency on Cash Crops

As highlighted by the case of Uganda, the success or failure of a policy is sometimes closely related to the development of the world's commodity markets. Scholars tend to agree, analogous to the famous resource curse, that an increase of dependency on a single cash-crop comes with an expected increase in overall vulnerability. Given high price volatility and relative decline over the past decades of many agricultural commodities, a reduction of growth can be expected over the long-run.

A recent FAO report highlights in dramatic display that a dependency on a few cash crops results in countries becoming "highly vulnerable to unfavorable market or climatic conditions" (FAO 2004, 20). This picture is especially grave in sub-Saharan Africa, as 37 out of 42 countries classified as Heavily Indebted Poor Countries (HIPCs) by the IMF and World Bank, "rely on primary commodities for more than half of their merchandise export earnings" (ibid., 20). The picture looks exceptionally grim in the agricultural sector, as overall price volatility appears to have declined over the last 20 years, yet "prices of many agricultural commodities remain highly volatile" (ibid., 21). Furthermore, there is very low demand elasticity for several agricultural goods, with some cash crops actually experiencing an overall decline in demand, such as cotton under the pressure from synthetic fibres. Lastly, differentiating between types of commodities, the instability tends to be "higher for agricultural raw materials and tropical beverages than for temperate-zone products" (ibid., 21).

Overall, it thus appears that dependency on a few primary commodities is a widespread 'economic disease' in Africa. As found by Grant and Agnew, "the overall structure of Africa's trade has remained remarkably stable over time, and Africa remains heavily dependent on the export of primary commodities" (1996, 737). This focus on primary commodities had a negative impact on Gross Domestic Product (GDP) growth in most African countries, as the "GDP of all commodity exporters grew by only 1.4% [between 1980 – 1992], whereas the GDP of manufacturing exporters grew by 6.8%" (ibid., 737).

A common thread in the literature is the emphasis on the negative economic and environmental impacts of monoculture cash cropping on growth and inequality vis-à-vis a more diversified agricultural scheme. Looking at 28 countries in sub-Saharan Africa over six 5-year periods from 1950 to 1980 with anthropometric estimates, Morati and Baten find that their

“regression results indicate clearly that the existence of a (single) cash-crop industry reduces a region’s average height by almost one centimeter and increases intra-regional inequality” (2005, 1252). Furthermore, they find the opposite effect for a more diversified cash-cropping strategy, as “heights increase nearly by three millimeters and the CV decreases by 0.10 for each additional cash-crop industry, while inequality is consistently lower” (ibid., 1252). Consequently, in an attempt to speak to policymakers about the further impact of globalization, they advocate in favor of a specialization in cash crops and simultaneous support for the process of globalization, arguing that it “could have overwhelmingly positive effects on a region’s development, decreasing inequality even further if a strategy of diversification is pursued simultaneously” (ibid., 1252).

These findings are furthermore supported by Beer and Boswell, who also find a negative relationship between commodity concentration and physical quality of life. Consequently, they also argue in favor of diversification, as it increases the ability “to better weather downturn in the global commodity market” (Beer and Boswell 2001). However, it is important to keep in mind that there is no direct link between diversification and inequality, as diversification per se “does not necessarily level rural incomes” (Tiffen 2003, 1359). According to Tiffen, both rich and poor are heavily dependent upon nonfarm incomes for their income composition, with rich farmers usually able to invest outside of the primary sector, agriculture . This would suggest however that even during periods of lower prices for the most important cash crop, rich farmers are the ones able to display the greatest resiliency, consequently potentially increasing the gap between rich and poor. It is within this context that inequality might come into existence even without the overwhelming economic pressures faced by farmers in the South overall.

Impact of Climate

It is evident that climate plays a major role at the local scale on inequality, due to varying degrees of resilience and adaptability in the populations. With the occurrence of global warming, climate issues have become an even more pressing concern for the future. Its impact on farmers, coupled with liberalization, appears to be however mixed, as both outcomes exist where "farmers who formerly had difficulty adapting to climatic variability may become less vulnerable to drought-related food shortages [… whereas] adaptation strategies may be constrained or limited for other farmers […]" (Leichenko and O'Brien 2002, 14). Furthermore, while climate change might have a negative impact on a region, its overall economic outcome might still be positive if "accompanied by rising world prices for that region's crop" (ibid., 3).

Focusing solely on droughts, it is clear that they have a great impact on overall cereal production, even though some crops are more drought-resilient than others (ibid., 7). Given the likelihood of wealthier farmers having multiple adaptation and livelihood strategies, as well as access to more drought-resistant crop varieties, severe droughts or other environmental crises, e.g. pest outbreaks, are likely to increase inequality and decrease growth.

Impact of Decline in Terms of Trade

As has been discussed previously, a historical decline in prices received for agricultural goods had detrimental impacts on both growth and inequality in sub-Saharan Africa over the past. At the globally aggregated scale, "terms of trade within the agricultural sector worldwide neither rose nor fell significantly between 1961 and 2002" (FAO 2004, 12). However, once again, the picture looks especially dire when focusing on the terms of trade for the LDC. Agricultural terms of trade "feel by half from a peak in 1986 to a low in 2001" (ibid., 12). As these countries heavily depend on their commodity export incomes to provide for food imports, overall food security has been significantly undermined over these past decades.

Furthermore, decreasing terms of trade have also increased the countries' respective debt burden. This phenomenon has been especially dramatically captured in the relationship of the terms of trade between agricultural commodities and manufactured imports, which were "even more persistent and more damaging", increasing the debt burden of developing countries (ibid., 12). As a matter of fact, from 1961 to 2001, "average prices of agricultural commodities sold by LDCs fell by almost 70% relative to the price of manufactured goods purchased from developed countries" (ibid., 12). This drop has resulted in a severe shortfall of revenues for countries in sub-Saharan Africa, as it has been declared the "region that has suffered the most from declining terms of trade [… costing them] the equivalent of 119% of their combined annual gross domestic product (GDP) in lost revenue" (ibid., 13).

Grant and Agnew however dispute the above picture, arguing that orthodox development economists showed that the terms of trade in sub-Saharan Africa has actually declined less compared to their Latin American and Asian counterparts in the 1980s, "and yet Africa experienced much the worst export performance" (Grant and Agnew 1996, 730). While their time period might differ, they nevertheless appear to argue in favor of liberalization as actually reducing structural inefficiencies, removing heavy taxation of crops for example that are holding a comparative advantage.

Overall, it however appears to be clear that a link exists between worse terms of trade indicators and worse prices for main export crops in sub-Saharan Africa. These changes in terms of trade had an impact on inequality both prior to reform efforts undertaken during the 1980s. Such was the case in Cote d'Ivoire, where inequality has increased due to "interaction[s] of external conditions – coffee and cocoa prices – with internal inequalities in land ownership and wages for civil servants […]" (Kayizzi-Mugerwa 2001, 22). Even during liberalization, it

continued to play a role, according to Kayizzi, as "the government had to cut civil service wages and salaries and export prices put plantations under pressure" (2001, 22).

Impact of International Trade Policy

One of the main driving forces for the above-discussed worsening of the terms of trade are attributed to unfair and illegal agricultural policy put in place by the most developed nations. Agricultural trade was largely excluded from processes of international trade liberalization prior to the 1980s due to a multitude of political, social and economic reasons. Politically, during the Cold War era countries made agricultural self-sufficiency a security priority. Consequently, while manufactured goods covered under the GATT were freely traded, agricultural goods were still heavily protected and internally supported.

It was within this context that the GATT trade ministers, under the leadership of the United States, launched the Uruguay Round (the first major trade round). Its main achievements were average cuts in tariffs and export subsidies of 36%, and an ambitious reduction in domestic subsidies. This trade round was proceeded by the current Doha Development Round, which holds the potential of providing the biggest liberalization of the agricultural sector. While the round has come to a halt (and been revived again after the World Economic Forum in Davos, Switzerland of 2007), the previous cuts and harmonization efforts are in place, and membership in the WTO is currently associated with an increasingly out-ward oriented policy which emphasizes exports, subsequently increasing growth. Onafowara and Owowye, focusing on their trade policy dummies, find "significantly positive effects of trade orientations on economic growth for five countries – Cameroon, Cote d'Ivoire, Kenya, Sudan, and Zambia – at the 5% level and better" (Onafowora and Owoye 1998, 503). As they additionally find a positive impact of orientation from in-ward to out-ward, they argue that it is "possible to stimulate real economic growth in sub-Saharan African countries through an outward-looking strategy of export

expansion" (ibid., 504). In conclusion, they advocate in favor of continued trade liberalization, as their results suggest the need for continued trade liberalization "in order to enhance economic growth [of sub-Saharan Africa] in the current world economy" (ibid., 505).

A unique way through which GATT/WTO membership would result in greater growth is through the endogeneity of trade protection. Membership creates more uniform tariff rates, as "tariff declines in each industry are proportional to that industry's prereform tariff levels, alleviating concerns about endogeneity, at least in the economic sense" (Goldberg and Pavcnik 2004, 227). Consequently, the most protected sectors are the ones experiencing the greatest cuts, potentially transferring additional resources from heavily protected manufacturing towards the agricultural sector.

It however would be wrong to argue that membership in the WTO is a win-win, when measured in absolute terms, as agreements tend to "primarily benefit a few nations, typically the initial signatories" (O'Brien and Leichenko 2003, 95-96). Other nations sign on in order to "minimize their absolute losses" (ibid., 95-96).

In relationship to the impact on growth, there however appears to be few studies that link WTO membership in particular, and trade openness in general, to inequality. For example, Dollar and Kray find "little evidence that these policies and institutions [openness to international trade, macroeconomic stability, moderate size of government, financial development, and strong property rights and rule of law] have systematic effects on the share of income accruing to the poorest quintile" (Dollar and Kray 2002, 196).

Impact of Input Use and Modernization

A defining feature of both monoculture and cash-cropping since the mid-century in the developed, and increasingly since the later part of the 20th century in the developing nations, is the gradual (attempted) modernization and mechanization of agriculture. A lack of access to

inputs has been identified as one of the most common obstacles in 'peasant agriculture' and for achieving growth (Wood 1994, 46).

As most states heavily taxed agriculture through lower prices, they tended to subsidize inputs in order to "appease powerful political forces" (Bates 2005, 6). In need of political support in the countryside, "their rural confederates include tenants and managers on state production schemes [as well as] elite-level farmers, [… and] the more widespread group of progressive farmers who have become dependent on state-sponsored programs of subsidized inputs" (ibid., 120-121). While they are placed at a disadvantage through the artificially lowered agricultural prices, they still support the government exactly because of these subsidized inputs. In addition, once producers have obtained a strong relative advantage (as reflected potentially in higher yields) in their production, they actually entertain weaker political bargaining power. This is based upon the observation that "the stronger their relative advantage, the longer they will persist in growing a crop under conditions of falling prices – the more thoroughly they can be "squeezed," in short, by adverse pricing policies" by the government (Bates 2005, 127).

Unfortunately, poorer farmers were largely ignored in policy schemes on both ends, as they did not receive facilitated access to the inputs and were stressed by the lower prices. There are clear signs however that rural citizens, as observed in the Tanzanian PRSP, are eager to be granted better access to credit and perceive "high costs of farm inputs" as hindering their own development (Ellis and Mdoe 2003, 1381).

Given the periods of structural adjustment and subsequent attempts at reducing the ability of states to subsidize such schemes favoring wealthy constituencies, it is important to observe more closely the effect of agricultural input price fluctuations. As argued by Wood, price fluctuations and actual prices for inputs "could be much more significant than capabilities for

local peasants and casual, agricultural wage laborers in determining real income entitlements" (2003, 457). But even in an entirely efficient and liberal market scheme for fertilizer usage, its usage might not be beneficial to small farmers for certain crops. As found by Cooksey in Tanzania in the case of maize, benefits of using such fertilizers might be rather small, and on purely economic terms "the mass of small farmers would not have profited from systematic inorganic fertilizer use" (2003, 71). As a matter of fact, given the unequal distribution of fertilizer usage prior to liberalization efforts, it comes as no surprise that the wealthiest farmers might be "the main loser from liberalization" in a post-structural adjustment environment (ibid., 72). These impacts of liberalization however might not be as strongly felt in a state with higher oil-revenues, such as Nigeria for example, who can afford to subsidize inputs.

In summary, a high fertilizer and tractor usage per capita should indicate the existence of a high number of large farmers, as "the distinguishing characteristic of large sellers is their good management quality, which has enabled them to accumulate resources (from livestock sales, crop production or non-farm incomes) for investment in intensification" (Tiffen 2003, 1354). Subsequently, no matter the benefits of using such improved inputs and equipment, the two main investments local farmers in Kenya would like to undertake "when resources became available" were equipment (67%) and inputs (17%) (ibid., 1357).

Impact of Land

Besides intensification, extensification or the expansion of agricultural production is another key aspect of agricultural production. Of the trinity of labor, land and capital, land consequently is of vast importance within an African agricultural context. Dollar and Kray find that countries with increased arable land per worker have lower income share of the poorest quintile, which is "consistent with Leamer et al. (1999) who find that cropland per capita is

significantly associated with higher inequality in a cross-section of 49 countries" (Dollar and Kray 2002, 215).

This emphasis on land is one of the most discussed agricultural variables in the literature, as reflected by the instrumental works of Deininger and Squire (1998), who find a negative impact of land inequality on inequality and growth. This is furthermore supported by Alesina and Rodrik, who have articulated that their estimated "coefficients imply that an increase in, say, the land Gini coefficient by one standard deviation […] would lead to a reduction in growth of 0.8 percentage points per year" (1994, 481).

As far as African case studies, there appears to be a less clear-cut picture of the relationship between inequality and land inequality. South Africa, for example, has been identified as having a very unequal land distribution, which has a large impact on inequality when coupled with a "policy mix that taxed the agricultural sector directly and indirectly through industrial protection and overvalued exchange rates" (Binswanger and Deininger 1997, 1962-63). Ghana, Nigeria, Tanzania and Uganda on the other hand have "agrarian structures dominated by family farmers", where land inequality has played a lesser role (ibid., 1962). Inequalities are rather the result from excessive taxation and little support that was provided which went "primarily to relatively inefficient, but politically powerful large producers" (ibid., 1962).

There are however some qualifications and cautions that need to be taken into account. While Adams also finds in the case of Pakistan that "agricultural income is highly correlated with land owned," his research also shows that livestock income is not linked with land ownership (Adams 1995, 472-474). Furthermore, a change in land law can not be assumed to have a predictable effect on farmers, as the change needs to be coupled with "changes in other

institutions affecting agriculture: market networks and crop pricing policies or marriage and gender relations, for instances" (Leach, Mearns, and Scoones 1999, 241).

Nevertheless, it appears valid that the greater the availability of agricultural land per capita, the more agricultural practices are viable. If farmers are inheriting smaller farms in a land scarce environment, for example, they are often "unable to find the necessary capital to intensify production from a small land holding [and] are increasingly forced to look to other occupations for a living […]"[4] (Tiffen 2003, 1358). These opportunities are often believed to be found in urban areas and the manufacturing sector.

Impact of Urbanization

A vast literature exists on the relationship of urbanization to inequality and growth simultaneously, both at a global scale, as well as for sub-Saharan Africa. One of the best known relationship stems from Lipton (1977). The argument goes that a greater urban population acts as an indicator for an increased urban bias, consequently resulting in heavier taxation on agriculture, ultimately increasing inequality while decreasing growth. The problem with this proposition however is that the critical link is placed on taxation. If that taxation occurs mostly on cash crops, which are generally of greater importance to wealthier farmers, it actually might decrease inequality as smaller farmers are less dependent on them for their income source. However, given that the focus most often rests on subsidizing urban food sources, the effect is most heavily expected on food crops. This negative effect could be offset through increasing domestic demand for food crops by the growing urbanized, non-agricultural population. Given the likelihood of changes in nutritional preferences for the urban population, this latter effect might be reduced in reality.

[4] There certainly is the possibility to obtain access to land, yet be unable to intensify production if labor constrains exist and capital is not available to off-set the constraint.

The literature nevertheless appears to support an increase in the likelihood of an urban bias with a higher urban population. As observed by Bates, "where urban interests came to power, they have adopted policies more hostile to the interest of farmers" (Bates 2005, 122). On the contrary, "governments dominated by rural producers have intervened less forcibly in the markets for outputs and have also provided more favorable subsidies in the markets for inputs" (ibid., 122).

In terms of geographical distance from the urban areas, as reflected in the measurement to the capital city, studies show that the "inequality is lower in distant regions. On the other hand, […] relative to the distance of the remotest region, distance has a positive effect on inequality" (Moradi and Baten 2005, 1253). Consequently, Moradi and Baten conclude that the size of the country matters, as "remote regions of large countries such as Tanzania, Mali or the Ivory Coast display smaller inequality, whereas distant regions of small countries such as Rwanda and Uganda have higher inequality" (ibid., 1253).

Tiffen is one of the main proponents of the argument that urban areas are playing an increasingly larger role for domestic farmers, and acts as "a main generator of change in farming systems, particularly, but not only, in the semi-arid areas" (Tiffen 2003, 1344). She actually finds that most African countries are not "exporting more than 20% of agricultural production value, so 80% is locally consumed. Crops internally consumed are now much more important than crops exported […]" (ibid., 1351). While this would indicate for the urban areas to be a clear driver of growth in the rural areas, it is likely that inequality actually will increase at the national level, as "the urban market is attracting not only their products, but also their labor" (ibid., 1344).

This inequality between the urban and rural areas is well-documented in the literature and has been described as "a major aspect of inequality in Africa […] stem[ing] from colonial rule rather than globalisation" (Kayizzi-Mugerwa 2001, 10). This gap, however, appears to have lessened from an inequality standpoint through trade liberalization during the 1980s and 1990s. According to Kayizzi, "by boosting export crops, trade liberalization actually reversed rural decline in some countries. Where they were grown on small peasant holdings, the impact on rural welfare was clearly positive" (2001, 10).

While this observation might be closely related to the actual crises faced during these decades, it is likely that during periods of positive growth, the urban-rural bias is likely to increase. One of the most prominent evidence for such a phenomenon is provided by Krugman, who argues that increasing returns "are in fact a pervasive influence on the economy […] determining the geography of real economies" (Krugman 1991, 10ff).

Impact of Manufacturing

Other occupations outside the agricultural sector are often found in the formal or informal sector of manufacturing. Agricultural development strategies have increasingly taken a dualistic form, as the sector has been poised against manufacturing. As argued by Beer and Boswell, "it is not development per se, but dualism and diffusion processes that are the keys to explaining income inequality" (2001, 6). Consequently, a focus on key indicators of the agricultural exports has the potential for unearthing a great degree of these dualistic and diffusional processes.

According to Bates, if countries are able to tax other sectors for revenue besides agriculture, they not only use subsidy programs, but are more lenient on reducing taxation, as "governments with access to nonagricultural sources of funds often impose lighter levels of taxation on export crops" (2005, 123). Consequently, we could expect that from an agricultural

perspective, countries with larger non-agricultural exports might experience a lowered inequality, as revenues are more evenly distributed .

This political analysis is furthermore supported by Ellis and Mdoe, who find that Poverty Reduction Strategy Papers (PRSP) programs by the World Bank and IMF in Tanzania, with their goal at subsequent decentralization and improving rural livelihoods, resulted in increases in taxation and corruption. While this problem has been realized by the PRSP, "it fails to make specific proposals […] and [draws] no strategic connections between rural taxation and the demands for increased rural revenue generation that results from new district councils seeking to create budgets over which they can exercise their own control" (Ellis and Mdoe 2003, 1381).

Granted these findings, they have been qualified in terms of size and maturity of the non-agricultural sector, as typically initial non-agricultural sectors are still taxing heavily agriculture. These first nonagricultural sectors are usually "administration and defense, which often cull any small agricultural surplus that exists without contributing much to [agriculture]" (Tiffen 2003, 1347).

Focusing on the size of agricultural exports, several studies provide further support for focusing on the ratio between agricultural and manufacturing exports. Bourginion et al., for example, argue that countries dependent on few cash crops "are subject to an important risk, which affects the level of macroeconomic activity as well as the households' income distribution. Such a systemic risk is thus a potential source of inequality among households in a poor export-dependent country" (Bourguignon, Lambert, and Suwa-Eisenmann 2004, 369). While their study is less applicable, as they focus on a model showing the various impacts of liberalization policies based around Ivory Coast, they nevertheless highlight the importance of focusing on agriculture exports, as "export price risk is seldom taken into account when evaluating the

overall degree of inequality within a country" (ibid., 369). While dependency on a single cash-crop is discussed in an earlier section, such reasoning has received support from dependency theorists, who argue that large export sectors are positively correlated with income inequality, as export sectors are largely foreign owned, which "monopolizes internal capital and repatriates profits, stagnating the domestic sector" (Beer and Boswell, 3).

The positive relationship between the non-agricultural sector on inequality is also supported indirectly by Bebbington's analysis of livelihoods, as he finds that "the more viable rural livelihoods" share the common characteristics that they are able to sustain or increase their access to resources beyond the traditional agricultural sector (1999, 2028). The ability to diversify the income through other opportunities has a positive impact on growth (and inequality) is furthermore supported from a gendered perspective by a study of women's livelihoods in Benin. Mandel found that mobility and ability to diversify is key, as "women with substantial mobility tend to have greater autonomy and independence in their economic activities than those with limited mobility" (2004, 278).

This depicted positive relationship between the ratio of agricultural to manufacturing exports and inequality however appears to run counter the previously mentioned Kuznets hypothesis, which would predict an increase in inequality as a result from development of the manufacturing sector (Kuznets 1955). Combined with the impact of globalization, sectors that have imported heavily foreign machinery and have modernized are likely to experience an increase in "demand for skilled workers" (Goldberg and Pavcnik 2004, 239). If coupled with increases in productivity that "are shared with workers in the form of higher wages", the increased wage premium clearly would increase national inequality measures (ibid., 244). Goldberg and Pavcnik (2003) is even more applicable to our case of sub-Saharan Africa, as they

created a model, which displayed an increase in the informal sector in the aftermath of trade liberalization. Given this sector's association "with lower wages and worse job quality, trade liberalization could in principle contribute to increased inequality" (Goldberg and Pavcnik 2004, 247).

Using empirical data, if we accept the assumption that richer countries have lower agriculture to manufacturing exports ratios, these findings are disputed by studies that find no support for different relationships between rich and poor countries and inequality, "contrary to the Kuznets hypothesis that inequality increases with income at low levels of development" (Dollar and Kray 2002, 208). As a matter of fact, indicators, such as the percentage of labor force in agriculture, "have been found to be associated with income inequality at lower levels of development", with higher percentages indicating lower income inequality (Beer and Boswell, 6).[5]

From a policy perspective, it is important to note that overall, manufacturing exports in Africa have actually declined over the years, and both policies of competitive advantage and import substitutions have equally not been a development panacea. Consequently, recent tenors articulate that a healthy relationship between agriculture and manufacturing exports might be most beneficial, as "African economies might be better served by a degree of diversification than by the specialization mandated by the comparative-advantage thesis" (Grant and Agnew 1996, 734).

Impact of Infant Mortality

Infant mortality has in the past decade received considerably more attention, both as a proxy for overall human welfare, as well as due to its observed negative impact on economic

[5] This picture however is different in the case of the United Sates, where a small number of workers in the agricultural sector exist, yet inequality is relatively high.

growth (Deininger and Okidi 2003, 486). One of its most famous proponents is Amartya Sen, who has advocated in favor of a greater focus beyond basic economic indicator in order to receive a fuller picture of a person's quality of life. As such, he argues that mortality information not only highlights the capabilities of a person, but furthermore "can throw light also on the nature of social inequality [… as b]iases in economic arrangements are often most clearly seen through differential mortality information" (Sen 1998, 23). Placing the impact of mortality on economic income into the African context, Bloom and Sachs find that "high rates of fertility with falling levels of infant and child mortality" in Africa result in a "substantial drag on African economies by reducing their productive capacity per capita" (1998, 4). Furthermore, due to the heavy population skew towards the younger levels of the population pyramids, this "youth-heavy age distributions also tend to be associated with lower rates of savings and investment […] and therefore slower economic growth" (ibid., 4)

While a clear relationship appears to exist between economic growth and infant mortality, it is unclear whether or not a distributional relationship exists as well. As shown in Table 2-1, adopted from Wood (2002, 49), inequality follows a unique path in relationship the other measures of development. While sub-Saharan Africa has by far the lowest GDP ppp per capita, highest poverty rates and highest infant mortality, Latin America's inequality is even higher, thus showcasing the complex relationship between these two variables.

Furthermore, while focusing on the impact infant mortality can have on inequality, the relationship can also be the reverse. As found in a study of the US, "inequality increases economic segregation, which increases infant death", with infants living in states with higher level of inequality holding a greater chance of dying than those in poorer states (Mayer and Sarin 2003, 19). Given these findings, yet reported, even if complex, relationship between income

inequality, development and infant mortality, close attention will be paid to this variable in both the qualitative and quantitative analyses of Chapters 4 and 5.

Outlook

Overall, the importance of the agricultural sector in Sub-Saharan Africa is unlikely to diminish soon. While scholars disagree on whether or not agriculture will hold the key for development (Thirtle, Lin, and Piesse 2003), it is clear that it will continue to play a vast role in the future, as "the share of agriculture in African primary output and exports seems likely to increase in the future" (Wood 2002, 14). This is furthermore stressed by the multitude of untapped inputs and proclaimed scientific advances that have so far largely sidestepped the African continent, such as the Green Revolution, irrigation, inorganic fertilizer and genetically-modified crops.

Some preliminary caution however is in order, as agriculture, while accounting for a large portion of income in sub-Saharan Africa, might not significantly explain respective inequalities. As highlighted by Congeu et al., no matter how "interesting the inequalities within the agricultural sector may be per se", they argue that in their study of five countries they did not find it as the major source of "substantial inequality deviations" between their case studies (2006, 14). While their findings could be disconcerting, given the author's primary goal of simply focusing on the agricultural sector for highlighting its importance (or lack thereof) on inequality (and growth), their warnings are well taken. However, other studies have highlighted the vast role agriculture plays. Adams found that in rural Pakistan, "agricultural income makes the largest contribution to overall inequality. Depending on the year, the results suggest that agricultural income accounts for 35.5% - 45.6% of overall inequality" (Adams 1995, 472).

Concerning measurements of development, such as the Gross Domestic Product per capita (purchasing power parity), the literature finds them useful to a certain degree. As argued by

Bates, due to the greater share of food in people's (especially urban populations) basket of income, "nations with lower per-capita incomes are thus more likely to adopt policies in support of low-priced food" (Bates 2005, 124). Furthermore, it has been noted that no correlation exists between the "share of agricultural exports in total exports […] with GDP per capita" (Wobst 2003, 74). As a note of caution, Wade points out that GDP per capita might just be an alternate measurement of inequality, as "the average income of each country weighted by population is interesting only […] an approximation to what we are really interested in [, inequality]" (Wade 2002, 14).

An additional concern is that common wisdom of Africa might indicate that not enough variations exist between countries when looking at agriculture and development indicators, given their clustered status of largely underdeveloped countries. This fear has been dispelled by Wood and Mayer's main findings, which showed that "[sub-Saharan] Africa is internally diverse […and its] export structure and resource combinations vary widely" (Wood and Mayer 2001, 389). This diversity of export structure and resources is exactly what we'll examine in the ten case studies of sub-African nations, arranged by regions, starting with Burkina Faso in Western Africa.

Table 2-1. Development outcomes

	Sub-Saharan Africa	Latin America	High-Income OECD
Per capita GDP ($000, PPP) 1995	1.5	6.4	26.9
Poverty (% of population <$1/day) 1999	46.7	15.1	-
Income inequality (Gini, most recent year)	46.1	54.7	38.4
Infant mortality (per 1000 live births) 1995	94.0	33.6	7.1

Sources: Adapted from Wood (2002). Weighted by population.

CHAPTER 3
HYPOTHESES, DATA AND METHODOLOGY

Hypotheses

Based upon the literature review, the thesis will test the following two main hypotheses:

(1) Countries with higher share of agriculture value added (as% of GDP) have lower inequality,

(2) Countries with higher share of agricultural exports (as% of total merchandise exports) have lower inequality.

These hypotheses are derived from the main assumption that the agricultural sector significantly explains differences among the inequality levels of sub-Saharan African nations', as measured by the Gini coefficient. The resulting inequality model will be tested by regressing agricultural with non-agricultural variables that have historically seemed to be significantly related to inequality, including human capital[6] and urbanization (Deininger and Squire 1998; Castello and Domenech 2002).

Building from this main hypothesis, five other hypotheses will be tested (Table 3-1):

As a note of explanation, GDP per capita ppp has been chosen in order to observe the impact of agricultural production and exports vis-à-vis inequality. Given this study's focus on inequality, it has not been elevated to the same importance as our main hypotheses, yet however is an integral part of the study, especially in connection with policymakers historical main foci on income, development, growth and poverty. The third hypothesis tests that countries with a higher dependency on a few (cash-) export crops have greater inequality; in other words, countries with a greater diversity in export crops have a lower inequality. In addition, the fourth hypothesis tests that countries after 1994, signifying the aftermath of most structural adjustment

[6] Traditionally, human capital is measured by educational levels (years of schooling). Due to lack of data availability, infant mortality has been chosen as a proxy, as it has been found to hold a "very significant and quantitatively not unimportant negative effect on attainment of schooling in the population […]" (Deininger and Squire, 1998, p.273).

policies, the founding of the World Trade Organization (WTO) from its predecessor (GATT) and the implementation of the Uruguay Round have a higher inequality. The fifth hypothesis tests whether a higher percentage of the urban population of a country is correlated with greater inequality. In addition, several secondary hypotheses have been considered. However, due to lack of available (or complete) data, significance or other constraints, these have not been included here.[7]

Data

Data used for this thesis comes from a variety of sources. The data source is the most recent UN-WIDER database on World Income Inequality, Version 2.0a (World Institute for Development Economics Research 2005), which includes the large World Bank dataset created by Deininger and Squire (1996). This represents the main dependent variable of inequality examined in this study and the main hypotheses. The data for the independent variables come from a variety of official UN or FAO datasets, most notably the up-to-date FAOSTAT database (FAO 2006), the African Development Indicators (World Bank 2005) and the World Bank Development Indicators (UN 2006). Given the collaboration and interdependence between these international organizations, the data is fairly compatible as one of the above organizations themselves reference the others' variables. A detailed definition and data ranges of each independent variable is listed in Appendix L.

Dependent Variable

Gini coefficient (gini)

This data set is the largest and most commonly used secondary source for inequality data, listing 4664 Gini coefficients, ranging from before 1960 up to 2003, and includes 40 countries

[7] They include tests on the value of agricultural exports per capita (FAO database had missing variables or not reliable), terms of trade (lack of available data), droughts (issue of time and susceptibility), Foreign Direct Investments (FDI) (lack of relevance to agriculture), fertilizer and tractor data (lack of reliability).

from sub-Saharan Africa. A gini coefficient is calculated based upon the respective share of national income held by each percentile of the population, resulting in a Gini coefficient of 0 for perfect equality, and a Gini coefficient of 1 for perfect inequality. For every country's value, the database lists the source and quality of the data, a reported (and calculated) Gini coefficient, quintile and decile shares, "survey means and medians along with the income shares of the richest 5% and the poorest 5%" (World Institute for Development Economics Research 2005).

A conscious decision has been made to rely on consumption data rather than income data. While the former has been observed to be "not closely tied to short-term fluctuations in income [and is] smoother and less variable than income", gathering reliable income data is very difficult in a (rural) developing country setting (UNU-WIDER 2005, 4). While some people disagree with the use of consumption data given the question of quantifying consumption patterns, it is broadly agreed that "where the rural agricultural sector is large […] consumption data should be used"[8] (UNU-WIDER 2005, 4). These studies were all undertaken at the household level, and ideally measured both food and non-food consumption, the use-value of durable goods and housing. The dataset also reports two different Gini coefficients, and the study uses the first Gini coefficient calculated by WIDER "using methods developed by Tony Shorrocks and Guang Hua Wan to estimate [it] from decile data almost as accurately as if unit record data were used" (UNU-WIDER 2005, 9). Finally, the database also uses a quality ranking, which indicates whether or not the income concept or the survey quality could be judged.

Based upon this metadata, fifty data points have been chosen in sub-Saharan Africa. The three main criteria applied were that they were not allowed to be of the lowest quality rating (4), should come from a uniform, reliable source, and should include at least two data points at

[8] In sub-Saharan Africa, income data is historically rarely collected in the first place, with the major exception for South Africa.

different times for each country. 46 of the 50 data points are based on consumption data (Table 3-2), while only one data point from South Africa in 1997 is based on gross income[9]. These datasets cover a total of 23 years (Figure 3-1), with the earliest data point starting in 1980 (Nigeria) and the latest in 2003 (Mozambique). The vast majority of the data points were inevitably of lesser quality (quality 3 out of 4, with 1 being the best), given the sub-Saharan African environment, accounting for 78% of the sample[10] (Figure 3-2). The main source of the data points from the UN-WIDER dataset comes from Deininger and Squire 2004 World Bank dataset, which accounts for 68% of the data points. The remaining 32% come from other World Bank sources, with the exception of the 2003 Mozambican case, which was reported in a journal article by James, Arndt, and Simler (2005) (Table 3-3: Sources). Finally, while seventeen countries were initially included, Senegal's data points have been removed because of various data problems, which are likely based on reporting errors[11]. Consequently, the current data set covers sixteen sub-Saharan African nations, a representative sample of the entire continent (Table 3-4: Countries).[12] The mean Gini of the 50 cases is 49.6 with a standard deviation of 7.39 (Figure 3-3: Histogram of Gini).

[9] Comparing income to expenditure-based data, authors have usually adjusted the former to match the latter. The adjustment, as undertaken by Frazer (2006) was 4.3 points, whereas Deininger and Squire (1996) adjusted by 6.6 points on average. No adjustment in our case was undertaken, as these previous cases related to expenditure data, not consumption.

[10] The one missing value for which no quality has been assessed is the 2003 Mozambican Gini coefficient published in 2006, which has been included in the dataset.

[11] Senegal's Gini, according to the survey, dropped by more than 30 points from 1994 to 1991 to a low of 29.3. A different survey in 1994, however, has found that its Gini was 41.0 for that year. While there might be other such cases of error, I have attempted to eliminate any data that seems unreasonable and consequently no other data point has been eliminated.

[12] The main inequality regression models use only a minimum of two and a maximum of three data points per country.

Independent Variables

Agricultural production (agvalue)

To measure the value of agricultural production, and its importance to the economy, the so-termed agricultural GDP is measured, as reported by the UN as *Agriculture Value Added* (as% of GDP) (UN 2006). Agriculture includes "forestry, hunting, and fishing, as well as cultivation of crops and livestock production" according to the ISIC divisions 1-5 (UN 2006). It is calculated by measuring the "net output of a sector after adding up all outputs and subtracting intermediate inputs" (UN 2006).

Food exports (tradfood), raw agricultural exports (tradraw) and total agricultural exports (totagexp) as percentage of merchandise exports and as percentage of GDP

Sporadic absolute values of agricultural exports are available in some countries. However, the most reliable value available for each year needed for the dataset is the variable of *food exports as percentage of merchandise exports* and to a lesser degree, the *raw agricultural exports as percentage of merchandise exports*, with the latter measuring primarily cotton that is not accounted for by the former (UN 2006). These two separate variables have also been combined into an aggregate *total agricultural exports as percentage of merchandise exports*. Furthermore, this independent aggregate variable has also been measured in relationship to the *percentage of GDP*.

In addition, the degree the agricultural export sector is dependent on a few commodities is measured by calculating the *value of the top three export commodities as a percentage share of the value of the top 20 export commodities* in any given year (FAO 2006). Stated positively, this variable measures the degree export diversification has taken place.

Arable land (ha) per capita (arabland)

The estimated amount of arable land per capita. Data is available every year and has been calculated. Arable land is defined as "is land under temporary crops (double-cropped areas are counted only once), temporary meadows for mowing or pasture, land under market and kitchen gardens, and land temporarily fallow (less than five years)" (FAO 2006).

Urbanization (urbaniza) and population density (popdensi)

Urbanization is measured as the urban population as a% of total population. Since definitions can vary of what comprises urban areas, some caution should be used (UN 2006). Furthermore, population density has also been used as an alternate measure of population's potential role on inequality.

Before WTO (prewto)

A time dummy has been created to indicate, whether or not the Gini coefficient was before or after the end of the Uruguay round and the creation of the WTO, with a 1 indicating before or in 1994. Beyond attempting to assess the impact of the WTO, it also is aimed at including the aftermath of the structural adjustment programs, which were mostly in their final stages or ended by 1994.

Gross Domestic Product per capita (gdppppca) and LN GDP per capita (loggdpppp)

In order to measure overall development, *GDP per capita, purchasing power parity*, is measured (in international $) (UN 2006). This variable has also been logged in an attempt to reduce the outlier of South Africa.[13]

Furthermore, the variable is also used as a dependent variable (Secondary Hypotheses) in order to test for the relationship between agriculture and development.

[13] Using purchasing power parity, we are able to better compare the relative ability for same amounts of money to purchase a given set of goods across countries.

Infant mortality (infantmo)

Children's infant mortality rate (deaths per 1000 live births) is used as an approximation to indicate primarily human welfare, development, and to a lesser degree human capital. Since the variables are only available in 1980, 1990, 1995, 2000, 2004, the value closest to the respective year was chosen (UN 2006).

Methodology

Two different methods will be employed in this thesis. First, a primarily qualitative case study analysis is undertaken to develop a narrative of the agricultural structure and development history of individual countries, which are not told by the numbers alone. The ten case studies have been chosen in order to represent a diverse, representative sample across the African continent. The chapter will conclude with a comparative analysis.

The quantitative study is undertaken in Chapter 5. It involves the creation of a regression model (enter/stepwise method) aimed at testing the above main hypotheses (Table 3-1). Given that some data points are missing, a separate model has been created replacing them with the mean. Thorough empirical analysis will be undertaken to study whether or not collinearity exists. Normality will be tested, and leverage and outliers will be taken into considerations. The following main model will be tested:

$$\begin{aligned}&\mathrm{Y}(GINI) = \beta_0 + \beta_1(PREWTO) + \beta_2(AGVALUE) + \beta_3(TRADFOOD)\\&+\beta_4(TRADRAW) + \beta_5(LOGGDPPP) + \beta_6(INFANTMO) + \beta_7(URBANIZA) + u\\&,whereby\\&\beta_1(PREWTO) + \beta_2(AGVALUE) + \beta_3(TRADFOOD) + \beta_4(TRADRAW) \cong Agriculture\end{aligned}$$

Figure 3-4. Regression model[14]

[14] PREWTO: Before WTO; AGVALUE: Agriculture, value added (as% of GDP); TRADFOOD: Food exports (% of merchandised exports); TRADRAW: Agricultural Raw exports (% of merchandised exports); LOGGDPPP: LOG of

As such, my study combines both quantitative and qualitative sections in order to better understand the role played by agriculture on inequality in Africa.

GDP ppp per capita (international $) ; INFANTMO: Infant mortality (deaths per 1’000 live births); URBANIZA: urban population (% of total population).

Table 3–1. List of secondary hypotheses

Secondary Hypotheses		
1	1	Countries with higher share of agriculture value added (as% of GDP) have lower GDP per capita ppp;
	2	Countries with higher share of agricultural exports (as% of total merchandise exports) have higher GDP per capita ppp;
2		Countries with more arable land per capita have greater inequality;
3		Countries with greater dependency on a few export crops have greater inequality;
4		Inequality in African countries increased after the WTO agreement in 1994;
5		Countries with higher percentage of urban population have greater inequality.

Table 3-2. Definition of inequality measured

	Frequency*	Percent
Consumption	46	92.0
Consumption / Expenditure	2	4.0
Expenditure	1	2.0
Income, Gross	1	2.0
Total	50	100.0

*Refers to the number of data points

Table 3-3. Sources

	Frequency	Percent
Deininger & Squire, World Bank 2004	34	68.0
James, Arndt, and Simler (2005)	1	2.0
World Bank Poverty Monitoring Database 2002	7	14.0
World Bank, Africa Department	1	2.0
World Bank, World Development Indicators 2004	7	14.0
Total	50	100.0

Table 3-4. Countries

	Frequency	Percent
Western Africa (50%)		
Burkina Faso	2	4.0
Cameroon	2	4.0
Cote d`Ivoire	6	12.0
Ghana	4	8.0
Gambia	4	8.0
Guinea	2	4.0
Nigeria	5	10.0
Eastern Africa (26%)		
Ethiopia	3	6.0
Kenya	3	6.0
Malawi	2	4.0
Tanzania	2	4.0
Uganda	3	6.0
Southern Africa (24%)		
Mozambique	2	4.0
South Africa	2	4.0
Madagascar	4	8.0
Zambia	4	8.0
Total	50	100.0

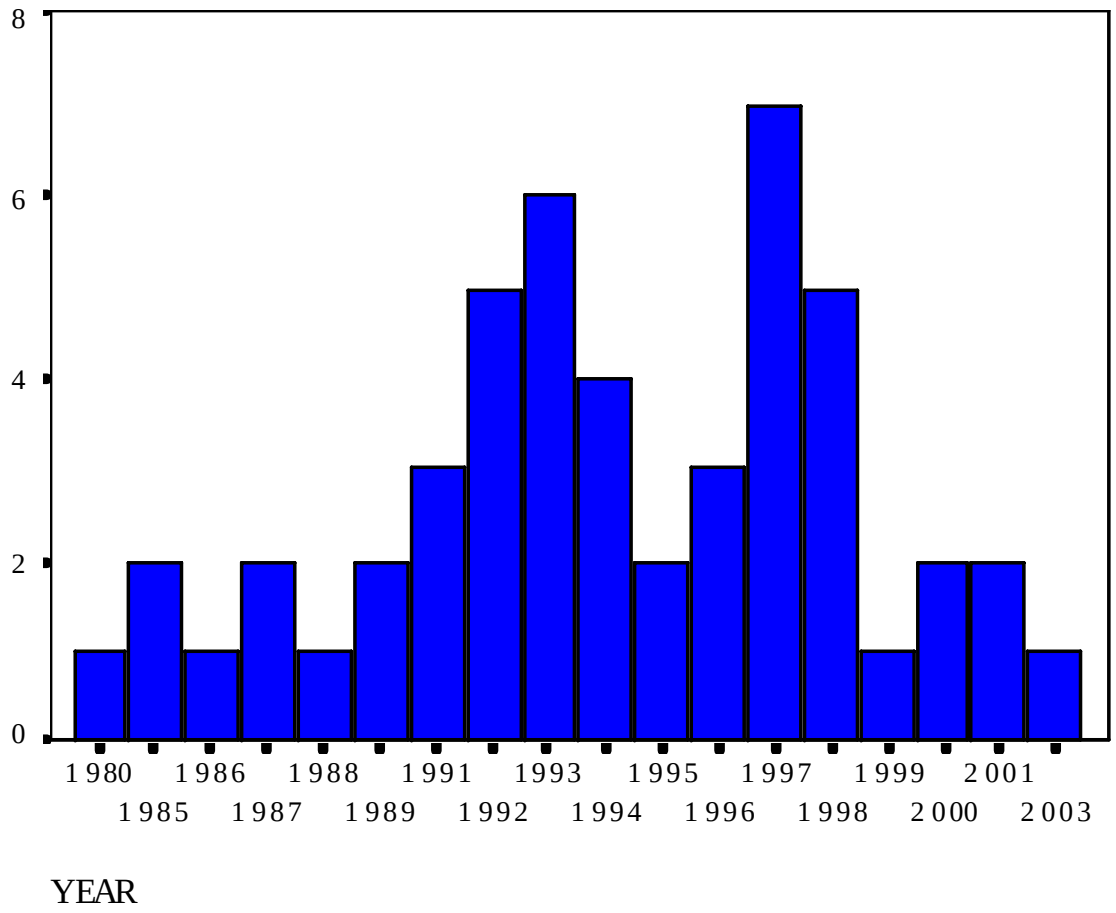

Figure 3-1. Frequency of years of inequality measured

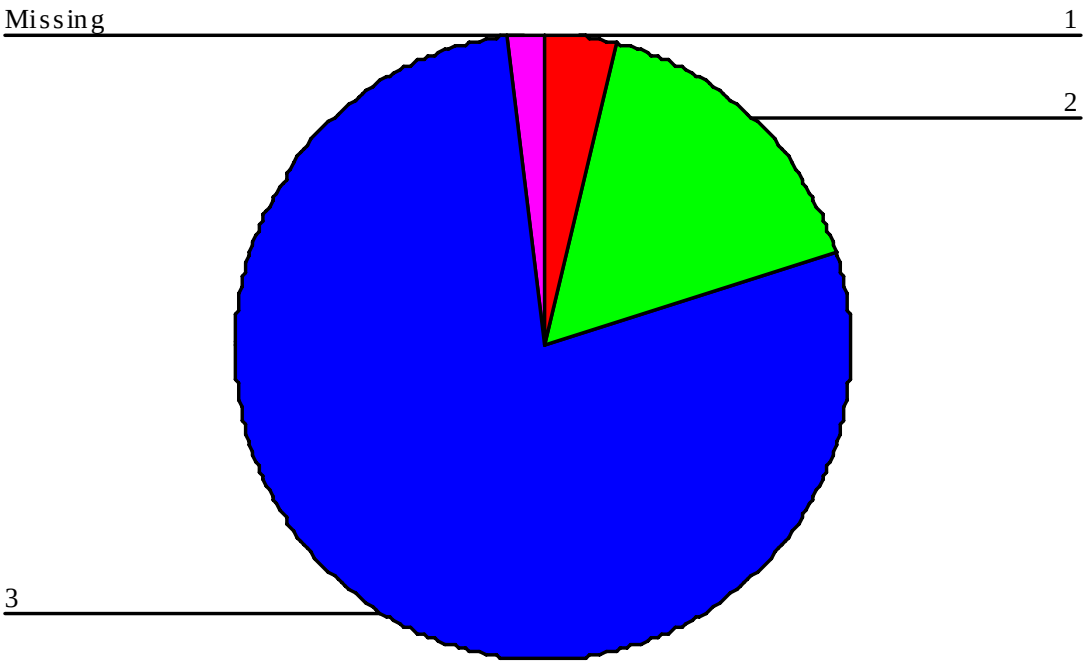

Figure 3-2. Quality of inequality data

Range from 1 -4, with 1 indicating the highest quality, 4 worst. Missing case is from Mozambique.

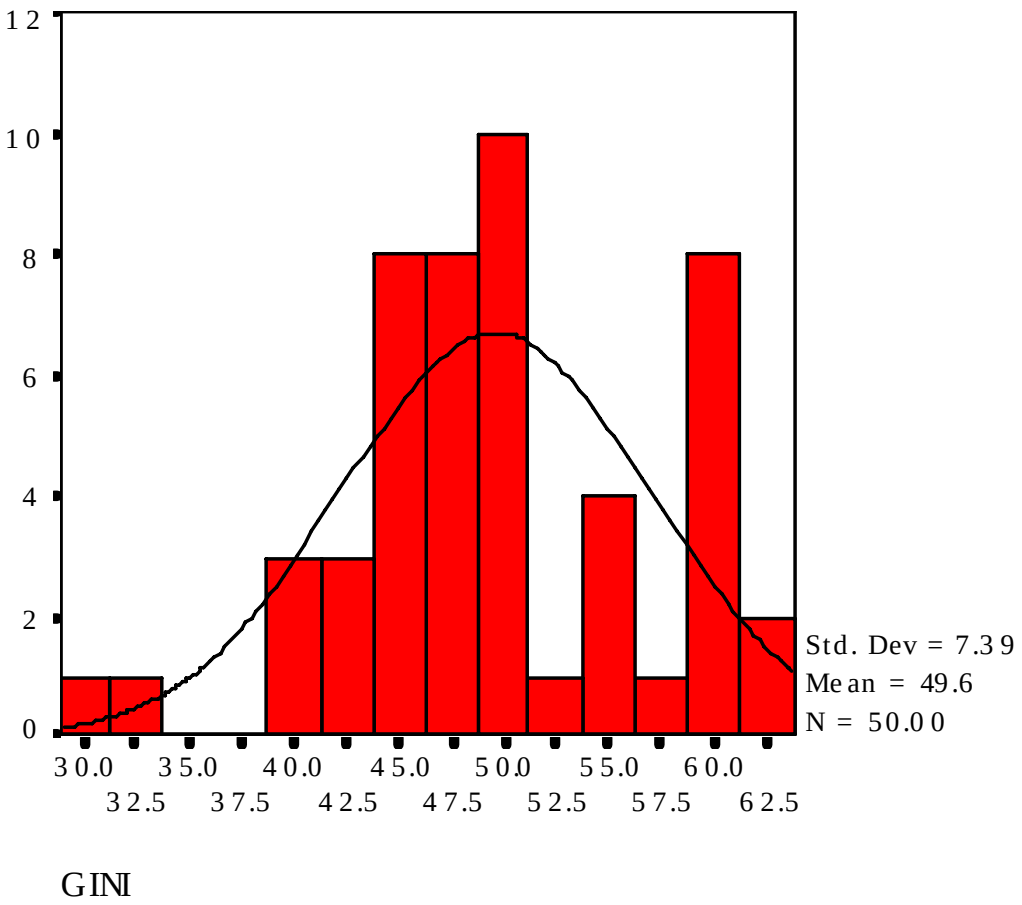

Figure 3-3. Histogram of Gini

CHAPTER 4
DEVELOPMENT AND AGRICULTURAL GROWTH IN SUB-SAHARAN AFRICA

Case Study: Burkina Faso

Burkina Faso is a landlocked West African nation located within the cotton belt and just south of the Sahel region (Bassett 2001, 17). It has experienced considerable growth in GDP since 1990, just above 4% per year, with GDP per capita, adjusted for purchasing power parity (PPP), increasing from constant 2000 US$ 889 in 1990 to 1093 in 2005 (FAO 2006; UN 2006) (Table 4-1 and 4-2 for all data). Similar to its neighboring Sahelian countries, it remains a largely rural agricultural society dependent upon a few major cash crops for export revenues. In 1990, an estimated 92.4% of the total labor force were agricultural workers[15] (Earthtrends 2003). Agriculture's contribution to the Gross Domestic Product (GDP), in terms of value added, increased from 28% in 1990 to 31% in 2005, with the mean averaging at 31.7% from 1990 to 2005 (Table 4-1).

Table 4-1. Summary Burkina Faso

Mean GDP Growth (%)	4.13
Mean Agricultural Exports (% of GDP)	7.41
Mean Agriculture, Value Added (% of GDP)	31.69

Source: World Bank (2005), UN Development Indicators (2006) and FAO (2006)

Similarly, agricultural exports, measured in US$ million, have increased from US$ million 92.10 in 1990 to 313.70 in 2004, a growth of over 340%. The role of agricultural exports, even when adjusted for overall growth in the GDP, has increased, accounting for 5.3% in 1990 to 9.9% in 2004, with a mean for the four years of data available of 7.4%. Given the heavy reliance of most West African agricultural exporters on a few commodities, mostly cotton, considerable fluctuations are in order when taking into context the volatility of the global commodity markets

[15] It is important to note that an estimated three million Burkinabis are migrant laborers who work in Côte d'Ivoire and send home remittances, contributing significantly to the economy (new-agri.co.uk 2006).

(Norton 2004, 56). Burkina Faso's top four export commodities in 1989-1991 accounted for 87%, decreasing to 83.8% in 1999-2001, and recovering to 86.75 and 91.35% in 2003 and 2004 (Table 4-2). As such, the share of the top four commodities seems to follow a similar path as the share of agricultural exports previously analyzed. What follows is that Burkina Faso, similar to its neighboring states, such as Mali, has failed to diversify its agricultural export commodities and holds a large dependence on cash crops similar to most lesser developed nations (LDCs) in sub-Saharan Africa.

In 2004, cotton lint remained the 'king' of these cash crops. Its value totaled over 264 million US$, followed by a distant second, sesame seeds, with 10 million US$. This difference between the overall top two export commodities was vastly smaller in the years 1990 and 2000 when the share of agricultural exports as percentage of the GDP was small as well. As reflected in both 1990 and 2000, cotton's value accumulated to 86 and 75 million US$ respectively, with the second highest export commodity, cattle, averaging more than 7 and 8 million US$ (FAO 2006).

An estimated three million, "mainly subsistence farmers, depend on cotton production for their income whilst a further three million are involved in the industry" (new-agri.co.uk 2006). The average income of such cotton farmers is hovering around $250, which is strongly influenced through the artificially low global agricultural prices depressed by Western agricultural subsidies currently disputed at the WTO (Baffes 2004, 2005; Stiglitz 2006, 85f). Cotton overall is marketed by the parastatal, SOFITEX, with "the cotton company still hold[ing] a monopsony on cotton purchases, but producers acquired 30% of the company's shares in 1999" (Baffes 2004, 13). One of the main reason for the phenomenal growth of cotton, averaging 12% per year from 1995/96 to 2004/05, is the provision of a guaranteed minimum price by the ginners

“one year before selling cotton fiber”, which provides stability to the farmer while allowing profitability for the parastatal (Goreux 2005). Furthermore, in October 2003, the Cotlook ‘A’ Index, which is the world price for high quality cotton used in the West African case, reached a six-year high of US$ 1.55 per kg, significantly boosting production and export revenue (FAO 2004). The value of cotton exports has thus increased dramatically, raising from US$ 103 million in 2002 to US$ 224 million in 2003 and US$ 261 million in 2004 (FAO 2006). However, since 2004 the world prices have declined again, dropping by approximately 25%, showcasing the price volatility in a globalized market distorted by Western export subsidies and China’s vast influence (Cotlook 2007).

Livestock used to be another mainstay of Burkina Faso’s export economy. However, the number of livestock per person appears to have decreased drastically. While Burkina Faso averaged the most sheep and goats per person, with 5.74 head, in sub-Saharan Africa in the early 1980s, the number has dropped now to around one per person by 2004. Cattle, on the other hand, has not experienced the same dramatic drop, as per capita cattle stocks was 0.41 in 2004, compared with 0.40 in 1961 and 0.42 in 1980 (FAO 2006). Overall, export trade in livestock has decreased from 25.2 million US$ in 1980 to 19.7 million US$ by 2002, while total agricultural exports have increased from 79.6 million US$ in 1980 to 271.9 million US$ in 2002 (FAO 2005). Other major cash crops produced that contributed to this growth are groundnuts and sesame. Subsistence crops are sorghum, millet, maize, and rice (new-agri.co.uk 2006).

While this dominance of cotton certainly appears problematic, theoretically increases in cotton production through heavier fertilizer usage can also results in higher yields for other crops due to fertilizer residues. As opposed to much of sub-Saharan Africa, which has failed to increase cereal yields in relationship to per capita growth with production from 1979-81 to 1999-

2001 dropping by 11%, Burkina Faso has increased per capita cereal production by 34% over the same time period. Furthermore, while still resting below the sub-Saharan African average crop yield of 1221 kg per ha, it has also increased its yields by 53% to 880 kg per ha from 1979-81 to 1999-2001 (Earthtrends 2003). Compared to both South America and Asian countries, these yields figures however still are extremely low, with South America averaging 3016 kg per ha and Asia (excluding the Middle East) with 3294 kg per ha (Figure 4-1). The average yields of cereals in 1999-2001 of Burkina Faso pale in comparison to the average yields of a select Asian agricultural exporters, ranging from a low of 2661 kg per ha in Thailand to a high of 4084 kg per ha in Vietnam (Figure 4-1) (FAO 2006). Nevertheless, comparatively more impressively is Burkina Faso's achievement of increasing its per capita food production by around 25% since 1965, which is a significant achievement given the population growth to almost 14 million people by end of 2004 (Table 4-3).

Table 4-3. Burkina Faso, food production per capita index, 1965=100

1965	1970	1975	1980	1985	1990	1991	1992	1993	1994
100.0	97.2	89.9	80.0	101.4	93.1	108.7	110.6	121.3	108.2
1995	1996	1997	1998	1999	2000	2001	2002	2003	
112.2	119.8	104.2	121.3	121.4	99.5	129.9	124.3	127.0	

Source: FAOSTAT (2006)

The reason for that increase in production output, according to Gray and Kevane (2001) rests in a strategy of intensification. They argue that the dominant 'population-degradation' narrative does not hold true for Burkina Faso, as farmers, faced with an increasing pressure of smaller plots of land given the increases in population, have responded through corresponding increases in intensification, à la Boserup. Consequently, they find that farmers in the southwestern 'cotton zone' in Burkina Faso, living in "the *more* densely populated village has *more* intensive production practices, [… and] farmers are making changes in their management strategies that result in improved soil quality" (Gray and Kevane 2001, 574). The village with

dense population showed "that fertilizer use was in general very high; it was applied to 65% of all fields [… while m]anure use was lower [with] only 20% of fields were manured" (Gray and Kevane 2001, 578).

As a matter of fact, fertilizer usage intensity, measured in kg per hectare of cropland, was above the sub-Saharan African average in 1999 of 12 kg/ha, reaching a high of 15 kg/ha (Earthtrends 2003). While farmers overall appear to have responded, there however also diverging response paths, with wealthier farmers being able to better secure land tenure rights than poorer farmers, widening the income gap to be analyzed in the later chapters (Reardon and Tayler 1996; Gray and Kevane 2001). It however is important to keep in mind that Gray and Kevane's study focused on three villages in the heart of Burkina Faso's southwestern cotton zone during the 1995-96 agricultural season (Gray and Kevane 2001). While providing us with a narrative of inequality in that area, it is important to point out that the following inequality analysis, by taking place at the national level, will be insensitive to any regional differentiation, and thus their case study can only provide a glimpse into the complexities measured by the Gini coefficient.

Case Study: Côte d'Ivoire

Côte d'Ivoire, a densely populated West African nation of over 18 million people, is named after the thriving trade of ivory in the 17th century which attracted European traders and ultimately its French colonizers (Britannica 2006). Consequently, it enjoys a situational advantage compared to its northern neighbors by having access to the Atlantic Ocean, as well as a less arid climate. The southern region of Côte d'Ivoire is dominated by cocoa beans, with total production accounting for an estimated 37% in 2004 and 40% in 2003 of total global export value of cocoa beans (FAO 2006). While overall exports were relatively low, with 332,000

metric tons in 1980 compared to the second largest exporter of cocoa beans, Ghana, it has increased to more than 1.2 million metric tons by 2003 (World Bank 2005). Its northern, more arid region, however, similarly to the southern regions of Burkina Faso, is part of the West African cotton belt, with the largest political regions (departments) being Korhogo, Mankono, Boundiali, and Ferkessedougou. As of 1995-96, these regions themselves accounted for approximately 60 to 70% of overall cotton production in the country (Bassett 2001, 16). While cotton has also been considered an agricultural 'success story' in that country, the country has experienced disappointing economic growth over the past decade compared to Burkina Faso and currently is embroiled in a low level civil war. The major exception to this narrative of economic decline is for the years following the 50% currency devaluation in 1994 by the West African franc (FCFA), as pressured for by the International Monetary Fund (IMF) and the former colonial power, France, temporarily reviving economic growth (Bassett 2001, 148). GDP has increased by only 1.4% per year on average since 1990. Of the 16 years measured, only seven years reported positive growth figures (1994-1999, 2004), with the other nine experiencing negative or zero growth. Consequently, its GDP per capita, as adjusted for purchasing power parity (PPP), decreased from constant 2000 US$ 1807 in 1990 to US$ 1401 in 2005 (Table 4-4 and 4-5 for the data).

Table 4-4. Summary Côte d'Ivoire

Mean GDP Growth (%)	1.44
Mean Agricultural Exports (% of GDP)	25.60
Mean Agriculture, Value Added (% of GDP)	25.69

Source: World Bank (2005), UN Development Indicators (2006) and FAO (2006)

While the agricultural sector is largely dependent upon a few major cash crops for export revenues, with cotton leading the way, its division of labor appears to be diversified compared to

its neighbors, as only an estimated 59.9% of the total labor force were agricultural workers in 1990 (Earthtrends 2003). In comparison to Burkina Faso, these sixty% interestingly account for a similar share of total value added of agriculture, 26%. Furthermore, the mean contribution of the agricultural exports to the GDP are significantly higher, 25.6%, compared to 7.4% in Burkina Faso, reflecting agriculture's importance as a main source of foreign currency. Especially in recent years, when there have been incentives for smaller farmers to grow cotton in Côte d'Ivoire, these export earnings were growing rapidly. Agricultural exports, measured in US$ million, have increased by 87% from $1.65 billion in 1990 to $3.09 billion in 2004. The role of agricultural exports, even when adjusted for overall changes in the GDP, has grown substantially, from 19.9% in 1990 to over 30% by 2003 and 2004, with a mean increase of 26% over the four years measured. However, as opposed to Burkina Faso's high dependence upon four export commodities, averaging around 90%, Côte d'Ivoire's top four agricultural export commodities averaged around 70% of all agricultural exports, with a high of 76% from 1989-1991 to a low of 69% in 2004[16] (Table 4-5).

From an overall agricultural production standpoint, Côte d'Ivoire has been able to increase its per capita production of cereals (as measured in tons per person) since 1979-81 to 1999-2001 by 15%. This is a significant increase in contrast to the overall decline in per capita cereals production sub-Saharan Africa of 11% to 135 tons per person in 1999-2001. Compared to Burkina Faso, its actual average cereal yields are above those of the sub-Saharan African

[16] These contrasts are sometimes not as stark when focusing on the top 3 of the top 20 export commodities for a given year. In 1998, for example, cotton lint, cattle and green beans accounted for 89% of total value of the top 20 exports in Burkina Faso. In Côte d'Ivoire, on the other hand, cocoa beans, green coffee and cocoa paste also accounted for about 86% in 1998. However, only three years earlier, cocoa beans, green coffee and cotton lint accounted for *only* 57% of the total share of exports of the top 20 commodities. While both cocoa or cotton dominate the value share of the top 3 export commodities over the past decade, there appears considerable fluctuations in their share depending heavily upon their value (market price), environmental impacts (droughts), and overall planting decisions made by the mostly small-scale farmers of Cote d'Ivoire. These factors clearly reach across scales, from the international to the local.

average of 1221 kg per ha, with 1307 kg per ha, an increase by 51% in its yields since 1979-1981 (Earthtrends 2003). Correspondingly, while average fertilizer use intensity, measured in kg/ha, declined from 11.87 kg/ha in 1979-81 to 10.23 kg/ha, it has reached an estimated new historic heights with 16.4 kg/ha in 1997 and 15.8 kg/ha in 2002 (FAO 2006). According to the FAO Food Production Index per capita estimates, Côte d'Ivoire has increased its levels by around 10% since 1965, with as high as 121.7 in 2000. Interestingly, as opposed to Burkina Faso, Côte d'Ivoire never experienced a drop below 100, which appears to indicate a relatively stable supply for food production over the past 40 years (Table 4-6).

Table 4-6. Côte d'Ivoire, food production per capita index, 1965=100

1965	1970	1975	1980	1985	1990	1991	1992	1993	1994
100.0	102.9	124.7	113.2	109.5	108.2	106.6	105.4	103.8	102.7
1995	1996	1997	1998	1999	2000	2001	2002	2003	
113.7	119.5	116.9	116.0	119.5	121.7	116.8	114.1	109.5	

Source: FAOSTAT (2006)

Overall, Côte d'Ivoire is clearly part of the cotton belt, but has a more diversified agricultural export base. Besides cotton in the northern region[17], there has been a "dramatic increase in coffee and cocoa production […] between 1950 and 1990" through agricultural extensification (Bassett 2001, 9). According to Bassett, these two cash crops, however, have had significantly lower yields than the international average, around 300-450 kg/ha, and the subsequent expansion "in total output of these two mainstays of the Ivorian economy has historically been the result of pioneer agriculturalists establishing new plantations in sparsely settled areas of the tropical rainforest" (ibid., 9).

[17] Interestingly, the reason for farmers in the north growing cotton despite bad financial conditions often result from the lack of a profitable alternative cash crop, especially since no other crops have received as much support and attention.

This path of extensification production runs counter to the intensification approach taken with cotton production. According to Bassett, observing the astonishing growths of yields by an average of more than 4% per year from 1965 – 84, he confidently concludes that there is ample evidence to label this achievement a "cotton revolution" and one of the few agricultural success stories in sub-Saharan Africa (ibid., 9). In the past decade, there have been many dynamic changes in the cotton sector, including privatization of the cotton sector, a devaluation of the currency, the FCFA, introduction of new, unsatisfactory cotton varieties (GL7), and a recent recovery of producer prices. While some prominent agricultural economists and political scientists perceive poor and illiterate farmers as incapable of having their voices heard and influencing their fates, farmers in the Ivory Coast have used diverse coping strategies. Not only did they use both diversification and extensification strategies in the face of decreasing terms of trade and profit margins, they also "exerted pressure through their individual farm management decisions as well as through their organizations" (Bassett 2001, 173). While the fate of the producers under the newly privatized system in the new millennium is unclear[18], it seems evident that the prior monopolistic *Compagnie francaise pour le development des fibres textiles* (CFDT) system that existed since 1949 and cooperated with the local agricultural service of Côte d'Ivoire (IRCT) and the established *Compagnie ivorien pour le développement des fibres textiles* (CIDT) was very successful in providing the Ivorian cotton farmers with (subsidized) input packages and guaranteed purchasing prices, while garnering all the profits as the sole buyer "from controlling the ginning and sale of cotton" (Bassett 2001, 176). Nevertheless, they did not

[18] The CFDT system has undergone restructuring throughout the past decades, was renamed DAGRIS in 2001 and has currently undergone privatization, as of 2006, as the French government sold its majority shares in the company (UNCTAD 2006). Furthermore, the parastatal CIDT was taken over by three other companies in 1998: "*Ivoire Coton* (northwest block), owned by IPS of the AgaKhan group; *Compagnie Cotonniere* (northeast block), owned by the Aiglon, a Swiss company; and *Nouvelle CIDT*" (USDA 2002).

succeed in improving these rural livelihoods, as "incomes in real terms steadily declined over the period 1970-94 and that cotton growers received a relatively small share of the market value of their crop" (Bassett 2001, 180). By 1998, several private companies have built cotton gins, and due to better seed prices, yields and rainfall, record growth seasons have been achieved, and a "new cotton boom" seemed to have taken place (Bassett 2001, 181). However, in the last few years, this apparent boom appears to have cooled down according to the latest FAO statistics, which show that the quantity of cotton seed produced dropped from a high of 220,000 tons in 2000 to a low of 161,000 tons by 2004, with a simultaneous drop in the area under cultivation from 330,000 ha to 206,360 ha in 2004 (FAO 2006).

Unfortunately, the main export commodity, cocoa, has experienced a similar 'bust', being affected by the current state of political turmoil in Côte d'Ivoire, as well as one of its underlining causes (Woods 2003; Kurti 2005). As argued by Woods (2003), Côte d'Ivoire's property rights regime has been a major cause of the recent ethnic conflict and civil war there, as the *tutorat* has been put in place, which is an institution that decides over access to land by immigrants (Chauveau 2003; Richards 2004, 15). According to Woods, it "encouraged a rent-seeking process that shifted social and political interactions from a relatively peaceful dynamic to a more conflictual one, as the rent derived from the exploitation of tropical forest land declined" (Woods 2003, 642). With decreasing availability of forest land to be cleared, the so-called "forest rent", benefits accrued from planting cocoa trees, diminished and became increasingly difficult to obtain. Consequently, by 1998, the 1967 decree dating back to the rule of Felix Houphouet-Boigny stating that "land belongs to the person who cultivates it" with its aim at spurring cultivation, was replaced with a law enforced by the current Gbagbo government giving priority of access to "traditional, ancestral land rights" (Kurti 2005). Ultimately, as not to lose political

support, the current administration failed to address the property rights issues, rather blaming foreigners and Muslim Northerners for the weak economy and lack of available land, resulting in the "north rebelling and the onset of a civil war" (Woods 2003, 14). The Gbagbo government has consequently seeded the 'venomous flowers of Ivoirite', according to Lemarchand, a murderous "ideology which calls into question the citizenship rights of perhaps as many as three million long-time Ivoirian residents of foreign extraction" (Lemarchand 2003, 21). While the conflict, involving the rebel parties in the North and the government in the South is certainly more complex than only resolving around cocoa land, it seems clear that agriculture plays a large role. Richards goes so far as proposing that the reason for the popularity of the rebel forces found in West Africa rests on their attempt at instituting an agrarian reform against the village elders and political elites, which have exploited the poor, landless and uneducated for their labor and services for centuries (Richards 2004, 15f). He cites the case of a young RUF commander, who created a "rural farm development programme after demobilization for 60 former comrades and over 600 villagers" with the ultimate aim of creating a "mass movement for agrarian change" (Richards 2004, 16).

While the ultimate outcome of the civil war is yet to be determined, an analysis of changes in total production, as measured in 1'000 tonnes, from 2001 to 2002 and 2001 to 2003 indicate that out of the 60 total commodities reported by the FAO, only 14 in 2002 and 21 in 2003 have declined in production compared to 2001. Since the civil unrest has been ongoing over the past ten years below the surface, these figures might not correctly capture the full effect the civil war had on agriculture (FAO 2006). As a matter of fact, both cotton and cocoa

production seems to have recovered in the last years again, and out of the main cash crops, only coffee and to a lesser case pineapples, have experienced a continuous decline[19] (Table 4-7).

Table 4-7. Production in Côte d'Ivoire 1999-2005 of commodities facing declines since 2001

Production (1'000 mts)	1999	2000	2001	2002	2003	2004	2005	2002 <2001	2003 <2001
Avocados	2.1	2	1.5	1.2	1	1.05	1	1	1
Cassava (fresh and dried)	1,681	2,100	2,087	2,074	2,060	2,128	2,198	1	1
Coffee, green	307	336	209	182	140	154	96	1	1
Cucumbers and gherkins	29.36	27.22	25.64	24.99	17.35	17.92	18.52	1	1
Large Pelagic fish	28.93	33.68	33.01	23.1	21.3	21.3	21.3	1	1
Millet	65	75.8	73	70	45	60	60	1	1
Molluscs (excl. cephalopods)	0.08	0.05	0.08	0	0	0	0	1	1
Nuts, nec	80.2	80.22	85.72	83.07	66.94	74.52	83.09	1	1
Pineapples	257	268.2	284.82	271.92	242.23	248.99	194.5	1	1
Sheep and goat meat	10.51	9.49	9.61	9.43	9.03	9.43	9.28	1	1

Source: FAOSTAT (2006)

Case Study: Ghana

Half a decade after having gained independence as the first African nation, Ghana continues to present itself as one of the economic and political success stories in Africa and optimism for its future prevails. Fifty years after the revered first leader of independent Ghana, Kwame Nkrumah, called for pan-Africanism, Ghana has emerged as one of the leaders on the African continent, hosting the 2007 meeting of the African Union (AU) "dedicated to one sole agenda item – the AU's "Study on an AU Government: Towards a United States of Africa" (Wanyeki 2007).

[19] Nevertheless, a clear drop in the FPI can be identified post-2002.

Table 4-8. Summary Ghana

Mean GDP Growth (%)	4.44
Mean Agricultural Exports (% of GDP)	15.27
Mean Agriculture, Value Added (% of GDP)	38.69

Source: World Bank (2005), UN Development Indicators (2006) and FAO (2006)

Compared to its neighboring countries of Burkina Faso in the North, Togo to the East and Cote d'Ivoire to the West, Ghana has achieved astonishingly consistent high rates of growth over the last two decades, with a mean GDP growth of 4.44% from 1990 to 2005, and relatively low population growth rates of 2.05% in 2005 (Table 4-8 and 4-9). Agriculture continues to be the largest contributor towards the GDP, as measured in value added, contributing 39% by 2005 (UN 2006). For 22 million people of Ghana, agriculture continues to be the main source of income, as an estimated 56% of the labor force are partaking in agriculture in 2004, a figure that is similar to Cote d'Ivoire, but very low compared to their northern neighbor of Burkina Faso (FAO 2006). While gold has risen to the top of the country's source of foreign exchange, aptly named 'Gold Coast', agricultural exports account for over 15%, with slightly higher figures identified for 2003 and 2004 with 18.19% and 20.09% respectively (Table 4-8). Ghana consequently represents an African nation that has achieved a sustainable economic transformation, including development of the manufacturing sector without neglecting the agricultural sector. According to Stiglitz, this success was aided by new political leadership in the 1990s that was more receptive "to pursuing good economic policies", including investment promotions and the creation of one of the world's most profitable stock market (Stiglitz 2006, 41; Moss 2007, 231). This dynamic, mostly liberal, strategy has resulted in one of the highest GDP per capita, PPP, of sub-Saharan Africa of a non-oil exporting nation, growing from 1589.10 US$ in 1990 to 2149.00 US$ in 2005, an increase of over 35% over these 15 years (UN 2006).

One of the main reasons for the economic success is Ghana's ability to slowly reduce the trap of dependence on global price volatilities experienced in other African nations. Historically, cocoa beans, butter and paste have been the three main agricultural export commodities, accounting for example in 1987 for 97% of the top 20 export commodities' value (FAO 2006). Cocoa, one of the world's most important tree crop, was introduced in Ghana during the late 19th century and experienced a rapid growth (Edwin and Masters 2005, 491). Prior to independence in 1957, cocoa accounted for "more than 70% of the country's export earnings" from 1900 to 1950 and became the world's leading exporter by 1910 holding 30 – 40% of the global market share (Konandu-Agyemang and Adanu 2003, 516; Edwin and Masters 2005, 491). Observing the top four agricultural exports in 1989-1991, the dependence within the agricultural sector is equally dramatic with 96.09%. However, starting in 2000 a considerable can be observed, with the share of the top four agricultural exports slowly decreasing from 86.60% in 2000 to 85.77% in 2003 and 83.30% in 2004 (Table 4-9). As a matter of fact, by 1998, pineapples has risen into the top three commodities exported, gaining a value of 11.7 million US$. This reflects Ghana's leading efforts in nontraditional exports under the ongoing structural adjustment programs, "reduc[ing] the vulnerability of the economy by diversifying the sources of export earnings, but also engendering participation in the export trade by regions that have been traditionally left behind" (Konandu-Agyemang and Adanu 2003, 513). By 2000, cocoa itself accounted only for 22.5% of Ghana's overall exports, with minerals, mostly gold and to a lesser extent diamonds, accounting for 40%, and timber, the third main export, ranging at 9.0%. Nontraditional exports (NTE), on the other hand, have grown to 13.6% of total exports (Konandu-Agyemang and Adanu 2003, 517). It is important to note that cocoa production however has not experienced a 'bust' (Table 4-10). While it has declined in the 1970s and early 80s, in 1984, numerous

“economic reforms, including regularly increasing farm gate prices, spurred a recovery” and production level, thanks to improved genetic varieties and continued fertilizer usage, have recovered (Edwin and Masters 2005, 491).

The range of NTEs is wide and large, mostly horticultural products, including “pineapples, flowers, and bananas to wood products such as carvings, coffins, and wodden poles” (Konandu-Agyemang and Adanu 2003, 519). Beyond these more ‘traditional’ exports, they also include the increased trade in items that previously were assumed to hold no value, such as “cocoa waste, orange peels, and cornhusks”, as well as reptiles (Konandu-Agyemang and Adanu 2003, 519). The latter appears to be by far the most exotic commodity traded, yet possibly also one of the fastest growing. By 1999, exports of around 7’000 adult and 30’000 baby pythons amounted to annual export earnings of 1.4 US$ million (Konandu-Agyemang and Adanu 2003, 519-520). In summary, Ghana appears to be well on its way to transition from its trinity exports of cocoa, minerals and timber, towards a more diversified and dynamic economy.

While poverty rates are as high as 90% in parts of the northern and central area of Ghana, the country has secured continued international support, including a US$ 547 million “anti-poverty Compact” from the US Millennium Challenge Corporation (MCC) in 2006 (MCC 2006). Divided into three sectors of agriculture, transportation and rural development, the key is to “alleviate the poverty of over 230,000 Ghanaians and to enhance the livelihood and welfare of one million Ghanaians in total” (MCC 2006). Since clear spillovers exist for each section, farming receives a total of US$ 241 million, with an emphasis to provide training for further commercialization, irrigation improvements, increased processing and access to credit (MCC 2006). Consequently, Ghana appears well on the road towards continued strong and hopefully equal growth.

Case Study: Senegal

Located at the Western tip of sub-Saharan Africa facing the Atlantic Ocean, Senegal, reaching independence from France in 1960, is well known as one of the most stable democracies in Africa. Since 2000, the forty year majority rule of the socialist government has ended and Senegal's opposition leader, President Abdoulaye Wade was elected, ending a four term rule from 1981 to 2000 by former President Abdou Diouf (CIA 2007). As of March 2007, the eight-plus year old Wade was re-elected as president in what was termed a (relatively) free and fair election (IRIN 2007).

Table 4-11. Summary Senegal

Mean GDP Growth (%)	3.38
Mean Agricultural Exports (% of GDP)	4.36
Mean Agriculture, Value Added (% of GDP)	52.88

Source: World Bank (2005), UN Development Indicators (2006) and FAO (2006)

Overall, agricultural performance has been declared to be in a state of crisis by the government over the 1970s and 80s, as "[agricultural] growth has not exceeded the population growth rate" (Government of Senegal 1994). Comparing agricultural cereal per capita production has continued to drop, as they decreased by 27% from 1979-81 to 1999-2001 to 113 tons per person (Earthtrends 2003). Senegal overall continues to experience very high population growth, with the average growth figure ranging from a high of 2.89% in 1989-1991 to a low of 2.36% in 2005, decreasing every year slightly. However, overall population increase is very large, with a growth of almost 50% over the past 15 years, from around 8 million in 1990 to more than 11.5 millions in 2005. Starting with a series of liberalization and structural adjustment efforts in 1980 and throughout the next two decades, Senegal has enjoyed an increase in GDP per capita (PPP) over the last 15 years from around 1,400 US$ in 1989-1991 to 1615 US$ in

2005 (Table 4-11 and 4-12 for all data). While some years were lower, such as 2002, from 2000 to 2005, five out of the six years experienced GDP growth that was greater than population growth.

The role of the agricultural sector in comparison to the GDP appears to have decreased slightly, from 19.45 in 1989-1991 to around 18% in 2005 as measured in terms of value added. Correspondingly, agricultural exports have decreased significantly from 5.67% in 1989-1991 to 3.47% in 2004 in relationship to the GDP. Most significantly and telling has been the decline in the share of the top four commodities of all agricultural exports, as measured in value. While they averaged 81.80% in 1989-1991, the share has decreased to only 56.5% by 2004, representing a major overall shift in agricultural production in Senegal.

The colonial government in Senegal was very successful in rapidly pushing for a "transformation of a subsistence economy into an export-oriented, cash crop economy" (Kelly et al. 1996, 12). The main cash crop that was promoted was peanuts in combination with a subsistence crop of millet or sorghum, with the governmental aid of "provision of inputs and credit, import of rice from Asia, and guaranteed purchasing of cash crops" (ibid., 12). This policy of agricultural support continued into the post-colonial era, with the government taking gradually over the former "French trading houses with a government peanut and input marketing parastatal" (ibid., 13). This indirect subsidy program by the government worked for periods of strong international price for peanuts and good yields, however faltered as farmers experienced increasing droughts and were unable to pay back their credits. As the fiscal deficit accumulated by the government through its control of the agricultural market became increasingly unsustainable, it began to institute structural adjustment programs for the agricultural sector in 1980 under the pressure of major international donors and international organizations, notably

the IMF, WB, US and France. The ultimate aim of these policies were to "curtail direct government involvement in the agricultural sector" and to "eliminate government subsidies and taxes to the greatest extent possible" (ibid., 18). While some private actors have entered the market, it has overall enjoyed a reduction in overall fertilizer usage, as credit and subsidy programs were no longer in place, and stagnating yields from 1960 until 1990. However, since 1979-81, average crop yields appear to have increased again by 24% to 854 kg per ha, still around 1/3 lower than the sub-Saharan average (Earthtrends 2003). While the Food Production Index per capita (Table 4-13) appears to have some serious data issues (as seen in the base year of 1965 and 1975), it has remained stagnant and not improved over the past forty years, but rather decreased, as seen in the drop in 2002 (FAO 2006). Upon closer investigation, the 2002 agricultural season experienced a prolonged "dry spell", a 7% lower cereal output compared to 2001, "with a particularly sharp fall of millet" by 21.7%, and subsequent dramatic increases in price for that crop[20] (FAO 2002). Similarly, farmers had increasing difficulty obtaining access to fertilizer, as a restriction has been put in place that only farmers "with a 100% repayment record are eligible to further credit for inputs (seed and fertilizer)" (FAO 2002). Overall, the government of Senegal is still reluctant to fully liberalize its markets, as it continues to set producer prices and applies "high tariffs on processed groundnuts [20%] to encourage domestic processing or oil production" (Diop, Beghin, and Sewadeh 2005, 227).

In terms of export commodities, groundnuts (oil and/or cake) still account usually for the largest share of all exports, however no longer hold the top share as measured in value in recent years. In 1995, the top 3 commodities, oil of groundnuts, cotton lint and Arabic gum, accounted for approximately 80% of the top 20 export values. Prior to 2000, an estimated one million

[20] Yield drops were even more dramatic for other food crops, such as rice (54%), maize (45%) and sorghum (34%), with the first two known to be the most sensitive to irregular rainfall (FAO 2002).

people, about ten% of the total population, was believed to be engaged in groundnut processing and farming, contributing "about 2% of [GDP] and 9% of exports in Senegal" (Beghin et al. 2003, 4). By 2000, oil of groundnuts, oil of palm and cake of groundnuts were the three export commodities that accounted for only 67% of the top 20 export values. Finally, by 2004, cotton lint was the most valuable export commodity, netting 29 millions US$, with oil of groundnuts and prepared food accounting for second and third respectively. Overall, by 2004, these top 3 export commodities accounted only for 50% of the top 30 export values' share (FAO 2006). In summary, while maintaining around the same share of agricultural output, it appears that Senegalese farmers have undertaken the important step of diversifying their production away from groundnuts, one of the rare cash commodities experiencing lower volatility yet long-term, recently rapid price declines, and Senegal's prime export of groundnut oil, which is increasingly being replaced by cheaper vegetable oils (Beghin et al. 2003; Diop, Beghin, and Sewadeh 2005).

Case Study: Ethiopia

Unfortunately, when depicting Ethiopia, one quickly is tempted to denounce it as a country of over 70 million people ravaged by constant hunger, omnipresent food insecurity and overwhelming famines. Marked by 15 major famines over the hundred years before the epic famine in the mid-1980s that caused the deaths of over half a million people, Ethiopia "has become synonymous with crisis" (Block and Webb 2001, 335). Given this dominant, dramatic narrative of famine in Ethiopia, it should be very interesting to take a closer look at its agricultural production and developmental figures since the 1990s, especially in comparison to other sub-Saharan African nations.

Located in the horn of Africa, Ethiopia has been left landlocked since 1993 in the aftermath of its violent conflict with Eritrea. As a matter of fact, this ongoing struggle only intensified the problems encountered of starvation, highlighting the political dimensions of food

insecurity, as it has cost as many as 50,000 lives and resulted in deteriorating conditions of food security in the border region (White 2005). While the recent conflict with Somali Islamist forces appears (or at least appeared) to be under control, as the Islamist fighters have fled the capital city of Mogadishu and the Somalia's interim government took over, it nevertheless indicates the constant political insecurity faced within the region, worsening people's lives and the country's overall development (BBC 2007).

Table 4-14. Summary Ethiopia

Mean GDP Growth (%)	3.38
Mean Agricultural Exports (% of GDP)	4.44
Mean Agriculture, Value Added (% of GDP)	52.88

Source: World Bank (2005), UN Development Indicators (2006) and FAO (2006)

This development of the country, as measured by the average GDP growth from 1990 – 2005, has been better than one could expect, with an average growth of 3.38%. However, hidden in that figure is the fact that the economy has grown at tremendous swings, as the GDP for example dropped by 11% in 1992, only to 'rise from the ashes' with a growth of 13% the next year in 1993, likely reflecting the granting of independence to Eritrea, ending several years of strive. In a similar fashion, 2002 and 2003 witnessed zero or negative GDP growth, with a vast rebound to 12% by 2004. This is likely related to the complex 2002-2003 famine, which slowed down the economy. After a bumper harvest in 2001-2002, prices dropped rapidly and several farmers reported a net loss that did not cover their expenses. Consequently, the following year, in order to mitigate losses and costs of labor, several farmers reduced seed, fertilizer, fuel and planting acreages. However, as a drought hit Ethiopia that next year, yields dropped dramatically and a dramatic food shortage become evident (Thurow 2003). As reflected in the agriculture value added figures for these years, it actually increased from the 2002 to the 2003

season by 2%, with agricultural exports reaching a high of 450 million US$ in 2003, indicating that plenty of food was exported. According to Thurow and Kilman, what took place was the perverse situation where US aid policy, opposing the purchasing of local food during famines in favor of flooding markets with US grain, made the situation worse as "American food traveled on roads that ran right past local warehouses filled with the 2002 Ethiopian harvest" (Thurow and Kilman 2005, 2).

It is important to note that even with 2001-2002 being a year with a bumper harvest, it is counted as a year where there was significant shortage of rain, indicating an incidence of drought, according to the World Bank (Table 4-16). An analysis of the variable however indicates that it is, as acknowledged by the World Bank, "the only indicator […] based on subjective considerations" (World Bank 2005, 242). A 'D' consequently was "assigned to a country if a significant shortage of rain unfavorably affected its agricultural production" (ibid., 242). While this variable attempts to take into considerations the regional differences, it is clear that given the size of Ethiopia, this subjectivity might be stressed greater than at other countries. Nevertheless, out of all mainland sub-Saharan African countries, Ethiopia experienced by far the most droughts from 1980 – 2004, with 15 years, followed by Zambia with 11 years of droughts that negatively affected its agricultural production. Thus, these figures appear to confirm the dominant narrative surrounding Ethiopia's crises (ibid., 240). However, as seen in the Food Production per capita index for Ethiopia (Table 4-15), the patterns are far more complex, as significant deviations in terms of food security appear to exist between the droughts. As a matter of fact, the index appears to have climbed up to a record high in 2002, while dropping slightly in 2003, both being drought years. Given the political dimensions of Ethiopia and the fact that data was not available prior to 1993, these figures should be evaluated with great caution.

Table 4-15. Ethiopia, food production per capita index, 1993=100

1993	1994	1995	1996	1997	1998
100.0	97.1	104.9	118.2	115.7	106.7
1999	2000	2001	2002	2003	
110.5	113.2	121.5	122.0	114.6	

Source: FAOSTAT (2006)

The main solution proposed by international actors to such a crisis is often through an increase in food supply, with soil depletion named a major reason for poor yields. As a matter of fact, per capita production (tons per person) of cereals has dropped by 14% since 1979-1981 to 1999-2001. Furthermore, average crop yields (kg per ha) have declined by 2% over the same time period to 1164 kg per ha, which is not only below the sub-Saharan average, but also 11% worse than the overall performance in the region, and 43% worse than the world (Earthtrends 2003)! Thus, an increase in fertilizer usage has generally been advocated as a popular approach towards amending these insecurities (Kristof 2005). While the most recent FAO statistics only show fertilizer usage until 2002, they have increased from a low of 7.2 kg per ha in 1993 to 14.1 kg per ha in 2002, with an estimated high of 16.9 kg per ha in 1996. The main applications of fertilizer in Ethiopia are maize, teff and coffee (Camara and Heinemann 2006, 10). Taking into consideration that 33 African nations' fertilizer intensity usage rests below 10 kg per ha, Ethiopia's current usage is actually relatively high.

Taking into account that agricultural exports account for approximately 90% of all exports in Ethiopia, the sector's overall export performance of agriculture as percentage of GDP is extremely low ranging from 3.70% from 1999-2001 and increasingly slightly to 5.48% in 2003 and 4.12% in 2004, with each of those years affected by droughts (INTRACEN 2001). The overall agricultural exports, measured in millions US$, follow a similar pattern, as agricultural exports ranged from 290 million US$ in 1999-2001 to 450 million US$ in 2003. Aggregate share of the top four agricultural exports of total exports similarly have decreased lately from a

high of 84.14% in 1989-91 to a low of 71.39% in 2004, indicating a possible trend in agricultural production. However, upon closer observation it becomes evident that Ethiopia continues to be heavily dominated by one major cash crop commodity: coffee. An estimated 1.2 million coffee farmers, mostly small-holders working on less than half an acre of land, and over 15 million households are either "indirectly or directly dependent on coffee for their livelihoods" (Oxfam 2002). Measured in export value, coffee accounted for 70.8% of the top 20 agricultural exports in 1995, 77.7% in 1997 and 76.4% in 2000 (FAO 2006). Since 2000, Ethiopia has ranked amongst the top 15 exporters of green coffee, with the crop accounting around 55% of all agricultural exports in 2003 and 2004 (FAO 2006).

The second largest cash crop, sesame seeds, appears to have risen relatively quickly in comparison to coffee exports, as indicated in Figure 4-3 below.[21] What's astonishing is that even though sesame seeds exports have increased rapidly, coffee exports actually have not dropped, but rather increased over the past years. The lower export values are consequently attributed not to a decline in coffee production, but rather a drastic drop in producer prices over the past years in coffee (Figure 4-2). While both commodities have experienced severe declines, coffee's producer prices have declined by approximately 40% over the span of four years from 2000 until 2003. Even though sesame seeds have also experienced a decrease in producer price, its decline is approximately 31% from its high of 3'000 to its low of 1'990 in 2002. Coffee however has dropped just in one single year from a high of 7'910 to a low of 4'460, a drop of 44%, seriously jeopardizing the livelihoods of local coffee farmers, especially when coupled with droughts that reduce coffee production by as much as 20 to 30% (Oxfam 2003; FAO 2006). Furthermore, at the national level, the decrease in world prices due to oversupply and low

[21] Please note that the 2001 value has been omitted, as it was reported as 28'100 tonnes.

demand elasticity has critically reduced foreign revenues for the government, as well as its taxes received from coffee exports[22] (INTRACEN 2001). This overall crash in producer prices dates as far back as in 1989, when the international coffee market was liberalized, and new countries entered the already saturated market, such as Vietnam, which has become the world's second largest coffee producer (Bloomer 2004).

Given the inefficient and complex commodity chains of coffee production in Ethiopia, it is unlikely that an increase in world price would result in a significant trickle-down effect for the farmer. As a matter of fact, Ethiopian coffee farmers on average only receive an estimated 27% of the export price, compared to 70% in Uganda and 80% in Kenya[23] (Oxfam 2002, 8).

Ultimately, neither coffee or sesame beans might be the main agricultural income for a majority of these smallholders in the future. Numerous farmers have switched their production away from coffee towards chat, a "mild amphetamine-like stimulant" illegal in the US that garners a significantly higher market price as global demand has increased (Bloomer 2004).

Case Study: Kenya

As one of the most prominent African nations, Kenya was ruled by one of the infamous 'big men' of Africa, Jomo Kenyatta. After his death in 1978, Kenyatta left behind "a legacy of tension between his Kikuyu and other ethnic groups, as well as repressive state machinery in place for his successor, Daniel arap Moi" who ruled until 2002 (Moss 2007, 43). As of today, the country is ruled by a fragile coalition government, which appears to be devoted towards economic reforms, yet riddled by "rivalries and jockeying for power" (USAID 2005, 4).

[22] The government has actually cut its export tax during the crisis in recent years.

[23] These percentage figures are significantly higher for farmers in a co-operative, as they eliminate numerous chains of the coffee trade, including the auctioning house. While not dealing with a parastatal, as in the Ivorian case, it appears that these farmers have found alternate ways in order to increase their share of the purchasing price (Oxfam 2002).

Located on the Eastern border of Africa, Kenya is home to both one of the most productive agricultural regions, the Kenyan highlands, and a major hub for commerce and trade in Africa in Nairobi and port in Mombassa (CIA 2007). Riddled by corruption, Kenya has achieved disappointing growth over the past decade, averaging 2.19% from 1990 to 2005 as measured in GDP (Table 4-17). Kenya has received disappointingly little foreign direct investment (FDI), below the sub-Saharan average, reflecting the general distrust by investors after the corruption scandals. It nevertheless appears that with the passing of the landmark anti-corruption legislation and several other measures intended to restore its international reputation, Kenya might be well positioned to enjoy considerable outside investments and economic growth in the near future (USAID 2005).

Table 4-17. Summary Kenya

Mean GDP Growth (%)	2.19
Mean Agricultural Exports (% of GDP)	8.24
Mean Agriculture, Value Added (% of GDP)	30.00

Source: World Bank (2005), UN Development Indicators (2006) and FAO (2006)

Even though the service and industry sectors dominate the economy, including smaller-scale manufacturing and tourism, agriculture continues to be a key component of Kenya's economy with a mean of 30% of its GDP stemming from value added agriculture, dropping slightly to around 27% by 2005 (Table 4-18). As of 1990, an estimated 79.5% of agricultural workers existed as a percentage of the total labor force (Earthtrends 2003). The average GDP per capita (PPP), as measured in constant 2000 international dollars, actually decreased from 1132.42 $ in 1990 to 1042 $ in 2005, illustrative of the poverty faced by approximately half of the 34.3 million residents of Kenya, especially in the rural countryside (CIA 2007).

From an agricultural perspective, food production, as estimated through the Food Production per capita Index (Table 4-19), has actually not improved over the past 25 years,

achieving only a value above 100 three (1990,1991,1992) out of the last 15 years. This actual decrease in per capita production is reflected also in the drop by 33% of per capita production, as measured in tons per person, of cereals from 1979-81 to 1999-2001. At the turn of the millennium, the 94 tons per person annual cereal yields were even 30% lower than the sub-Saharan average of 135 tons per person (Earthtrends 2003). On a positive note, fertilizer use intensity, measured in kilograms per hectare, however is well above the sub-Saharan African average, reaching 27.7 kg per ha in 2002, compared to 12.4 kg per ha in sub-Saharan Africa. This is a substantial increase from only ten years ago, when it was as low as 21.6 kg per ha in 1992 and 14.7 kg per ha in 1982 (FAO 2006). Given the prevalence of large scale farming in Kenya, however, it is likely that the overall fertilizer consumption is very unevenly distributed (and applied), heavily favoring the exporting horticulture sector.

The 1.3 US$ billion of agricultural exports in 2004 accounted for approximately 9% of total GDP, a figure that has increased substantially from its lower value of 6.31% in 1989-91 and 8.13% in 1999-2001. The undisputed top export continues to be tea, which accounts for approximately half of the top 20 agricultural exports in 2004 with US$ 463 millions. While coffee (and to a lesser degree sugar) was the other traditional main export commodity, they have been replaced, similar to the case of Ghana, by non-traditional exports, such as pineapples and green beans. These two are part of one of the main success stories found in sub-Saharan agriculture surrounding horticultural produce production.

Encompassing the production of vegetables, fruits and fresh cut flowers, the horticulture sector is estimated to have generated jobs that “directly support a half a million workers, small farmers and their families” in Kenya (English, Jaffee, and Okello 2004, 1). Horticulture has grown dramatically, overtaking in recent years coffee as the second largest merchandise export,

and “accounting for two-thirds of all growth in agricultural exports” (English, Jaffee, and Okello 2004, 1). Fresh fruit and vegetable exports are estimated to have grown by over 500% to 164 $ million from 1991 to 2002, while the export of cut flowers has enjoyed similarly vast growth rates of approximately 450% to 175 million $ from 1991 to 2002 (English, Jaffee, and Okello 2004). Most of these export commodities are produced through contract farming, a practice which clearly favors larger scale producers who “have the resources of land, technology, labor, and credit to undertake large-scale, flexible production under contract for European importers” (Barrett et al. 1999; Stock 2004, 219). Given the stringent food standards and quality demands put in place by the European Union and the contracting large-scale buyers, small-scale farming production of horticulture has become increasingly problematic in a market heavily dominated by a few major players. Overall export production is dominated by “two-dozen large-scale farms, which account for 75% of the industry” (English, Jaffee, and Okello 2004, 4). These problems not only relate to the cut flower sector, but also to the exporting of vegetables as small-scale farmers are facing pressures to obtain food safety certification and to comply with ethical and environmental principles (English, Jaffee, and Okello 2004). The sector nevertheless is believed to be a successful tool towards poverty reduction, if not through the increasing of farming income, but rather of providing increased opportunities for sources of off-farm income for the (urban) poor.

Case Study: Uganda

Uganda is one of the few African countries that has not only been able to achieve high growth rates in the 1990s, averaging 6.31% from 1990 to 2005 (Table 4-20), but also significantly reduce poverty, thus achieving “pro-poor growth” (Moss 2007, 173). GDP per capita purchasing power parity has increased by 55% from a low around 878 US$ in 1989-1991 to a high of 1363 US$ by 2005 (UN 2006). While a higher income does not have to reflect a

reduction in poverty, Uganda's economic growth appears to have been "translated into substantial increases in household consumption and a reduction in income poverty" (IMF and IDA 2001, 2). Based on three household surveys undertaken during the 1990s, the% of people living below the poverty line, also called the poverty head count index, "declined from 56% in 1992 to 44% in 1997, and then to 35% in 2000", an overall decrease by 38% from 1992 to 2000 (IMF and IDA 2001, 2).

Table 4-20. Summary Uganda

Mean GDP Growth (%)	6.31
Mean Agricultural Exports (% of GDP)	4.47
Mean Agriculture, Value Added (% of GDP)	42.56

Source: World Bank (2005), UN Development Indicators (2006) and FAO (2006)

Given this major success, it however is important to note that inequality over the same period, measured from 1992 to 2000 has increased from 0.39 to 0.47 on the Gini scale, an increase of 20% (World Institute for Development Economics Research 2005). Large regional inequalities continue to exist, especially with the ongoing civil war in the North, where poverty has increased since 1997, while it has declined in all other regions. Furthermore, rural to urban dualisms exist, as "96% of the poor [are] living in rural areas in 2000" (IMF and IDA 2001, 2). In addition, consumption growth rates vary highly between classes, as the richest decile has experienced an increase by 20% in consumption since 1997, while the poorest quintile's consumption levels have only grown by 8% (ibid.) Given this urban and upper-class bias of the growths of consumption levels, the policy makers of the IMF and the International Development Association (IDA) proclaim that "the need to raise rural income to reverse the adverse trends in inequality is recognized […]" (IMF and IDA 2001, 3).

This rural economy in Uganda continues to be dominated by agriculture. Estimated in 1990, 84.5% of the total labor force were agricultural workers, with value added agriculture

contributing an average of 42.56% of GDP from 1990 to 2005 (Table 4-21). However, as dramatically reflected, agricultural exports only contribute to 4.47% of the country's GDP, not necessarily reflecting the increasing export production boosted by international donors. On a side note, Uganda is unique in comparison to a majority of sub-Saharan African countries, in that its economy does not heavily depend upon other mineral and oil exports. As of 2004, gold exports (to Congo) amounted to only 73.8 US$ million. Total mineral production was as low as $41 million in 2000, projected to "rise to between $128 and $203 million in 2008" (Yager 2004). Furthermore, value added of agriculture has declined from 55.49% of GDP in 1989-1991 to 34% of GDP in 2005. Analogous, the share of the top four agricultural export commodities has dropped from a high of 92.19% in 1989-91 to a low of 66.01% in 2004, as farmers have increasingly struggled with the dominant export commodity, coffee, and its great price volatility.

As of 2004, coffee, tea, tobacco and cotton were the four main agricultural export commodities ranked in order of export value. Coffee alone accounted for more than 40% of the total exports of the top 20 commodities with $124 millions, followed by tobacco leaves with $41 millions, tea with $37 millions and cotton with $32 millions (FAO 2006). In 2004, Uganda was the 14th largest exporter of green coffee behind Ethiopia (11th), yet ahead of major coffee producers of Cote d'Ivoire (17th) and Kenya (20th). This leading position appears to be held relatively constant, with the major exception of 2001 and 2003, where coffee exports have dropped to a low of $51 and $37 millions respectively (FAO 2006). Similar to Ethiopia's fate, Uganda has experienced dramatically the problems associated with a more than fifty% drop in world coffee prices, "a doubling of the petroleum price, combined with poor weather and the continued advance of coffee wilt disease" (Wetzel 2003). Overall, the share of coffee, constituting 48.7% of total export earnings in 1997/98 declined dramatically to as low as 19.2%

by 2001/02 (UNECA 2003, 66). Even through the periods of such vast declines in terms of trades, the Ugandan economy has been able to achieve surprisingly solid growth figures, mostly through an increase in non-traditional exports, such as fish, flowers, and hides and skin. These NTEs, for example, increased by over 80% over the from 1998/99 to 2001/02 growing from a total of US$ 165 million to US$ 300 million (Wetzel 2003).

In summary, Uganda has been able to increase its export diversity to the extent of reducing the devastating impact on its economy of the rapid decline in terms of trade of its largest export commodity, coffee. It consequently has entered similar markets to Kenya and Ghana, while avoiding the heavy dependency faced by Ethiopia. Even in the face of these successes, Uganda continues to struggle to keep up overall agricultural production with annual population growth over three%, as its per capita production yields of cereals remained stagnant over the past two decades, even though still above the sub-Saharan average (Earthtrends 2003). Food production per capita (Table 4-22) reflects a similar picture, showing a boom in per capita production in 1970 and 1975, yet stagnating around 95 in the 21st century (FAO 2006).

Case Study: Malawi

Malawi holds the infamous label as one of the world's poorest and least developed places on earth. According to the most recent Human Development Report, Malawi is ranked 166th out of 177 countries, recording the 6th lowest life expectancy at birth with 39.8 years and the second lowest GDP per capita, PPP, of 646 US$ in 2004, or 596.75 US$ if expressed in constant 2000 US$ (UNDP 2006). Given its low development status, it comes as no surprise that Malawi's economy is heavily dependent on agriculture. As of 1990, an estimated 86.6% of its work force were agricultural workers, with agriculture accounting on average 38.29% of its GDP from 1989 to 2005 (Earthtrends 2003). Haunted by seven incidences of drought from 1991 to 2004, Malawi is popularly depicted as a similar "basket case" in need of US and international food aid as

Ethiopia (Wines 2005). Both countries display similar patterns of food insecurity. Malawi's variation in domestic cereal production from 1992 to 2001 averaged 26.7% from the mean, while Ethiopia's averaged 18.5%, both well above the sub-Saharan African mean of 6.5% (Earthtrends 2003, 2003). Food aid from 1998 to 2000 accounted for 29.4% of Malawi imports, a figure that is well above the sub-Saharan average of 19.9% (Earthtrends 2003). However, while of course differing in terms of shortages of rain, a simple comparison shows that Ethiopia's situation during the same period was significantly different, as an astonishing 321.3% of its total imports were food aid (Earthtrends 2003). While droughts, such as the one in 1993 and 2005 clearly have a devastating impact on local food production, if they are coupled with global increases in maize prices due to a regional shortfall of rain, such as in 2005, Malawi is unable to afford purchases from its neighbors. Consequently, while people have been able to adapt to occasional droughts and the resulting hunger crises, increasing "corn prices are at the root" of the 2005 famine, displaying the interconnectedness of political-economic and ecological factors, as well as Malawi's huge dependence on the agricultural sector (Wines 2005).

Table 4-23. Summary Malawi

Mean GDP Growth (%)	3.04
Mean Agricultural Exports (% of GDP)	25.09
Mean Agriculture, Value Added (% of GDP)	38.29

Source: World Bank (2005), UN Development Indicators (2006) and FAO (2006)

As a matter of fact, Malawi's agricultural sector accounts on average 38.29% of its GDP, with the agricultural exports accounting 25.09%, a staggeringly high number (Table 4-23). Agriculture is consequently placed at the core of the government's strategy for earning foreign currency. These averages from 1989 to 2005 have declined slightly over the years, from 45.47% of GDP in 1989-1991 to 34.70% in 2005. However, this last figure, similar to the low 30.05% in

1995, has clearly been affected by incidences of droughts (and lower tobacco prices)[24]. Throughout the years, with the exception of 2004, a drought year, agricultural exports as a percentage of GDP has not declined significantly, measuring 28.83% in 1989-91, 25.36% in 2000, 25.96% in 2003 and a lower 20.22% in 2004. What however has declined slightly is its share of the top four agricultural export commodities, which dropped by approximately three% from 1989-91 to 2004 to a very high level of 89.96% (Table 4-24).

In 2004, its top four export commodities were classical cash crops, including tobacco leaves (258 million US$), centrifugal sugar (42 million US$), tea (39 million US$), and cotton lint (13 million US$). Out of the top 20 agricultural exports, totaling 388.9 million US$, tobacco accounted for 66% in 2004, and an estimated 76% in 2000 (due to better prices; Figure 4-4). Of all total exports in 2004, estimated at 483.1 million US$, tobacco leaves produced by both small- and large-scale farmers accounted for around 53% of them, indicating the great lack of diversification present in Malawi's export structure. A model created by the International Food and Policy Research Institute (IFPRI) showed that a potential decrease of the world tobacco price would be exceptionally harmful to the Malawian economy; "a 40% decline in the tobacco prices may cause Malawi's tobacco production to fall more than 50%", and reduces its export revenues by 66% (Diao et al. 2002, 6-7). While local tobacco prices in Malawi have recovered from a low in 1995, any drop in price would have devastating impacts on the economy, as the government heavily relies on its revenue "through the regulated auctioning of tobacco exports, corporate taxes paid by tobacco producers and traders, as well as some minor export tax revenue from tobacco trade" (Diao et al. 2002, 12). Furthermore, an increase in tobacco production does not

[24] Food Production per capita Index has dropped to an all time low in 1992 of 57.8 points.

necessarily result in increased food security compared to farmers who do not produce tobacco, as (gender) inequalities tend to be more persistent in such households (Peters and Herrera 1994).

Given this rather bleak assessment, there are several positive signs surrounding Malawi's agricultural sector. First, per capita cereal production in Malawi has actually increased by 8% from 1979-81 to 1999-2001 to 234 tons per person, which is 99 tons per person more than the sub-Saharan African average (Earthtrends 2003). In addition, even more promising is the increase in average crop yield by 41% over the same time span to 1,634 kg per ha, as well as the almost double (98%) increase in average production to 2.65 million metric tons in 1999-2001 (Earthtrends 2003). While these increases certainly are substantial, they have only been able to halt a decline experienced since 1965, which was especially pronounced during the 1980s and 90s, as measured in the food production per capita index (Table 4-25). While Malawi continues to struggle with droughts, production figures appear to have recovered, possibly creating space for the creation of policy reforms towards diversification.

Case Study: Mozambique

Mozambique has experienced a tumultuous past, which included a harsh, destructive and unusually long period of Portuguese colonial rule of almost five centuries. Having finally achieved independence in 1975, what followed were years of civil war and failed Marxist policies, "large-scale emigration by whites", severe droughts and economic dependence on its mighty southern (neo-colonial) neighbor, South Africa (CIA 2007). As of 2004, the signs are considerably more optimistic as the country's leader for 18 years has been succeeded by a democratically elected president, Armando Emilio Guebuza, who appears to embrace wholeheartedly liberal free market economics called for by the main international donors and organizations (CIA 2007). It thus appears that the country has been able to alter its path towards deeper impoverishment through the establishment of rapid growth rates since the mid 1990s.

Average economic growth was 6.44% from 1989 to 2005, with a high of 13.10% annual growth in 2001 alone. This growth has resulted in a significant increase of its GDP per capita (PPP) from 686.11 US$ to 1219.93 US$ in 2005, starting its transformation from one of the poorest to one of the fastest growing nations (Table 4-26 and 4-27).

Table 4-26. Summary Mozambique

Mean GDP Growth (%)	6.44
Mean Agricultural Exports (% of GDP)	1.91
Mean Agriculture, Value Added (% of GDP)	32.89

Source: World Bank (2005), UN Development Indicators (2006) and FAO (2006)

Alongside this process up on the ladder of development, Mozambique's primary sector has decreased in importance, falling from a high of 42% in 1989-91 to a low 23% in 2005 in terms of value added to the GDP. However, indicating the increasing liberalization and removal of trade barriers, actual agricultural exports have increased from 43.7 million US$ in 1989-1991 to 123.6 million US$ in 2004. Besides this absolute increase, they have also increased in relationship to the rapidly growing GDP figures in the most recent years. Agricultural exports initially fell from 1.97% of the GDP in 1989-1991 to 1.32% in 1999-2001, yet grew to 2.08% in 2003 and 2.31% of the GDP in 2004. Throughout these developments, the share of the top four agricultural exports has remained relatively high and stable between 81 and 84% of total exports.

While the narrative told by these growth figures appear to reflect a success story of an African country that has finally achieved a turnaround out of the traps of underdevelopment so many others are caught in, several points of cautions need to be raised. First, Mozambique continues to experience very high levels of poverty (Table 4-28). 38% of its population continues to live below US$ 1 per day and an official poverty headcount in 1996 estimates that 69% of the total population lives in poverty (World Bank 2005). According to a recent study, this figure has dropped significantly to 54% by 2002 over a period where the economy "grew by

62% cumulatively" (James, Arndt, and Simler 2005, 1). However, analyzing the case further they find that this relative reduction in poverty has occurred in connection with an analogous increase in inequality, especially in the urban areas of Maputo City, the country's capital. On a countrywide level, the Gini coefficient increased only marginally from 0.40 in 1997 to 0.42 in 2002. However, in urban areas closer to South Africa, "particularly Maputo City […] it rose from 0.44 in 1996-97 to 0.52 in 2002-03" (James, Arndt, and Simler 2005, 1f). These urban areas are not only experiencing great population growth they also foster the continued high prevalence of HIV/AIDS with 12.2% of the adult population living with HIV/AIDS in 2003. According to latest UN figures, HIV prevalence has dramatically worsened over the last years from 8.2% in 1998 to 16.2% in 2004 of the adult population. Most staggering are the HIV positive rates in Maputo City, where prevalence rates "increased from less than 1% in 1988 to 18% in 2002", a figure that was well above the country-wide average of 12.2% in 2003 (UNAIDS 2007). Not surprisingly, given the HIV/AIDS epidemic, population growth rates have continuously fallen (with the exception of 1989-91) from 3.32% in 1994-96 to 1.88% in 2005 to a total of approximately almost twenty million people by 2005.

Agriculture continues to play by far the largest role for a majority of the almost twenty million people. While in 1979-1981 agricultural workers represented 84% of the total work force, that figure has dropped by 1% to 83% by 1989-91 and has since been estimated to have never dropped below 80%, with the latest estimate in 2004 showing that 80% of the population worked in the agricultural sector. Given the population growth rates, it comes as no surprise that the number of workers in the agricultural sector has increased from an absolute low of 5.6 million in 1979-81 to over 8 million by 2004 (FAOSTAT 2005).

In 2004, the top four main export commodities were tobacco leaves (32 million US$), cashew nuts (28 million US$), cotton lint (23 million US$) and raw centrifugal sugar (18 million US$). Sesame seeds was the fifth most valuable export commodity (9 million US$), with maize, the distant sixth valuable one (2 million US$) (FAO 2006). From 1994 – 2004, the top three export commodities have always been dominated by three of those four export commodities. One of the most important and infamous cash crops with a long history in the Mozambique case are cashew nuts. Starting under colonization in the 1930s, cashew production was expanded rapidly "on mainly small and medium, and typically African, farms" (Cramer 1999, 1252). This expansion was so dramatic that Mozambique became "by the early 1970s […] the largest producer of cashew nuts in the world and a domestic processing industry had begun to emerge" (ibid., 1252). This processing industry, even with the aid of export tariffs on unprocessed cashew nuts, however faltered in a post-independence setting, leading to "two main waves of policy reform that washed over the cashew sector during the 1990s", privatization and later market liberalization (ibid., 1253). According the Cramer, these aggressive liberalization policies, indicative of the commitment towards the free market by the government and placed at the top of the list by the World Bank, put in jeopardy the whole processing industry, an industry that is severely constrained internally, most importantly by "low and variable level of supply of raw cashew nuts, and its variable quality" (ibid., 1257). Consequently, by 1994-1996, Mozambique's share of the world raw cashew nut production market has dropped from 42.7% in 1969-71 to 4.1% (ibid., 1257). Recent production figures and export figures indicate that cashew production has recovered again, growing from 33,423 Mtons in 1995 to 57,894 Mtons in 2000, while processed (shelled) cashews exports remain small (FAO 2006). Given this recent recovery of at least cashew supply yet lack for gaining market share in the processed segment, Cramer's

concluding critique concerning the international markets still rings true: "International markets for the production and trade of processed commodities are rich in imperfections and if a country is to promote such exports then its task is to promote effective market imperfections that work to its own advantage, not to abandon competitive hopes […]" (Cramer 1999, 1262). Consequently, rather than 'getting the price right', it is a matter of 'getting the politics right' in order to foster development in an attempt to gain a greater share of the commodity chain through agroprocessing.

Finally, the current state of Mozambique's economy appears mixed. Observing the estimated changes in food production index per capita, the magnitude of the dire state and challenges ahead for Mozambique appear evident. Food production levels have dropped dramatically since independence, reaching new lows during the periods of liberalization and privatization, only recovering slightly in the late 1990s, and currently are indexed around 70, 30 points below its 1965 base value (Table 4-29). However, agricultural cereal production figures are a lot more promising. While per capita production (tons per person) is still well below the sub-Saharan African average of 135 tons per person with 91 tons per person, it has increased by 65% since 1979-81 to 1999-2001. Similarly, the average crop yield (kg per ha) has increased by 54% over the same period to 929 kg per ha, while resting below the sub-Saharan African average of 1,221 kg per ha (Earthtrends 2003). In summary, Mozambique, while enjoying very high growth rates, appears to continue to struggle into the 21st century with a large deficit of production and development it acquired in the 1980s and 1990s in the aftermath of bad policies, droughts, internal civil strive and intense international competition.

Case Study: South Africa

South Africa, as has been well established in the literature, represents both a geographical and economic outlier in sub-Saharan Africa. Located at the southern tip of the continent, the

country has enjoyed a unique history under apartheid rule by the right-wing white National Party that rose to power in 1948 and ruled until 1994, when Nelson Mandela was elected as president in the first free elections (Moss 2007, 25). It was during this second half of the 20th century that South Africa became the economic powerhouse of sub-Saharan Africa, emerging out of its state of underdevelopment and becoming the most industrialized nation in sub-Saharan Africa.

While its mean growth figures average below those of the faster growing nations with 2.31% from 1990 to 2005, its GDP per capita (PPP) is by far the largest with US$ (constant 2000) 11,044 in 2005 (Table 4-30 and 4-31 for all data). Growth figures appear to be stronger post-independence, as they averaged 0.35% in 1989-91 and 3.55% by 1994-1996. It was during the late 1980s that South Africa's economy was especially struggling under the internationally imposed financial sanctions, which "undermined business confidence […] and sharpened divisions among the white elite" (Crawford 1999, 19). On the other hand, the percentage of value added of agriculture appears to have declined from a high of 4.87% in 1989-91 to a low of 3.00% in 2005. Agriculture nevertheless continues to play an important role, as exports have increased from 1.864 billion US$ in 1989-91 to 3.421 billion US$ in 2004. This increase of agricultural exports is also reflected in the increasing percentage of exports, as they averaged around 1.65% both in 1989-91 and 1999-2001, but grew to 2.01% in 2003 and 2.25% in 2004.

Table 4-30. Summary South Africa

Mean GDP Growth (%)	2.31
Mean Agricultural Exports (% of GDP)	1.89
Mean Agriculture, Value Added (% of GDP)	4.00

Source: World Bank (2005), UN Development Indicators (2006) and FAO (2006)

Overall, South Africa's economy is well-diversified, including its agricultural sector. While increasing over the past five years, the share of the top four agricultural export goods only measured 37.05%. Given the country's Mediterranean climate (besides six others, including

sub-tropical and semi-deserts), its agricultural exports are unique to Africa. In 2004, its top export was wine, measured at 533 million US$, followed by various fruits in the next four spots: grapes (283 million US$), oranges (271 million US$), apples (181 million US$), and prepared fruit (174 million US$) (FAO 2006). Of all the agricultural exports in January 2007, 66% went to the European Union (EU), with less than 10% going to Northeast Asia and 7% to China. Reflecting both the type of goods exported, as well as the lack of regional trade, only 0.5% went to West Africa and a mere 0.1% to Central Africa of the exports in January 2007 (DTI 2007). While these export commodities are of large importance to the overall economy, they are mostly exported by large-scale, capital intensive white farmers.

Given the country's long history of apartheid and a slow process of land redistribution, the primary sector is still marked, to use the narrative put forth by the national tourism alliance and a recent personal visit, by a visible dual economy "with both well-developed commercial farming and more subsistence-based production in the deep rural areas" (Southafrica.info 2007). An estimated 1.271 million people were employed in the agricultural sector as of March 2004, slightly more than 10% of the total employed workforce of 11.95 millions (Statistics South Africa 2004). This figure is only slightly lower than the previous estimate of 13.4% of agricultural workers as a percentage of the total labor force in 1990 (Earthtrends 2003).

Focusing on agricultural inputs, South Africa takes on an utter dominance in the sub-Saharan African realm. For example, of the total thousand metric tons of fertilizer used in 1999, South Africa used 804,000 metric tons out of a cumulative total of 2.12 million metric tons in sub-Saharan Africa. Furthermore, in terms of using mechanized machinery, South Africa holds an estimated 100,000 tractors in 1997 out of a total of 261,984 tractors in sub-Saharan Africa. Taking into account the lack of capital and resources in many African countries to undertake

repairs, this number might even be more dominating (Earthtrends 2003). Finally, 8.6% of the cropland in South Africa was estimated in 1999 to be irrigated, which is more than twice as large as the sub-Saharan average of 3.8% (Earthtrends 2003).

These dramatic differences in agricultural modernization result in correspondingly significantly higher yields. South Africa's average crop yields, measured in kg per ha, are almost twice as great as the sub-Saharan African average, averaging 2,334 kg per ha in 1999-2001 compared to 1,221 kg per ha (Earthtrends 2003). While per capita production has decreased over the past two decades following the growth of the other sectors, average yields have increased by 11% for cereals from 1979-81 to 1999-2001 (Earthtrends 2003). The population growth, with a high of 2.24% 2000 and a current low of -0.70% in 2005, appears not to play a major factor given South Africa is much further down the path of the demographic transition than any other neighbors[25]. Consequently, even though the most recent estimates on the Food Production Index show that it has dropped as low as to 75.2 points in 1995, ranking 88.7 points in 2003, South Africa's agricultural sector appears healthy (Table 4-32).

A major problem of course needs to addressed more in detail, which is the extensive inequality and expansive number of people living in poverty in this wealthiest of nations in sub-Saharan Africa, resulting from "huge inequalities in access to productive [land assets], basic infrastructure and capital as well as to education and skills" (DTI 2007). In 1997, inequality, as measured by the Gini coefficient, has increased by 0.6 points from 1993 to 60.1, which is the 4th highest value of the sample countries under study (World Institute for Development Economics Research 2005). More equal land access provided through the "willing seller – willing buyer" policy is by many believed to be the key determinant towards decreasing the inequality (World

[25] Unfortunately HIV/AIDS plays a large reason as well for the lower levels of population growth.

Bank 2005). In terms of poverty, an estimated 86% of the rural population is living below 2/3 of the national mean per capita income, a number that is considerably lower in the urban areas with only 40% of the population living below those 2/3 (World Bank 2005, 309). Reflecting the inadequacies of the absolute poverty measurement of percentage of population living under US$ 1 a day, only 11% lived under that measurement, calculated between 1994 and 2002 (World Bank 2005, 309). Referring to the Human Development Index (HDI) of the UN, South Africa is ranked 121st out of 177 countries, ranking especially low on the life expectancy at birth measurement, which averaged only 47 years, or 156th out of the 177 countries (UNDP 2006).

Assessment of Case Studies

Comparing David to Goliath

As becomes evident, the various countries studied cover a broad range of Africa's development levels, with diverging results. The strata of the case studies ranges from a country heavily dependent upon its agricultural sector, yet struggling to gain a foothold on the ladder of development, such as Malawi, compared to the case of South Africa, which is at the verge of entering the club of industrialized developed nations. While the former is marked by a lack of diversification, heavy dependence on cash crops and great vulnerability to climate, the latter displays a modern, highly diversified agricultural sector that amounts to a decreasing share to the overall GDP, yet overall increases in total value of agricultural exports. The economic disparities, as measured in GDP ppp per capita in 2005, are vast: $596.75 in Malawi versus $11,044 in South Africa.

While these countries differ in about every aspect of economic comparison, they have one statistic in common: income inequality. The dramatic inter-country difference in per capita income is followed by similar levels of inequality at the national level in 1993 as measured as a Gini index: 62.00 in Malawi versus 59.50 in South Africa. Interestingly, income inequality is

likely one of the only variables where Malawi surpasses South Africa, as it lowered it by 1997 to 49.30, while South Africa's variable increased slightly to 60.10.

Without diverting into an elaborated discussion on the respective reasons for this finding, it becomes evident: First, that there are several complex development paths that can lead to the same level of inequality. Second, inequality is a key aspect for development policy in Africa, not only because of its growth retarding impact (Fosu 2005), but also because of its ability to provide us with an improved narrative of a country's distribution of income and wealth, especially in connection with an average value, such as GDP ppp per capita. It is within this context that a comparison of the case studies yields the following findings.

Conflict and Its Aftermath

First, our sample covers a diverse range of countries struggling or recovering from internal strive, civil war or external conflicts. One of the most prominent and pressing cases is Cote d'Ivoire, which has been involved in an increasing civil war that is linked to increasing pressures of land availability and inequality, and the subsequent struggle over that resource. This pressure on unequal land holdings is to a degree similar to the non-violent struggles faced in South Africa over land redistribution before the end of Apartheid, negatively impacting income inequality. Internal warfare has also resulted in vast inequalities in Uganda, as the Northern region is plagued with civil conflict in a country that has otherwise made great strides towards increasing development and reducing poverty. While not likely to have a direct impact on inequality, Ethiopia's ongoing international conflict with its neighboring countries is likely not only to be a drain upon its already limited resources, but also result in lowered international investors' confidence for funding private enterprises. Last, but not least, Mozambique appears to represent a country that has recovered into the 21st century from its internal unrest, achieving similar to Uganda astonishing growth figures.

Poverty, Infant Mortality and Inequality

Secondly, the cases of both Mozambique and Uganda are especially noteworthy, as they highlight the unique relationship of inequality in the process of growth and development. Ghana, while not having experienced civil strive over the past ten years of its fifty, at times bumpy, years since independence, can be added to those countries, since all these three countries have displayed astonishing growth rates over the past years after an implementation of a pro-export, liberal development strategies with the aid of international development agencies and donors[26]. For example, Mozambique has achieved astonishing growth rates since 2001, with the GDP growing by 13.10% in 2001 and never dropping below 7% annually. Similarly, GDP ppp per capita has increased each year, growing from $992.80 to $1219.93. Uganda and Ghana have grown correspondingly, averaging 5% GDP growth or more since 2001, with GDP ppp per capita increasing each consecutive year. While pockets of great poverty exist in each country, such as in the north of Ghana and Uganda, or in their urban areas, the countries have overall had impressive results in decreasing poverty at a national scale as discussed in the above country studies. Given their impressive growth figures and improvement in poverty, they all displayed a unique pattern of change in inequality: the Gini coefficient increased while agriculture's share of value added to the GDP decreased. Mozambique' s Gini coefficient grew minimally from 40.0 to 42.0 from 1997 to 2003, Uganda's grew from 39.0 in 1992 to 46.90 in 2000, and Ghana's most recent inequality indicator from 1998, 50.70, is significantly higher than the 1992 value, 39.70. Consequently, there appears to be a potential relationship between higher growth rates that result in a reduction of poverty, but corresponding increase in inequality, with agriculture's

[26] Ghana's astonishing growth started earlier before the other two countries.

importance decreasing, as measured in terms of value added as percentage of the GDP[27]. This relationship between poverty and inequality however is clearly complex.

Similarly, the relationship between infant mortality, a proxy for development, and inequality is neither clear. As displayed in Table 4-33, no clear relationship appears apparent between infant mortality and Gini coefficient, as highlighted by the case of South Africa, which experiences the largest GDP ppp per capita, the lowest infant mortality, yet one of the highest Gini coefficients. The country with the worst infant mortality, Malawi, having 133 deaths per 1000 live births, on the other hand holds also the lowest GDP ppp per capita, yet one of the higher Gini coefficients (49.30). For the two countries just above and below 100, Cameroon with 95 and Zambia with 102 deaths per 1000 live births, they hold vastly different Gini coefficients (44.20 and 57.40 respectively) and also different levels of average income, further complicating any initial interpretation.

In sum, while an overall trend appears apparent of a relationship between GDP ppp per capita and infant mortality, this relationship does not appear to exist, at least initially, with inequality in our case studies.

Diversification or Lack There Of

Having discussed the countries' respective performance in terms of achieving high growth rates, four countries in the sample stand out as having been exceptionally successful at diversifying their agricultural production. These include the afore-mentioned Uganda and Ghana, as well as South Africa and Kenya. Countries that have failed to diversify, for example, are Malawi and Mozambique, whose share of the top four agricultural export good stayed stable around 89 and 82% respectively from 1990 until 2004.

[27] As pointed out by Julie Silva, Mozambique's growth rates are largely a result for example of the construction of a dominating aluminum smelting plant, which is majority-owned by South African investors.

The main road leading towards diversification involved the increasing privatization and liberalization of domestic markets, with the sector entering into the export of non-traditional commodities (NTE). As a whole, with the major exception of a few designated cash crops, such as cotton in West Africa, most African countries have successfully (at least attempted) to liberalize and privatize their marketing boards by the mid- and late-1990s, as well as reduce their export tariffs on crops in the aftermath of the WTO's Uruguay Round.

As mentioned previously, especially Kenya and to a lesser extent Ghana have been exceptionally successful at that, with both countries' dropping their percentage share of the top four agricultural exports by more than ten% from 1990 – 2004. Uganda appears to have achieved even higher diversification, as their share dropped from a high of 92.19% to a low of 66.01% in 2004. The case of Uganda however clearly not only an increasing diversification strategy, but also the dramatic impact a drop in international prices for one of the four cash crops exported can have on the overall value exported, as was the case with coffee, Uganda's main export crop, in 2001 and 2003. Consequently, while NTEs have grown, such as fish, the overall growth is not as substantial as in the previous two cases, and a lower share of the top four export commodities does not indicate a higher value of overall agricultural exports necessarily.

The lowest share of the top four agricultural exports in the case study has South Africa, hovering around 35%, as would be expected given its place on the ladder of development. Its main agricultural exports are not made up of any traditional export crop, while overall agricultural exports have increased successively from 1.8 billion US$ in 1989-91 to 3.4 billion US$ in 2004. A lower share of the top four agricultural commodities does consequently not necessarily indicate lower levels of importance of the agricultural sector to the economy.

Senegal is an opposite case in point, where the country's share has decreased from a high of 81.80% in 1989-91 to a low of 56.5% in 2004. The overall value of agricultural exports has actually decreased from a high of 186 million US$ in 1989-91 to 182 million US$ in 2004. The change in Senegal, for example, is subsequently related to the government's fiscal inability to continue support for its exports, such as peanuts, and any subsequent diversification is likely due to the lack of (input) subsidies, such as seeds and fertilizer, creating a disincentive, as opposed to the successful entering of farmers into new marketing opportunities.

Overall though, a lack of diversification is likely to always result in reduced growth in the long-run due to increased vulnerability to fluctuations in producer prices, weakening terms of trade and droughts. This impact is highlighted by Burkina Faso's focus on cotton, Ghana's history with cocoa, Ethiopia's dependency and Uganda's struggle with coffee, and Malawi's dependency on tobacco. Returning to Malawi, given the high dependency on tobacco, a projected decrease in world prices is to have a devastating impact as discussed previously. Similarly, however, it can be argued that given the large amounts of livelihoods depending upon tobacco for their income, an increase in producer prices certainly has a positive impact on growth. Furthermore, it appears that the increase in producer price for tobacco (Figure 4-4) in Malawi from 1993 to 1997 correlates with a drop of the Gini coefficient from 62.00 in 1993 to 49.30 in 1997. In summary, it consequently appears that an improvement in producer prices for a commodity produced mainly by poorer, smaller-scale farmers, could result not only in increased growth, reduced poverty, but also a decrease in inequality.

Ability to Modernize

Faced with a lack of subsidized inputs, poorer farmers are usually less able to find the financing necessary to purchase fertilizer, if available. In several (poor) countries in our sample, we however have observed increases in fertilizer usage, such as Burkina Faso, Cote d'Ivoire,

Kenya, as well as South Africa. These countries however differ widely in their structure of farms. In West Africa, including Ghana, mostly small-scale farmers make up the landscape and the national scale increased fertilizer usage is likely to be connected to them. On the other hand, both Kenya and South Africa's agricultural export landscape consists of (dominant) large-scale farms, which clearly are the main purchaser of the increased fertilizer (and machinery). Consequently, while the increases in fertilizer usage are positive signs from the perspective of agricultural export production, the different make-up of the sector highlights the diverging impacts they are likely to have on inequality.

Droughts and Other Environmental Impacts

A final impact that appears to weigh heavily on agricultural development are droughts. Given that most African nations lack the capacity for irrigation (with the exception of South Africa), their farmers are vulnerable to increasing variability in rainfall. The two most prominent examples are Ethiopia and Malawi, with both experiencing numerous drought years during the study period. While the origins and results of droughts are complex, ranging from the political-economic to environmental, it becomes clear that the more severe ones have a ruinous impact on the economy, as reflected by the lack of or negative growth in 2002 and 2003 in Ethiopia, as well as the negative impact on food production per capita, as seen in the drop in 2002 in Malawi. As drought occurrences are likely to increase in the near future, especially in the countries in the Sahel, Ethiopia, Malawi and Mozambique, it appears that the ability for farmers to cope with such shocks will come increasingly under pressure. It is also important to note, that beyond droughts, pests are for example another major issue plaguing farmers, such as seen with coffee in Uganda or observed with cotton in the Sahel, only magnified by accounts of increased desertification.

The impact of droughts however is complex on inequality, as based upon our case studies, one could not infer whether or not more drought-prone countries experience higher or lower inequality levels. The case in point is Ethiopia, which enjoys the lowest Gini coefficients of our sample, with a low of 29.70 in 2000. This coefficient is dramatically lower than Malawi's, a similarly drought-prone country, where the latest Gini coefficient in 1997 equals 49.30. While this figure is actually only slightly higher than Ethiopia's 1997 coefficient of 48.20, Ethiopia's Gini coefficient measured 32.70 in 1995, whereas Malawi's previous 1993 value was 62.00, showing the (averaged) lower value of inequality[28].

Having highlighted some of the similarities and differences between the case studies, the next chapter will undertake a quantitative investigation of the impact and interactions of those agricultural variables on inequality and development.[29]

[28] For Ethiopia, 1997 and 2000 were years that experienced incidences of droughts. For Malawi, 1997 experienced an incidence of drought (World Bank 2005).

[29] While a comparison between the African countries and some more-developed Asian counterparts has preliminarily been investigated, it has not been explicitly dealt with here. The general understanding however is that these different continents varied widely in their availability of land, labor and capital, resulting in diverging development outcomes. For further information, see (Thirtle, Lin, and Piesse 2003) and (World Bank 1993).

Table 4-2. Overview of agriculture and development in Burkina Faso

Series	1989-1991	1994-1996	1999-2001	2001	2002	2003	2004	2005
Population, total (million)	8.53	9.83	11.30	11.64	12.02	12.42	12.82	13.23
Population growth (annual%)	2.93	2.76	2.94	3.08	3.19	3.24	3.20	3.12
Agriculture, value added (% of GDP)	28.17	32.25	34.11	33.00	31.00	31.00	31.00	31.00
GDP per capita, PPP (constant 2000)^	920.22	937.92	998.00	1026.00	1035.00	1067.00	1076.00	1093.00
GDP growth (annual%)	2.70	4.23	4.73	6.00	4.00	7.00	4.00	5.00
GDP (constant 2000 US$ million)	1809.54	2127.16	2638.20	2754.14	2875.32	3062.22	3181.65	3334.37
Agricultural Exports (constant US$ million)	92.10		130.23			291.44	313.70	
Agricultural Exports (% of GDP)	5.26		5.01			9.52	9.86	
Share of top 4 agricultural exports (%)	87.17		83.77			86.75	91.35	

Legend: ^: International $

Source: UN World Development Indicators (2006), UN (2006) and FAO (2006)

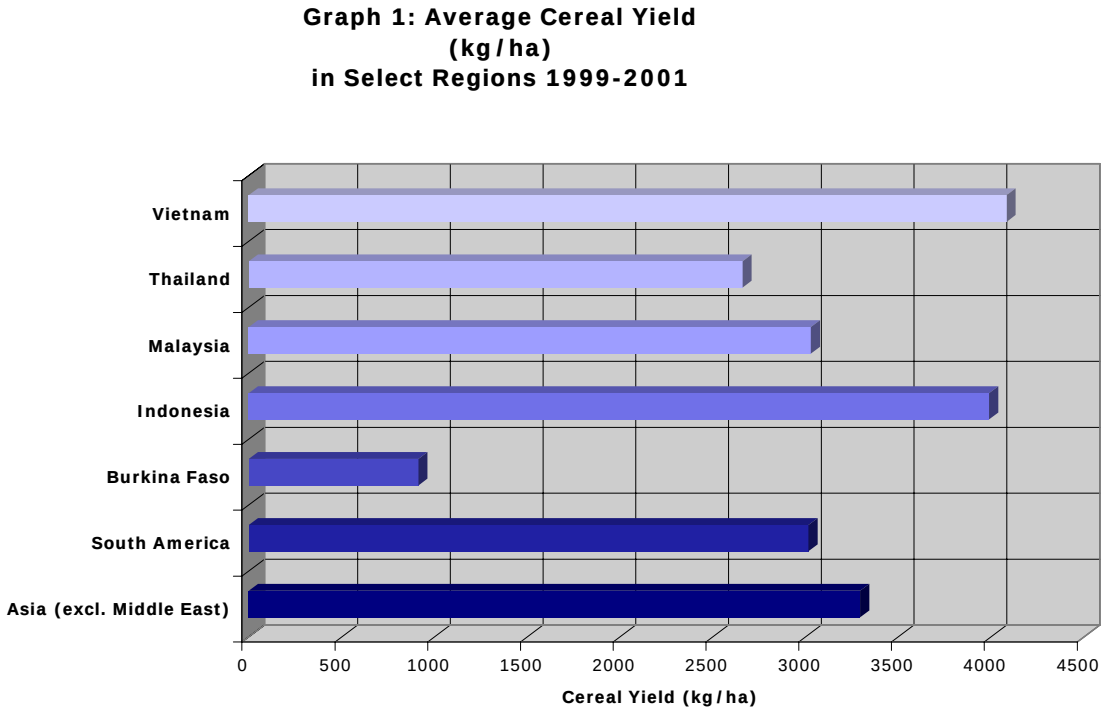

Figure 4-1. Average cereal yields in select regions

Table 4-5. Overview of agriculture and development in Côte d'Ivoire

Series	1989-1991	1994-1996	1999-2001	2001	2002	2003	2004	2005
Population, total (million)	12.66	14.76	16.72	17.05	17.34	17.60	17.87	18.15
Population growth (annual%)	3.43	2.87	2.12	1.87	1.66	1.53	1.51	1.57
Agriculture, value added (% of GDP)	32.84	24.86	22.84	24.00	25.00	24.00	22.00	22.00
GDP per capita, PPP (constant 2000)^	1802	1561	1576	1536	1485	1428	1425	1401
GDP growth (annual%)	0.63	5.22	-0.55	0.00	-2.00	-2.00	2.00	0.00
GDP (constant 2000 US$ million)	8306	8932	10549	10436	10266	10095	10261	10230
Agricultural Exports (constant US$ million)	1650		2130			3216	3093	
Agricultural Exports (% of GDP)	19.94		20.43			31.86	30.14	
Share of top 4 agricultural exports (%)	76.71		69.73			72.11	69.64	

^: International $

Source: UN World Development Indicators (2006), UN (2006) and FAO (2006)

Table 4-9. Overview of agriculture and development in Ghana

Series	1989-1991	1994-1996	1999-2001	2001	2002	2003	2004	2005
Population, total (million)	15.48	17.72	19.87	20.31	20.76	21.21	21.66	22.11
Population growth (annual%)	2.79	2.54	2.21	2.20	2.19	2.16	2.11	2.05
Agriculture, value added (% of GDP)	46.44	38.51	36.13	36.00	36.00	36.00	38.00	39.00
GDP per capita, PPP (constant 2000)^	1589	1705	1893	1912	1955	2014	2088	2149
GDP growth (annual%)	4.57	4.00	4.10	4.00	4.00	5.00	6.00	6.00
GDP (constant 2000 US$ million)	3289	4037	4988	5187	5420	5702	6033	6385
Agricultural Exports (constant US$ million)	403.00		521.00			1037.00	1212.00	
Agricultural Exports (% of GDP)	12.34		10.47			18.19	20.09	
Share of top 4 agricultural exports (%)	96.09		86.60			85.77	83.30	

^: International $

Source: UN World Development Indicators (2006), UN (2006) and FAO (2006)

Table 4-10. Ghana's exports, 1980 – 2000 (value as percentage of exports)

Year	Cocoa	Minerals	Timber	NTE	Others
1980	65.0	31.0	3.0	n/a	1.0
1990	40.2	17.2	22.5	n/a	n/a
1994	25.2	46.3	n/a	9.4	n/a
1996	35	40.9	9.3	9.1	5.7
1997	31.3	41.1	11.5	10.6	5.5
1998	29.7	34.3	8.2	10.9	19.0
1999	27.6	37.2	8.6	12.4	23.2
2000	22.5	40.0	9.0	13.6	24.9

Adapted from Konandu-Agyemang and Adanu (2003, 517)
Sources: (Ghana Export Promotion Council; Government of Ghana 1997, 1998; Ghana Statistical Services 2000)

Table 4-12. Overview of agriculture and development in Senegal

Series	1989-1991	1994-1996	1999-2001	2001	2002	2003	2004	2005
Population, total (million)	7.98	9.12	10.34	10.60	10.86	11.12	11.39	11.66
Population growth (annual%)	2.89	2.59	2.46	2.44	2.41	2.39	2.37	2.36
Agriculture, value added (% of GDP)	19.45	19.88	19.88	22	16	18	17	18
GDP per capita, PPP (constant 2000)^	1398.12	1323.90	1435	1460	1450	1504	1560	1615
GDP growth (annual%)	0.70	4.39	4.62	5	1	7	6	6
GDP (constant 2000 US$ million)	3236	3537	4411	4591	4642	4946	5251	5577
Agricultural Exports (constant US$ million)	186		135			175	182	
Agricultural Exports (% of GDP)	5.67		3.10			3.54	3.47	
Share of top 4 agricultural exports (%)	81.80		68.12			59.32	56.5	

^: International $

Source: UN World Development Indicators (2006), UN (2006) and FAO (2006)

Table 4-13. Senegal, food production per capita index, 1965=100

1965	1970	1975	1980	1985	1990	1991	1992	1993	1994
100.0	56.4	92.2	40.2	50.7	49.1	49.9	44.3	48.1	47.8
1995	1996	1997	1998	1999	2000	2001	2002	2003	
52.1	47.0	43.1	47.8	56.4	54.1	49.6	30.9	45.9	

Source: FAOSTAT (2006)

Table 4-16. Overview of agriculture and development in Ethiopia

Series	1989-1991	1994-1996	1999-2001	2001	2002	2003	2004	2005
Population, total (million)	51.16	56.55	64.29	65.78	67.22	68.61	69.96	71.26
Population growth (annual%)	3.52	2.95	2.37	2.28	2.17	2.06	1.94	1.83
Agriculture, value added (% of GDP)	54.79	57.57	47.01	46.00	42.00	44.00	46.00	48.00
GDP per capita, PPP (constant 2000)^	754.32	725.15	781.00	824.00	805.00	767.00	843.00	896.00
GDP growth (annual%)	-2.52	6.87	6.62	8.00	0.00	-3.00	12.00	9.00
GDP (constant 2000 US$ million)	6025	6410	7919	8467	8466	8204	9213	10018
Agricultural Exports (constant US$ million)			290.00			450.00	380.00	
Agricultural Exports (% of GDP)			3.70			5.48	4.12	
Share of top 4 agricultural exports (%)	84.14		83.83			79.42	71.39	
Incidence of drought*			D	D	D	D	D	

^: International $

*: Significant shortage of rain (excluding 1991 and 2005)

Source: UN World Development Indicators (2006), UN (2006) and FAO (2006)

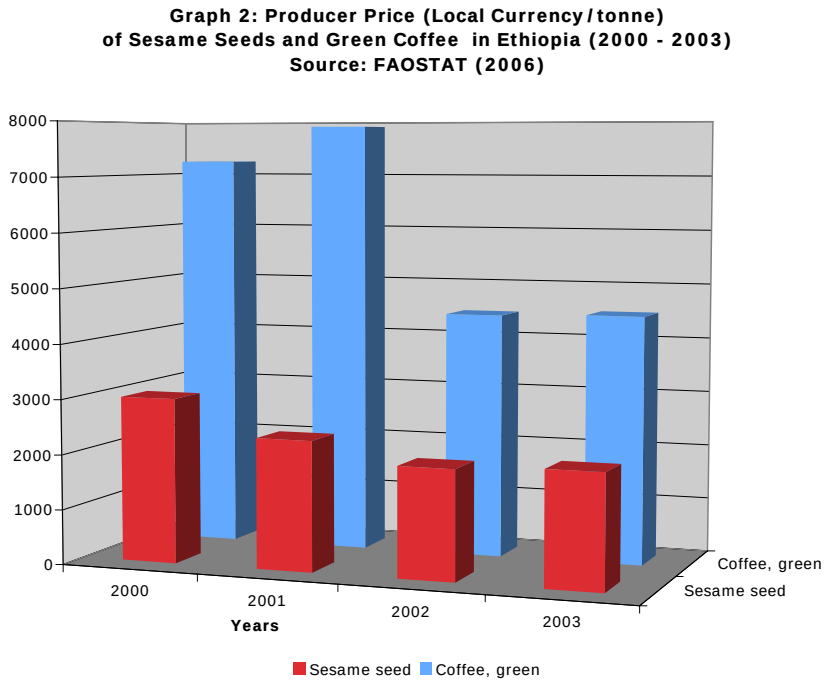

Figure 4-2. Producer price (local currency/tonne)

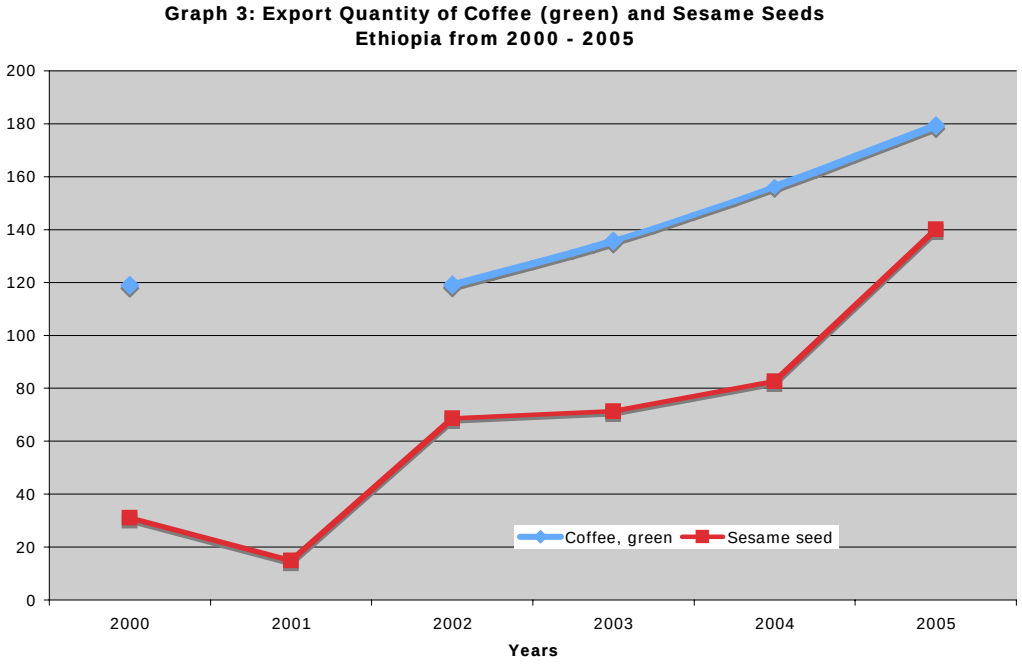

Figure 4-3. Export quantity of coffee (green) and sesame seeds

Table 4-18. Overview of agriculture and development in Kenya

Series	1989-1991	1994-1996	1999-2001	2001	2002	2003	2004	2005
Population, total (million)	23.4	27.2	30.7	31.4	32.0	32.7	33.5	34.3
Population growth (annual%)	3.42	2.74	2.23	2.17	2.13	2.14	2.22	2.33
Agriculture, value added (% of GDP)	29.28	32.03	31.80	31.00	28.00	28.00	27.00	27.00
GDP per capita, PPP (constant 2000)^	1132	1058	1018	1042	1022	1029	1047	1042
GDP growth (annual%)	3.44	3.73	2.42	4.00	0.00	3.00	4.00	3.00
GDP (constant 2000 US$ million)	10466	11421	12866	13262	13314	13683	14276	14676
Agricultural Exports (constant US$ million)	666		1033			1291	1296	
Agricultural Exports (% of GDP)	6.31		8.13			9.44	9.08	
Share of top 4 agricultural exports (%)	81.22		75.67			68.19	70.66	

^: International $

Source: UN World Development Indicators (2006), UN (2006) and FAO (2006)

Table 4-19. Kenya, food production per capita index, 1965=100

1965	1970	1975	1980	1985	1990	1991	1992	1993	1994
100.0	99.1	96.9	92.2	94.2	103.3	103.6	100.2	94.6	96.3
1995	1996	1997	1998	1999	2000	2001	2002	2003	
95.0	88	89.0	89.0	96	91.5	98.3	96.9	89.7	

Source: FAOSTAT (2006)

Table 4-21. Overview of agriculture and development in Uganda

Series	1989-1991	1994-1996	1999-2001	2001	2002	2003	2004	2005
Population, total (million)	17.76	20.89	24.33	25.11	25.96	26.87	27.82	28.82
Population growth (annual%)	3.57	3.09	3.14	3.25	3.34	3.42	3.48	3.52
Agriculture, value added (% of GDP)	55.39	48.15	37.37	36.00	31.00	32.00	32.00	34.00
GDP per capita, PPP (constant 2000)^	878	1038	1249	1270	1301	1311	1339	1363
GDP growth (annual%)	6.13	9.00	6.21	5.00	6.00	4.00	6.00	6.00
GDP (constant 2000 US$ million)	3071	4299	5919	6219	6622	6912	7300	7706
Agricultural Exports (constant US$ million)	206.00		272.00			115.00	359.00	
Agricultural Exports (% of GDP)	6.70		4.59			1.66	4.92	
Share of top 4 agricultural exports (%)	92.19		81.40			67.76	66.01	

^: International $

Source: UN World Development Indicators (2006), UN (2006) and FAO (2006)

Table 4-22. Uganda, food production per capita index, 1965=100

1965	1970	1975	1980	1985	1990	1991	1992	1993	1994
100.0	160	161.9	95.4	97.5	101.1	99.8	96.5	98.8	94.6
1995	1996	1997	1998	1999	2000	2001	2002	2003	
96.2	88.2	88.3	93.1	94.3	94.7	96.5	96.9	94.3	

Source: FAOSTAT (2006)

Table 4-24. Overview of agriculture and development in Malawi

Series	1989-1991	1994-1996	1999-2001	2001	2002	2003	2004	2005
Population, total (million)	9.42	10.13	11.51	11.80	12.07	12.34	12.61	12.88
Population growth (annual%)	3.80	1.42	2.64	2.43	2.30	2.20	2.16	2.16
Agriculture, value added (% of GDP)	45.47	30.05	38.72	38.78	39.01	39.77	38.88	34.70
GDP per capita, PPP (constant 2000)^	518.20	540.62	574.41	542.66	547.70	568.99	595.70	596.75
GDP growth (annual%)	5.26	4.60	-0.12	-4.97	2.86	6.07	7.12	2.55
GDP (constant 2000 US$ million)	1256.88	1405.76	1705.58	1656.77	1704.14	1807.59	1936.32	1985.75
Agricultural Exports (constant US$ million)	362.4		432.6			469.2	391.6	
Agricultural Exports (% of GDP)	28.83		25.36			25.96	20.22	
Share of top 4 agricultural exports (%)	93.36		93.47			88.95	89.96	
Incidence of droughts		D			D		D	D

^: International $

Source: UN World Development Indicators (2006), UN (2006) and FAO (2006)

Table 4-25. Malawi, food production per capita index, 1965=100

1965	1970	1975	1980	1985	1990	1991	1992	1993	1994
100.0	96.3	106.5	103.2	91.9	72.7	77.8	57.8	80.6	64.0
1995	1996	1997	1998	1999	2000	2001	2002	2003	
75.4	86.6	80.3	97.6	108.1	121.9	126.4	90.14	99.3	

Source: FAOSTAT (2006)

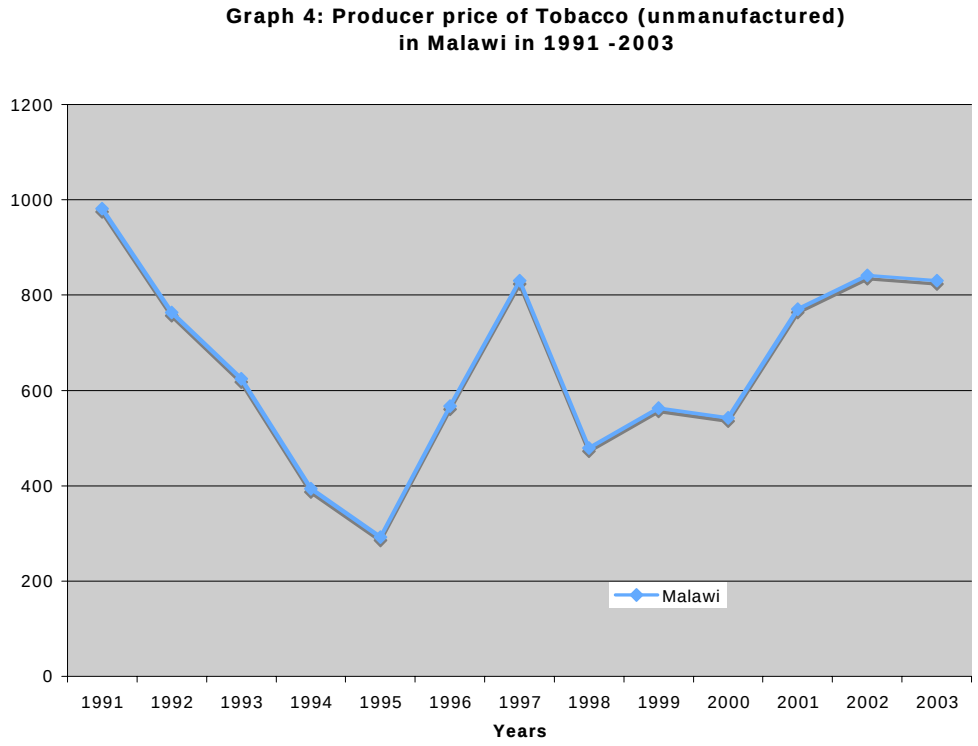

Figure 4-4. Producer price of tobacco (unmanufactured) in Malawi in 1991-2003

Source: FAOSTAT (2006)

Table 4-27. Overview of agriculture and development in Mozambique

Series	1989-1991	1994-1996	1999-2001	2001	2002	2003	2004	2005
Population, total (million)	13.48	15.84	17.91	18.30	18.68	19.05	19.42	19.79
Population growth (annual%)	1.36	3.32	2.17	2.13	2.06	1.99	1.93	1.88
Agriculture, value added (% of GDP)	41.83	36.50	27.06	24.00	24.00	24.00	23.00	23.00
GDP per capita, PPP (constant 2000)^	686.11	692.14	913.52	992.80	1008.02	1065.57	1142.86	1219.93
GDP growth (annual%)	4.13	6.30	7.53	13.10	8.16	7.90	7.49	7.70
GDP (constant 2000 US$ million)	2217.50	2597.41	3918.68	4272.63	4621.29	4986.37	5360.08	5772.80
Agricultural Exports (constant US$ million)	43.7		51.8			103.6	123.6	
Agricultural Exports (% of GDP)	1.97		1.32			2.08	2.31	
Share of top 4 agricultural exports (%)	81.83		83.75			83.69	82.05	

^: International $

Source: UN World Development Indicators (2006) and FAO (2006)

Table 4-28. Diverse poverty and health figures in Mozambique

% of population living under US$ 1 a day (between 1994 and 2002)	38.00
National poverty headcount (% of total population in 1996)	69.00
National poverty headcount (% of total population in 2002)	54.00
Gini coefficient (1997)	0.40
Gini coefficient (2002)	0.42
Adult rate (15-49 years) of% population with HIV/AIDS (2003)	12.20
Adult rate (15-49 years) of% population with HIV/AIDS (2004)	16.20

Source: World Bank (2005)

Table 4-29. Mozambique, food production per capita index, 1965=100

1965	1970	1975	1980	1985	1990	1991	1992	1993	1994
100.0	108.2	98.3	81.9	68.4	76.8	65.6	54.4	59.6	55.8
1995	1996	1997	1998	1999	2000	2001	2002	2003	
65.1	71.8	74.7	78.2	77.4	68.3	70.0	70	70.8	

Source: FAOSTAT (2006)

Table 4-31. Overview of agriculture and development in South Africa

Series	1989-1991	1994-1996	1999-2001	2001	2002	2003	2004	2005
Population, total (million)	35.21	39.13	43.91	44.81	45.35	45.83	45.51	45.19
Population growth (annual%)	2.11	2.17	2.24	1.83	1.18	1.06	-0.70	-0.70
Agriculture, value added (% of GDP)	4.87	4.22	3.44	4.00	4.00	4.00	3.00	3.00
GDP per capita, PPP (constant 2000)^	9977	9293	9488	9645	9819	10031	10472	11044
GDP growth (annual%)	0.35	3.55	3.08	3.00	4.00	3.00	4.00	5.00
GDP (constant 2000 US$ million)	110686	116307	13232	136512	141549	145761	152276	159738
Agricultural Exports (constant US$ million)	1863.00		2151.00			2937.00	3421.00	
Agricultural Exports (% of GDP)	1.68		1.62			2.01	2.25	
Share of top 4 agricultural exports (%)	36.81		31.35			33.43	37.05	

^: International $

Source: UN World Development Indicators (2006) and FAO (2006)

Table 4-32. South Africa, food production per capita index, 1965=100

1965	1970	1975	1980	1985	1990	1991	1992	1993	1994
100.0	95.7	104.8	105.4	91.7	92.9	92.4	76.4	86.4	90.1
1995	1996	1997	1998	1999	2000	2001	2002	2003	
75.1	88.5	88.4	81.1	85.0	93.3	87.7	92.4	88.7	

Source: FAOSTAT (2006)

Table 4-33. Infant mortality, GDP&Gini

Country	Year	Gini	GDP ppp per capita	Infant Mortality
South Africa	1997	60.10	8777.97	45.00
Ghana	1998	50.70	1754.61	62.00
Kenya	1997	44.50	982.40	73.00
Madagascar	2001	47.40	862.64	84.00
Uganda	2000	46.90	1248.88	85.00
Gambia	1998	50.20	1587.63	92.00
Cameroon	2001	44.20	2018.28	95.00
Zambia	1998	57.40	749.95	102.00
Tanzania	1993	47.70	441.42	103.00
Mozambique	2003	42.00	1130.03	104.00
Burkina Faso	1998	62.50	943.88	107.00
Cote d`Ivoire	1998	44.40	1603.59	115.00
Ethiopia	2000	29.70	639.06	116.00
Nigeria	1997	50.20	804.32	120.00
Guinea	1994	55.10	1587.63	129.00
Malawi	1997	49.30	555.57	133.00

Source: WDI (2006) and UN-WIDER (2005)

Note: Latest years available used in regression models. Infant mortality measures deaths per 1000 live births. Since the variables are only available in 1980, 1990, 1995, 2000, 2004, the value closest to the respective year was chosen.

CHAPTER 5
COMPARATIVE ANALYSIS ON AGRICULTURE, GROWTH AND INEQUALITY

Main Hypothesis

Results

Based upon the previously discussed model, the following results have been computed for Model 1, 2 and 3 (Table 3-5):

$$Gini = 58.96 + 0.198x_{BeforeWTO} - 0.407x_{AgricultureValueAdded} - 0.195x_{TotalAgricultureExport}$$
$$+.238x_{LogAgriculturelExportsGDP} + 0.195_{LogGDPppp} - .005_{ChildrensInfantMortality}$$
$$-.550_{Urbanization} + \varepsilon$$

Figure 5-1. Regression equation Model 1

$$Gini = 86.25 + 0.329x_{BeforeWTO} - 0.632x_{AgricultureValueAdded} - 0.538x_{FoodExports}$$
$$+.217x_{SquareRootAgriculturalRawMaterialsExport} - 0.110_{LogGDPppp} - .116_{ChildrensInfantMortality}$$
$$-.396_{Urbanization} + \varepsilon$$

Figure 5-2. Regression equation Model 2

$$Gini = 75.21 + 0.248x_{BeforeWTO} - 0.580x_{AgricultureValueAdded} - 0.431x_{FoodExports}$$
$$+.880x_{SquareRootAgriculturalRawMaterialsExport} - 0.252_{LogGDPppp} - .168_{ChildrensInfantMortality}$$
$$-1.938_{Urbanization} + \varepsilon$$

Figure 5-3. Regression equation Model 3

Of the seven independent variables, four agricultural variables are highly significant (Before WTO dummy, Agriculture Value Added, Food Exports, Total Agricultural Exports), while one variable, urbanization, found by other studies is significant at the .05 level in Model 1 and 2, and the .1 level in Model 3 (Deininger and Squire 1998, 272). The regressions (Table 5-1, 5-2, 5-3) overall yields adjusted R^2 value of 0.382 (Model 1), 0.516 (Model 2) and 0.403 (Model 3).

Test of Assumptions

Given the fact that the regression includes real-world data from Africa, we would expect certain analyses of assumptions to be rather messy. Every feasible effort has been undertaken in order to not violate the basic assumptions of multiple regressions and corrections and manipulations, if necessary, were undertaken.[30]

First, concerning normality (Appendix I for data), five of the variables[31] used in the model (as well as arable land, population density and value of the top three agricultural exports) did not pass the Shapiro-Wilkens test initially of .05 significance used for smaller sample sizes.[32] These variables, GDP ppp per capita, Food and Agricultural Raw Exports, as well as the others underwent a closer analysis, which is detailed specifically in the Appendices, mostly for Model 3. While certain limitations existed, given the nature of the dataset, for the independent variables not included in the model the following transformations (generally square-root or logarithmic) improved their normality, log of Arable Land and log of Population Density, with Value of Top 3 Agricultural Exports not improving.

Concerning the values of interest in our model, GDP per capita ppp was heavily influenced by the two data points of South Africa, which were significant and non-erroneous outliers. Since these outliers are not a result of data error, a conscious decision has been made to include them in this model, and possible transformations investigated. The logged variable clearly yielded superior results to the other two transformations, improving the Shapiro-Wilkens statistics from

[30] The sky seems to be the limited when undertaking empirical analyses. A case in point is the residual analysis, which was undertaken to the extent best possible, yet without for example mapping them, etc. This appears in line with current research, which rarely publishes on residuals, or undertakes similar analyses (Dollar and Kray 2002; Grimm and Gunther 2004).

[31] The dummy variable, Before WTO, is excluded from this discussion.

[32] Beyond the Shapiro-Wilkens test, special attention was paid to skewness and kurtosis.

.436 to .856 for Model 3, and .857 for Models 1 and 2. While it still is not significantly normal, having made an attempt to reduce their impact increasingly justifies their initial inclusion in the model. This interpretation becomes especially evident when comparing the two dramatically contrasting histograms for Model 3 (Appendix A).

For the other variable, Exports of Agricultural Raw Materials, a similar problematic situation arises, as Burkina Faso's amount of cotton and hides exports results in the creation of a dramatic outlier, with its agricultural raw materials exports amount to 68% in 1998, well above the mean of 10.5%. Consequently, as the outlier has been verified, a square root transformation yielded vastly superior results (histograms in Appendix A). While the final transformed variable is not passing the normality test, it is vastly superior, with .850, to the previous .584 value of the Shapiro-Wilkens test in Model 3, and a superior .892 for Model 2.

Last but not least, the normality of the Food Exports variable is closely evaluated. As becomes apparent with an observation of the histogram, the variable is very heavily influenced by the replaced missing variables, and ultimately no transformation was undertaken, as it yielded already a Shapiro-Wilkens value of above .9 for Model 3 and .925 for Model 2.

Concerning the unique variables used in Model 1, total agricultural trade exports as share of total merchandise exports [TOTAGEXP] and as share of the GDP [LNAGXGDP], the latter improved due to a log-transformation, with the former not improving. Ultimately, both variables yielded a normality value above .85 (.887 and .864), which appears satisfactory given the limitations.

It is within this context that the post-transformation normality tests using Shapiro-Wilkens provided sensible and lucid improvements, as presented in the post-transformation table in Appendix A.

As discussed above, considerable outliers exist in the dataset that might need remedial measures. In order to further evaluate their importance and impact, an analysis of Cook's D, leverage and Mahalanobis distance was undertaken on the whole dataset for the above regression (Appendix B: Outliers). The mean Cook's D of Model 1 was .031, with a high of a low.164. Furthermore, the average leverage (centered) value was .184 with a maximum of .544, while the Mahalanobis distance averaged 6.816, with a maximum of a low 20.130. For Model 2, the mean Cook's D was .028, with a maximum of .127. For the centered leverage value, the average was .184, with a maximum of .707. Finally, for the Mahalanobis distance, the average measured 6.816, with a maximum of 26.171. The mean Cook's D of Model 3 was .027, with a high of .416. Similarly, the average leverage (centered) value was .140 with a maximum of .613. Mahalanobis distance recorded a mean of 6.86, with a maximum value of 30.054.

Concerning the Cook's D, a simple analysis shows that none of the values listed in Appendix B are above 1 in all three of the models, which is a commonly used cut-off value (Garson 2007). An alternate test used for the cut-offs is 4/[n-k-1], where n is the number of cases 49 (or 37 respectively), and k is the number of independent variables (7). Based upon this measure, our cut-off value would be significantly lower, at 0.095 (or 0.133 respectively). While these cut-offs are very low, the only value above it in Model 3 is the 1998 Burkina Faso in, with .416, reflecting its Raw Agricultural Exports figure. In Model 2, none of the values are above the 0.133 cut-off. In Model 1, only Nigeria (1997) is slightly above this cut-off at 0.164.

Focusing on the leverage measure, using the .5 cutoff, only Burkina Faso in Model 2 and 3 again is above it, with .707 and .613 respectively. If applying an alternate measure of 2p/n for Model 3, where p is the number of parameters including the intercept, we receive a cut-off

around .33. Based upon this cut-off value, South Africa's 1993 and 1997 variables are on the brink in Model 3, relating to their GDP outlier.[33]

Finally, using a third alternate measurement, the Mahalanobis distance, Burkina once again is by far the greatest in both Model 2 and 3, with a value of 26.17 and 30.05, and South Africa's 1993 and 1997 value next with 16.7 and 15.7 in Model 3, yet below 15 in Model 2 respectively. Consequently, it appears clear that these three potential outliers exist, yet they are all affirmed to not stem from data error and thus have been left in the model while clearly taken into considerations for the further analyses. For Model 1, only Nigeria in 1997 is above 15, yet with 20.13 clearly below the cut-off of 30.

The next assumption tested relates to the normally distributed errors of the model (Appendix C: Normally Distributed Error). As can be clearly seen in the histograms for each model of the standardized residuals, they appear to fit well the normal curve, as well as the P-P plot. A formal test of Shapiro-Wilkens shows great normality for all models, with values ranging from of .979 to .984, at significance of .690 or greater, well above the .05 significance level.

Plotting the residuals, homoscedasticity can be identified in the models. One of the most common scatter plots of the standardized predicted values and the standardized residuals have been plotted in Appendix D for Model 1 and 3, and it becomes clear that no pattern can be identified in terms of their structure.

Furthermore, a simple test of nonlinearity has been undertaken (Appendix E). As stated by Garson, "as a rule of thumb, an indicator of possible nonlinearity is when the standard deviation of the residuals exceeds the standard deviation of the dependent" (Garson 2007). In both Model

[33] If considering the overall relationship of their GDP ppp per capita value to the others, it appears that South Africa's value fits well into the model.

1 and 2, the standard deviation of the Gini (7.918) is greater than the respective standard deviation of the unstandardized residuals (5.61 and 4.96). In Model 3, the standard deviation of the unstandardized residuals of 5.28 does not exceed the Gini's value standard deviation of 7.39, showing that nonlinearity is unlikely to be an issue.

One issue specific to multiple regression models is multicollinearity (Appendix F: Multicollinearity). Correlation itself is clearly not a problem, as the Pearson correlation values never exceed .7 in all models, with the largest correlations existing in Model 3 between urbanization and log GDP ppp per capita, with .619, and Model 1 and 2 log GDP ppp per capita and Agriculture value added, with -.689. Beyond that, there are three types of tests for multicollinearity undertaken.

First, investigating tolerance, none of the values in Model 2 and 3 are below the cut-off value of .20, with log GDP being closest in both Model 2 and Model 3. Only Model 1 appears to have a low tolerance value for Total Agricultural Exports, with .184. A second similar test for multicollinearity is the variance inflation factor (VIF), which has a general cut-off value of larger than 4.0. As becomes evident, in the Model 3, we also find no independent variables that exceed that point, with log GDP ppp per capita the closest with 2.799. For both Model 1 and 2, log GDP ppp per capita appears slightly over, while total agricultural exports (as share of merchandise exports) again are the highest, with a VIF of 5.4. Finally, when looking at the condition indices for Model 3, we find that the eighth dimension of even that model displays a very high condition over 80, indicating that there is possibly a problem of multicollinearity. Consequently, a closer analysis of the variance proportions shows that the insignificant variables in our model, LogGDP and SqrootRawTrad caused those high influences.

The problem of multicollinearity, if taken seriously, appears straightforward to address, as it would involve the altering of our regression model from an enter regression to a stepwise method (Appendix F for the stepwise results). This endeavor has been undertaken for Model 3, but also confirmed for the other models to resolve all the problems of multicollinearity. After this change, we find that none of the values are less than .20 in terms of tolerance or greater than 4.0 in terms of VIF. Furthermore, the resulting condition index is clearly superior, with only 17.29 as opposed to the previous value of 80. Urbanization now seems to have the greatest influence, with .81, followed by the value added by agriculture with .49. While this value certainly is above the more stringent cut-off of 15 (as opposed to 30 traditionally used), the fact that not two values are greater than .5 is broadly interpreted as a sign that multicollinearity is not a defining issue (Garson 2007). We also find that Cook's distance and leverage values are very significantly lower.

A final test was undertaken to assure that the assumption of independence was met (Appendix G: Independence). This assumption is usually tested using the Durbin-Watson test, with a value ranging from 1.5 to 2.5. Using the enter regression model, the Durbin-Watson test clearly is within that range for all models. Model 1 has a value of 1.807, Model 2 has 2.062 and Model 3 has a value of 2.131, indicating independence of the observations.

In summary, the main issue that needs to be taken into account are outliers (mainly in Model 3) and multicollinearity (mostly Model 1 and 2) that exist. However, the latter can easily be addressed and become negligible when undertaking a stepwise regression. A summary of the dataset used for Model 3 has been included in Appendix H.

To further highlight this case in point, a fourth regression was undertaken, without replacing the missing values with the mean, as well as eliminating Burkina Faso. While this

dramatically reduces the degrees of freedom, the situation has been amended by using a stepwise procedure on the same independent variables chosen in the previous regression model. The resulting adjusted R^2 is considerably higher, with .509 than the previous regression, with the 'Pre-WTO' and 'Urbanization' no longer significant. Overall, the model appears to confirm however the previous findings that agriculture is related to inequality, with higher shares in agricultural food exports and higher agricultural production value added decreasing inequality.

Given that we had some serious problems with outliers and multicollinearity in the previous regression, it is important to note that this regression is significantly improved. Multicollinearity statistics show that outliers are not an issue, as both the tolerance values (.804) and the VIF values (1.244) are significantly beyond their cut-off values. Furthermore, the condition index for the respective final model is well below the traditional cutoff value (30) at 6.807, displaying no multicollinearity. In addition, an analysis of outliers (e.g. Cook's D) shows that the maximum value of .417 is considerably lower than the previous model's outliers. Independence has also been observed for the model, with a Durbin-Watson value of 1.901. Finally, as a caveat for future research, it however appears that a quadratic equation might be better fitting than the linear regression model, as displayed in the scatterplots of the standardized predicted values against the standardized residuals (Appendix I).

Overall 15 variations of the regression models has been undertaken and both r-squared and the independent variables are consistent, indicating that the regression models, especially the agricultural independent variables, are tremendously robust (Appendix M). More specifically, in each of the 15 models, agriculture value added (as% of GDP) is highly significant. Food exports (as% of merchandise exports), when used in eight models is significant also in each of them. Total agricultural exports, on the other hand, as a percentage of merchandise exports, included in

the other seven models, is significant in two cases. As a percentage of overall GDP, total agricultural exports however are in none of the seven cases significant. Similarly, GDP ppp per capita and infant mortality were not significant, whereas urbanization was significant in five models. The Before WTO dummy variable was significant in six cases, especially in models with higher degrees of freedom. Finally, the adjusted R-squared value of the regression models ranged from a minimum of .32 to a maximum of .614.

Secondary Hypotheses

First Hypothesis: Role of Agriculture on GDP

Given our interest in both growth and inequality, a similar regression model was constructed surrounding the GDP ppp per capita variable (Appendix K). As opposed to the previous inequality model, this model was run with a stepwise regression, which only included agricultural variables and did not replace any missing variables, as its ultimate goal is to highlight any differences between inequality and GDP from an agricultural perspective[34]. Similar to the inequality models, agriculture value added (as% of GDP) proved to have a significant negative coefficient (-.368), which is a bit weaker (and less significant) than the variable's relationship with inequality. Furthermore, the previously significant WTO dummy variable no longer proved significant, yet the created agricultural diversity variable was highly significant at .016 with a standardized coefficient of -.449. In sum, these two variables yielded a total adjusted R^2 of 0.513, which is similar to the amount of variation in the Gini variable explained by the independent agricultural variables. What the resulting regression equation thus shows is that increased shares of agricultural production are related with lower GDP ppp per capita, confirming that agricultural activities are associated with lower levels of economic

[34] The complete list of variables used is listed at the bottom of the regression table.

development. However, more interestingly is the finding that the value share of the top 3 of the top 20 agricultural export crops is correlated with a lower per capita GDP ppp, suggesting the negative impact of dependency on a few cash-crops in the long-run for the economies under study, or the benefits of an overall increased diversity in export production, both within and between the agricultural sector and the other sectors[35].

Running a simple linear regression with the missing variables replaced with the mean based upon the inequality model 1 (Table 5-1), we increase our degrees of freedom slightly, but gain a similar regression result. The same two independent variables, agriculture value added (as percentage of GDP) and the value share of the top 3 of the top 20 exports, remain significant, with an overall similar impact and strength. Most tellingly, however, is that the model fails to pass the test of independence, with a low Durbin-Watson of 1.133, holds similar properties of multicollinearity, with a higher condition index value (due to enter-model) of 20.977 and a lower maximum value of Cook's distance with .275 (Appendix J).

As shown in the models, agriculture value added (as percentage of GDP), food exports and total agricultural exports as percentage of total merchandise exports had a negative relationship with inequality (and the former with GDP). This relationship has been depicted in the scatterplots below. While there appears no correlation between the Gini coefficient and agricultural raw exports' share of total exports, by excluding Burkina Faso and using the transformed root-squared variable, a clear linear relationship becomes apparent (see scatterplot). A summary of the correlations has been listed below, showing that all three agricultural variables (production, food and agricultural raw material exports) are significantly correlated with the Gini

[35] A brief analysis of the assumptions (Appendix K) shows that the regression passes independence (Durbin-Watson: 2.410), multicollinearity (Tolerance: .567; VIF: 1.765; Condition Index: 13.622), has no outliers (largest Cook's D: 1.256), and a normal distribution of its standardized residuals (see Histogram).

variable, causing us to reject the null-hypothesis that no statistically significant relationship exists between agricultural exports and inequality.

In relationship to GDP ppp per capita, we haven't found in the regression models that countries with higher shares of agricultural exports have higher GDP per capita. As a matter of fact, neither the amount of raw agricultural nor food exports' share of total exports was significantly correlated (Table 5-6). The strongest potential relationship appears to exist between agricultural food exports and the log GDP ppp per capita, yet this is only significant at the .139 level. Consequently, we reject the hypothesis that a statistically significant relationship exists between agricultural exports and GDP per capita (PPP).

Furthermore, on a final note, as becomes apparent, there is also no statistically significant relationship between the Gini coefficient and our chosen measures of economic development, GDP per capita.

Second Hypothesis: Amount of Arable Land

As seen in the above tests of inequality and growth, the amount of arable land was not significant in the model. Consequently, this section briefly interrogates (through correlation analysis and scatterplots), whether or not an inverse relationship exists, in which countries with more arable land per capita have greater inequality, as proposed by the literature.

As seen in the scatterplot, there appears a significant relationship between the Gini coefficient and the amount of arable land per capita, with larger amounts of arable land associated with greater inequality. This correlation is statistically significant at .015, with a correlation of .342. Testing the same variable against both GDP ppp per capita and Log GDP ppp per capita, we interestingly find that they are not significantly correlated. Consequently, our second hypothesis is confirmed that there exists a significant positive relationship between an increase in arable land per capita and an increase in income inequality.

Third Hypothesis: Dependency on Few Agriculture Exports

As already has been shown in the previous regression models, the third hypothesis has been confirmed in relationship to GDP ppp per capita (Figure 5-8, with South Africa as outliers). However, it is unclear whether or not it holds a statistically significant relationship on inequality as well. As depicted in the scatterplot below, a very weak negative relationship appears to exist, hinting at a potential decrease in inequality as the share of the top three agricultural export goods increases. As depicted in the table below, this correlation is not significant at .145, thus we reject our hypothesis that countries with greater dependency on a few exports crop have greater inequality, while affirming the latter in relationship to GDP ppp per capita (and log GDP ppp per capita).

On a side note, to further investigate the relationship, a cash crop dummy was created in order to preliminarily evaluate their potential relationship to inequality. Interestingly, countries, whose largest agricultural export for a given year was either cotton, coffee, tea or cocoa, had a statistically significant lower Gini coefficient (Table 5-9). This finding seems to contradict what Moradi and Baten (2005) have found in their study, where cash crops were negatively correlated with increased intra-regional inequality. However, as the sample appears heavily biased towards years and Gini values from countries that exported cash crops (37) compared to those years that cash crops were not the top export (13), a great degree of caution is in order. Furthermore, given their different scale of their study, our national level analysis might not observe the same phenomena.

Fourth Hypothesis: Agricultural Policies and Inequality

As a proxy for agricultural policy, the time dummy has been created, which has already been proven significant in the previous regression models on inequality. A correlation analysis of the dummy between both the Gini and GDP ppp per capita shows that this statistically

significant relationship only holds true for inequality, yet is not significant for our measures of growth. Consequently, this analysis confirms our previous findings that the time-proxy for agricultural policy is positively correlated with the Gini coefficient at the 0.05 level, indicating that the Gini values were higher pre-1994, and have dropped since the formation of the WTO and the implementation of the Uruguay round results. In other words, inequality in African countries appears to have actually decreased after the WTO agreement in 1994, disproving our previous hypothesis.

Fifth Hypothesis: Urban Areas and Inequality

As we've found already in several regression models, the rate of urbanization was the one non-agricultural independent variable explaining inequality. This hypothesis will nevertheless be tested in order to observe the strength of the correlation, both in relationship to income inequality and development.

Interestingly, there does not appear to be a strong linear association between Gini and urbanization, highlighting the uniqueness of the variable in combination with the agricultural variables. A statistical significance however does exist between the GDP ppp per capita, its logged version and urbanization. This relationship is positive, indicating that higher rates of urbanization is related with greater levels of economic income, as measured through GDP ppp per capita, at a high significance below the 0.001 level. Thus, it appears our fifth hypothesis is also placed in question that countries with higher percentage of urban population have greater inequality.

Population density has also been used as an alternate, approximate measurement of urbanization. The only significant correlation found, however, is a very weak one with urbanization, indicating that the greater urbanization value, the lower the population density, a finding that actually is contradictory to what would be expected. Given its lack of correlation

and the superiority of the urbanization variable, this issue is only of minor importance. The weak correlation between the Gini coefficient and population density can also be observed in the scatterplot below.

In summary, the rate of urbanization does not appear to be significantly correlated with the Gini coefficient, but has been found to play a significant role in the income inequality models. Urbanization, however, has displayed a strong (linear) relationship with measures of economic income, using both the GDP ppp per capita as well as the log GDP ppp per capita. On a final note, as exhibited in the last scatterplot, this relationship might not necessarily be a linear one, as shown with the cubic best fit line plotted, yielding a superior correlation value. Finally, adding a geographical dimension, land-locked countries have been found to have a lower level of economic income

Table 5-1. Model 1 regression results
(Adjusted R^2: 0.382; R^2: 0.499)
Missing Variables replaced with Mean (df: 30)^
Regression Type: Enter

Dependent Variable: Gini Coefficient	Unstandardized Coefficients (B)	Standardized Coefficients (beta)	t	Sig.
(Constant)	58.958**		2.364	.025
Before WTO	3.117	.198	1.281	.210
Agriculture Value Added	-.274	-.407*	-2.029	.051
Total Agricultural Exports as percentage of merchandise exports’	-.195	-.669**	-2.219	.034
Log of Agricultural Exports as percentage of GDP	1.809	.238	1.051	.302
Log of GDP ppp per capita (international US$)	2.387	.195	.752	.458
Children's Infant Mortality rate (Deaths per 1000 live births	-.00167	-.005	-.030	.976
Urbanization	-.375	-.550**	-2.222	.034

Note: *: significant at .10 level; **: significant at .05 level, ***: significant at .01 level, ****: significant < 0.01 level
^: This model has an n=38, with a minimum of 2 data points per country, and a maximum of 3.
‘: Calculated as the combination of Food Exports and Agricultural Raw Exports (as% of merchandise exports).

Table 5-2. Model 2 regression results
(Adjusted R^2: 0.516; R^2: 0.608)
Missing Variables replaced with Mean (df: 30)^
Regression Type: Enter

Dependent Variable: Gini Coefficient	Unstandardized Coefficients (B)	Standardized Coefficients (beta)	t	Sig.
(Constant)	86.249***		3.801	.001
Before WTO	5.171	.329**	2.518	.017
Agriculture Value Added	-.425	-.632****	-3.427	.002
Food Exports as percentage of merchandise exports	-.176	-.538****	-3.846	.001
Square Root of Agricultural Raw Materials Exports as percentage of merchandise exports	1.235	.217	1.485	.148
Log of GDP ppp per capita (international US$)	-1.343	-.110	-.466	.645
Children's Infant Mortality rate (Deaths per 1000 live births	-.00383	-.116	-.807	.426
Urbanization	-.270	-.396**	-2.058	.048

Note: *: significant at .10 level; **: significant at .05 level, ***: significant at .01 level, ****: significant < 0.01 level
^: This model has an n=38, with a minimum of 2 data points per country, and a maximum of 3. It is identical, with the exception of the lower data points, to Model 3.

Table 5-3. Model 3 regression results
(Adjusted R^2: 0.403; R^2: 0.489)
Missing Variables replaced with Mean (df: 42)
Regression Type: Enter

Dependent Variable: Gini Coefficient	Unstandardized Coefficients (B)	Standardized Coefficients (beta)	t	Sig.
(Constant)	75.210****		3.972	.000
Before WTO	3.634	.248**	2.168	.036
Agriculture Value Added	-.356	-.580****	-3.839	.000
Food Exports as percentage of merchandise exports	-.153	-.431****	-3.293	.002
Square Root of Agricultural Raw Materials Exports as percentage of merchandise exports	.651	.110	.880	.384
Log of GDP ppp per capita (international US$)'	-.585	-.047	-.252	.802
Children's Infant Mortality rate (Deaths per 1000 live births	-.00783	-.023	-.168	.867
Urbanization	-.215	-.320*	-1.938	.059

Note: *: significant at .10 level; **: significant at .05 level, ***: significant at .01 level, ****: significant < 0.01 level
': Excluding South Africa and substituting with the GDP ppp per capita, the R^2 value drops to .457, with an adjusted R^2 value of .361.

Table 5-4. Regression results Gini coefficient
(Adjusted R^2: 0.509; R^2: 0.545)
Missing Variables not replaced with Mean and Burkina Faso (df: 25)
Regression Type: Stepwise

Dependent Variable: Gini Coefficient	Unstandardized Coefficients (B)	Standardized Coefficients (beta)	t	Sig.
(Constant)	61.007		20.579	.000****
Agriculture Value Added	-.325	-.539	-3.582	.001****
Food Exports as percentage of merchandise exports	-.085	-.320	-.2126	.044**

Note: *: significant at .10 level; **: significant at .05 level, ***: significant at .01 level, ****: significant < 0.01 level

Table 5-5. Regression results GDP ppp per capita
(Adjusted R^2: 0.513; R^2: 0.548)
Missing Variables replaced without Mean (df: 26)
Regression Type: Stepwise

Dependent Variable: GDP ppp per capita (international US$)	Unstandardized Coefficients (B)	Standardized Coefficients (beta)	t	Sig.
(Constant)	7397.012		6.130	.000****
Value share of 3 of top 20 agricultural exports	-54.402	-.449	-2.565	.016**
Agriculture Value Added	-58.254	-.363	-2.072	.048**

Note: *: significant at .10 level; **: significant at .05 level, ***: significant at .01 level, ****: significant < 0.01 level
Variables not significant: Arable Land (ha per person), Food Exports as percentage of merchandise exports, Agricultural Raw Materials Exports as percentage of merchandise exports, Before WTO

Table 5-6. Regression results GDP ppp per Capita
(Adjusted R^2: 0.484; R^2: 0.554)
Missing Variables replaced with Mean (df: 32)
Regression Type: Enter

Dependent Variable: GDP ppp per capita (international US$) ^	Unstandardized Coefficients (B)	Standardized Coefficients (beta)	t	Sig.
(Constant)	8.811****		15.825	.000
Before WTO	-0.01856	-.015	-.114	.910
Value share of 3 of top 20 agricultural exports	-.0153	-.335**	-2.258	.031
Agriculture Value Added	-.02927	-.532****	-3.466	.002
Total Agricultural Exports (% of merchandise exports)	0.00361	.151	.918	.365
Arable Land (ha per capita)	.279	.052	.335	.740

Note: *: significant at .10 level; **: significant at .05 level, ***: significant at .01 level, ****: significant < 0.01 level
^: This regression model is based on the inequality models 1 and 2 in terms of the data set used, but uses the combined variable of food and agricultural raw materials exports, total agricultural exports. The model here uses the logged GDP ppp per capita, but even if not logged, the model changes minimally. Overall, these results are also extremely robust, as both agriculture, value added, and value share of 3 of the top 20 agricultural exports always ranked significant, no matter if the regression model was stepwise or enter, replaced with missing values or not replaced, or log GDP ppp per capita or not logged.

Table 5-7. Correlations of agricultural exports and inequality

		Gini Coefficient	Agriculture Value Added	Food Exports (% of total exports)	Square-Root Agricultural Raw Material Exports (% of total exports)
Gini Coefficient	Pearson Correlation	1	-.482**	-.580**	-.497**
	Sig. (2-tailed)	.	.000	.001	.004
Agriculture Value Added	Pearson Correlation	-.482**	1	.427*	.402*
	Sig. (2-tailed)	.000	.	.021	.025
Food Exports (% of total exports)	Pearson Correlation	-.580**	.427*	1	.514**
	Sig. (2-tailed)	.001	.021	.	.005
Square-Root Agricultural Raw Material Exports (% of total exports	Pearson Correlation	-.497**	.402*	.514**	1
	Sig. (2-tailed)	.004	.025	.005	.

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

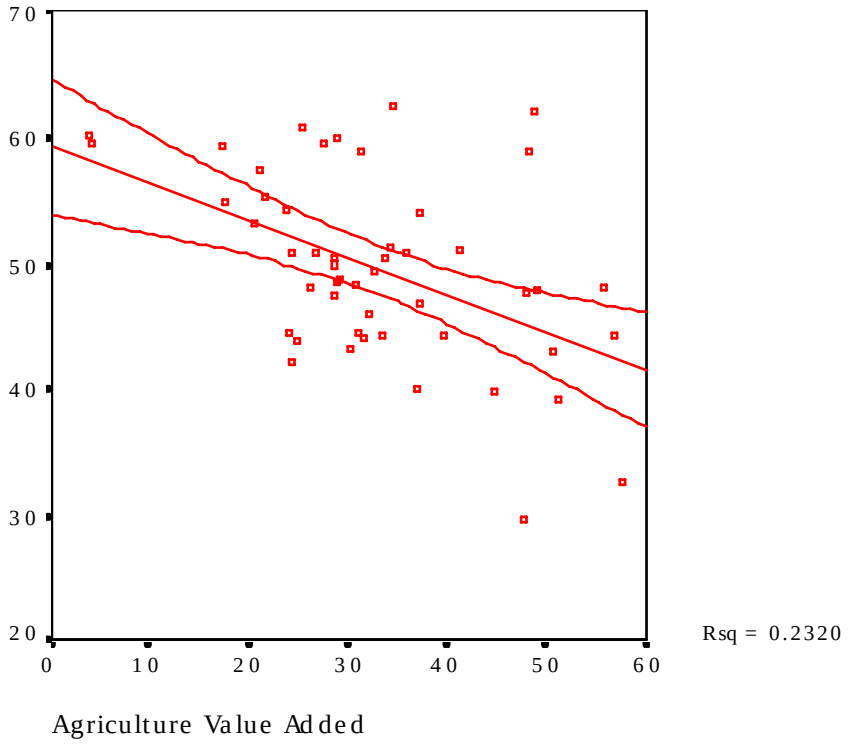

Figure 5-4. Scatterplot agriculture value added

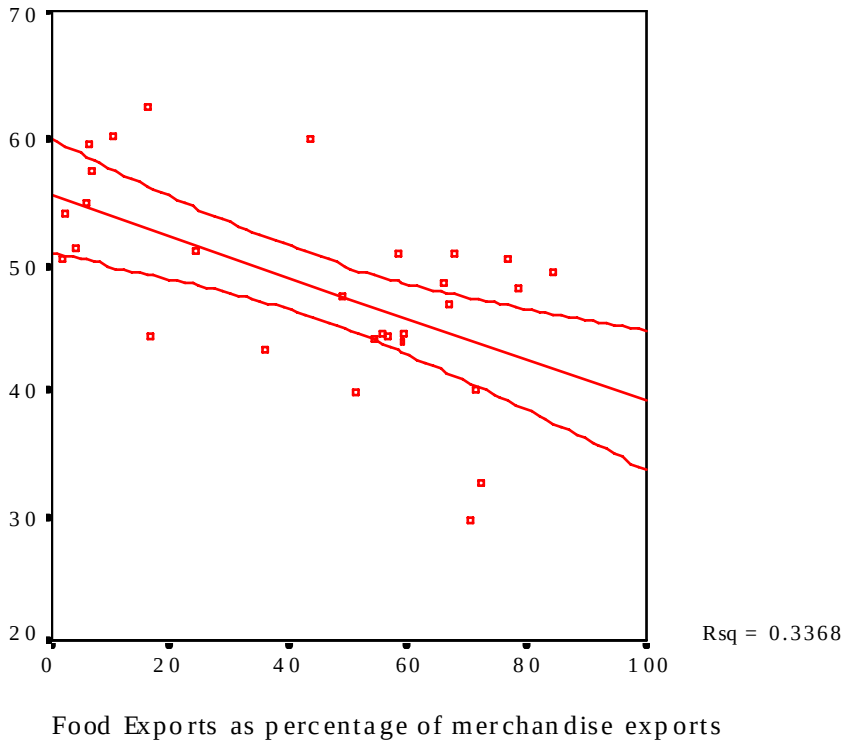

Figure 5-5. Scatterplot food exports as percentage of merchandise export

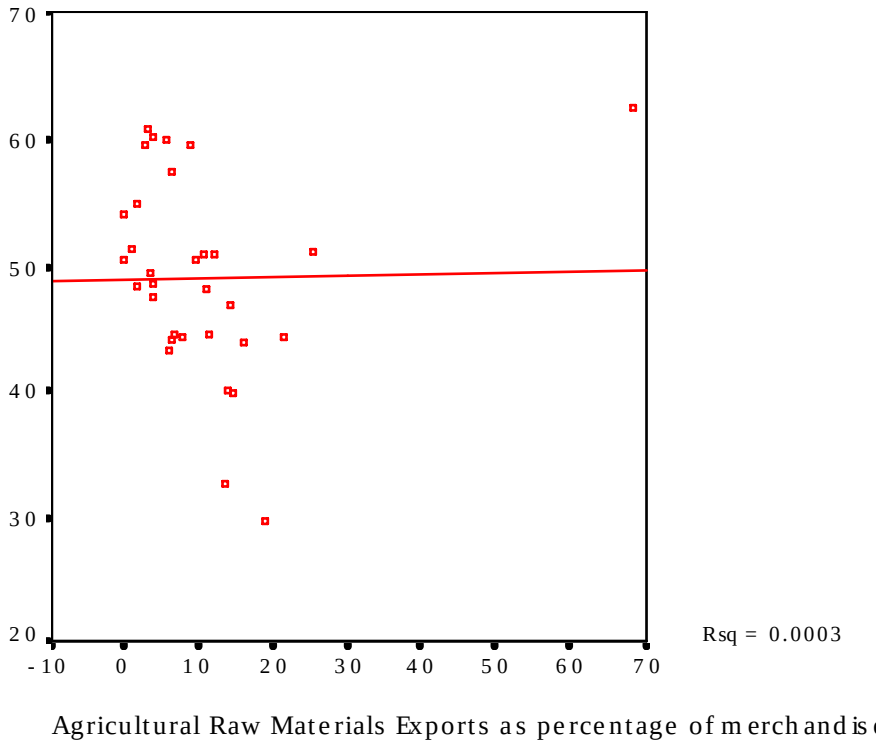

Figure 5-6. Scatterplot agricultural raw materials exports as percentage of merchandise exports

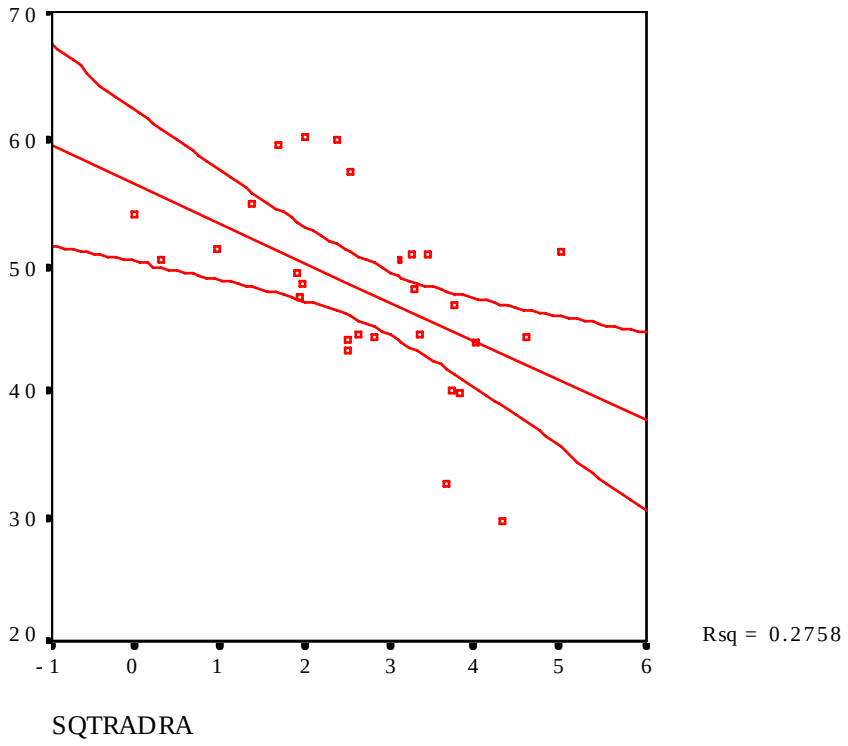

Figure 5-7. Scatterplot square-root raw agricultural exports as percentage of merchandise exports

Table 5-8. Correlations of agricultural exports and development

		GDPPPPCA	LOGGDPPP	AGVALUE	TRADFOOD	SQRTTRAW
GDPPPPCA	Pearson Correlation	1	.883**	-.543**	-.339	-.066
	Sig. (2-tailed)	.	.000	.000	.072	.725
LOGGDPPP	Pearson Correlation	.883**	1	-.568**	-.282	.131
	Sig. (2-tailed)	.000	.	.000	.139	.481
AGVALUE	Pearson Correlation	-.543**	-.568**	1	.427*	.402*
	Sig. (2-tailed)	.000	.000	.	.021	.025
TRADFOOD	Pearson Correlation	-.339	-.282	.427*	1	.514**
	Sig. (2-tailed)	.072	.139	.021	.	.005
SQRTTRAW	Pearson Correlation	-.066	.131	.402*	.514**	1
	Sig. (2-tailed)	.725	.481	.025	.005	.

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

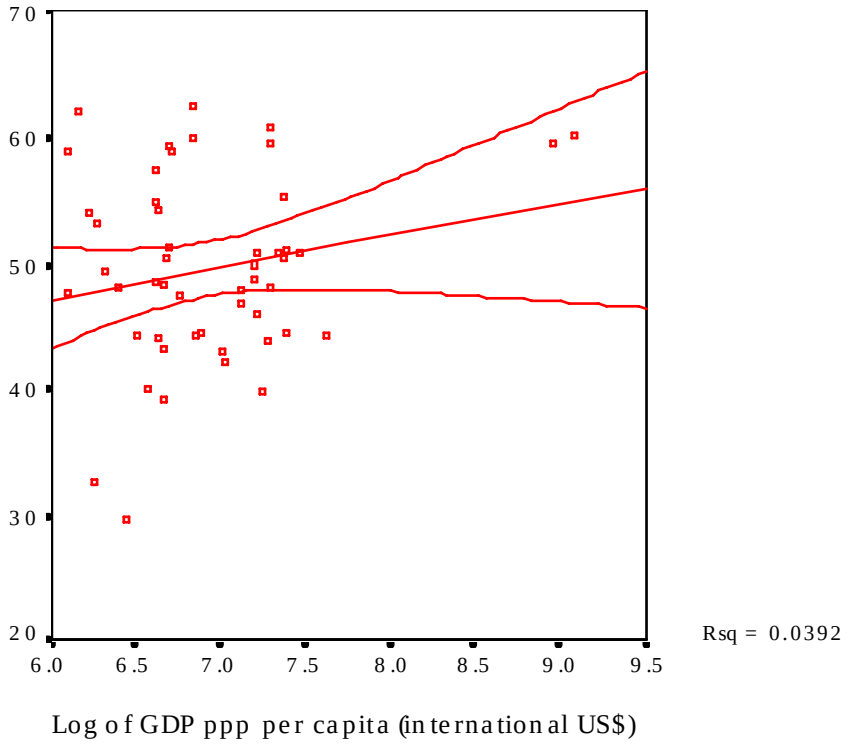

Figure 5-8. Scatterplot of log of GDP ppp per capita

Table 5-9. Correlations of arable land (ha per person)

		Gini Coefficient	GDP ppp per capita (international US$)	Log of GDP ppp per capita (international US$)	Arable Land (ha per person)
Gini Coefficient	Pearson Correlation	1	.273	.198	.342**
	Sig. (2-tailed)	.	.055	.168	.015
GDP ppp per capita (international US$)	Pearson Correlation	.273	1	.882	.152
	Sig. (2-tailed)	.055	.	.000	.293
Log of GDP ppp per capita (international US$)	Pearson Correlation	.198	.882	1	.057
	Sig. (2-tailed)	.168	.000	.	.692
Arable Land (ha per person)	Pearson Correlation	.342**	.152	.057	1
	Sig. (2-tailed)	.015	.293	.692	.

** Correlation is significant at the 0.05 level (2-tailed)

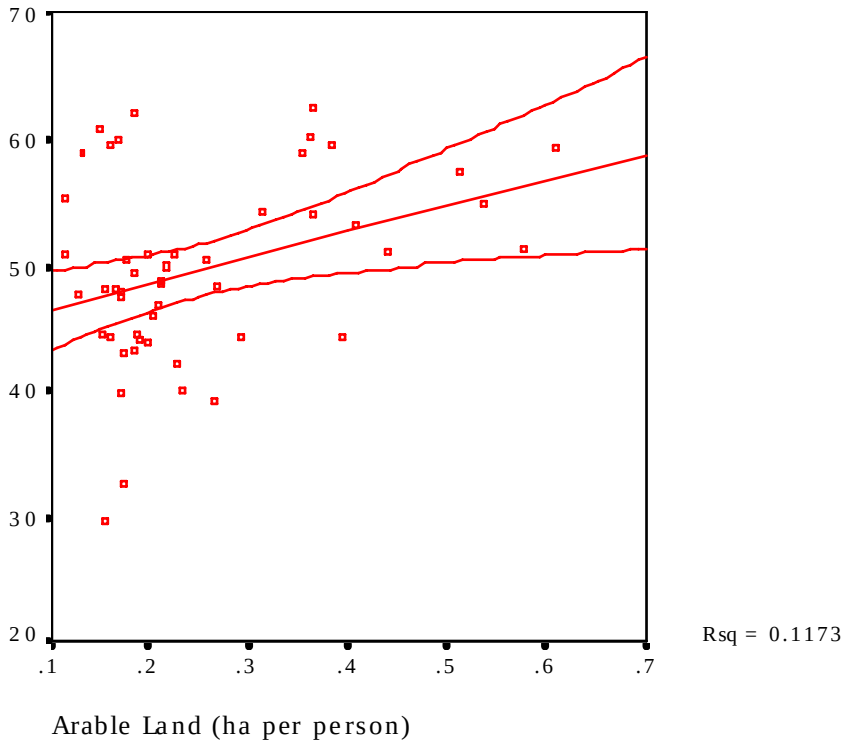

Figure 5-9. Scatterplot arable land

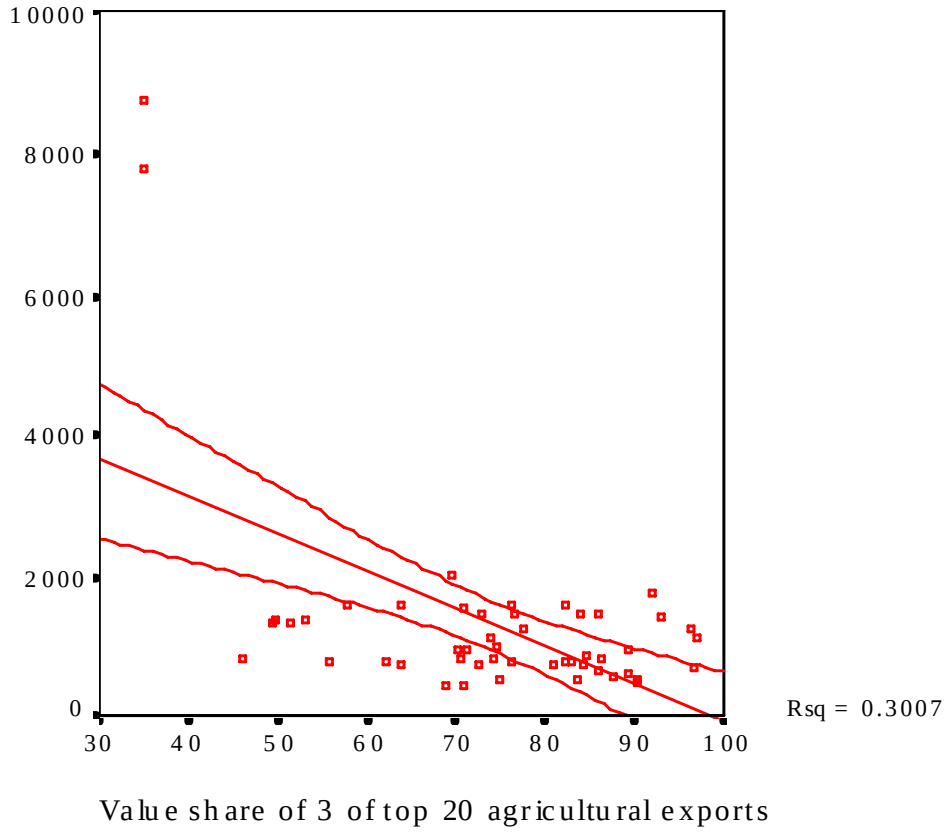

Figure 5-10. Scatterplot value share of three of the top 20 agricultural exports versus GDP ppp per capita

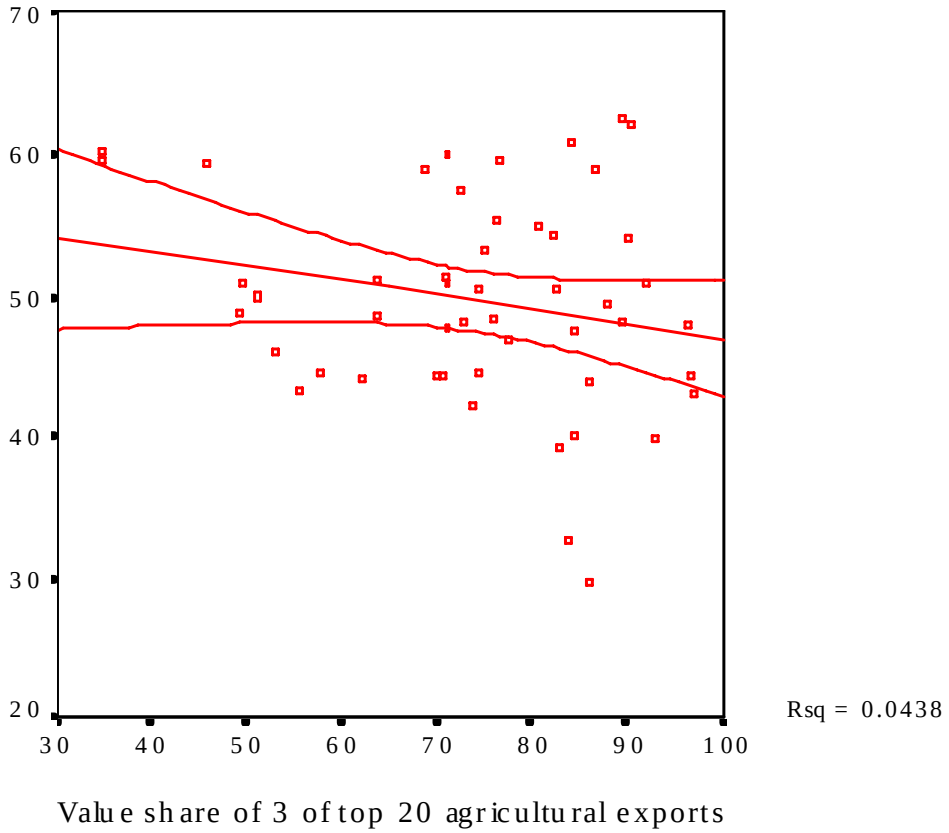

Figure 5-11. Scatterplot value share of three of the top 20 agricultural exports versus Gini coefficient

Table 5-10. Correlations of value share of 3 of Top 20 agricultural exports

		Gini Coefficient	GDP ppp per capita (international US$)	Log of GDP ppp per capita (international US$)	Value share of 3 of top 20 agricultural exports
Gini Coefficient	Pearson Correlation	1	.273	.198	-.209
	Sig. (2-tailed)	.	.055	.168	.145
GDP ppp per capita (international US$)	Pearson Correlation	.273	1	.882	-.548****
	Sig. (2-tailed)	.055	.	.000	.000
Log of GDP ppp per capita (international US$)	Pearson Correlation	.198	.882	1	-.502****
	Sig. (2-tailed)	.168	.000	.	.000
Value share of 3 of top 20 agricultural exports	Pearson Correlation	-.209	-.548****	-.502****	1
	Sig. (2-tailed)	.145	.000	.000	.

**** Correlation is significant at < 0.01 level

Table 5-11 Correlations of cash crops dummy variable

		Cash Crops	Gini Coefficient
Cash Crops	Pearson Correlation	1	-.358**
	Sig. (2-tailed)	.	.011
Gini Coefficient	Pearson Correlation	-.358	1
	Sig. (2-tailed)	.011	.

** Correlation is significant at 0.05 level

Cash Crops Dummy: 1 = The top export crop for a given year was coffee, cotton, cocoa or tea.

Table 5-12. Correlations of agricultural policies, inequality and growth

		Gini Coefficient	GDP ppp per capita	Log GDP ppp per capita	Before WTO
Gini Coefficient	Pearson Correlation	1	.273	.198	.304*
	Sig. (2-tailed)	.	.055	.169	.032
GDP ppp per capita	Pearson Correlation	.273	1	.883	-.037
	Sig. (2-tailed)	.055	.	.000	.800
Log GDP ppp per capita	Pearson Correlation	.198	.883	1	-.037
	Sig. (2-tailed)	.169	.000	.	.801
Before WTO	Pearson Correlation	.304*	-.037	-.037	1
	Sig. (2-tailed)	.032	.800	.801	.

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

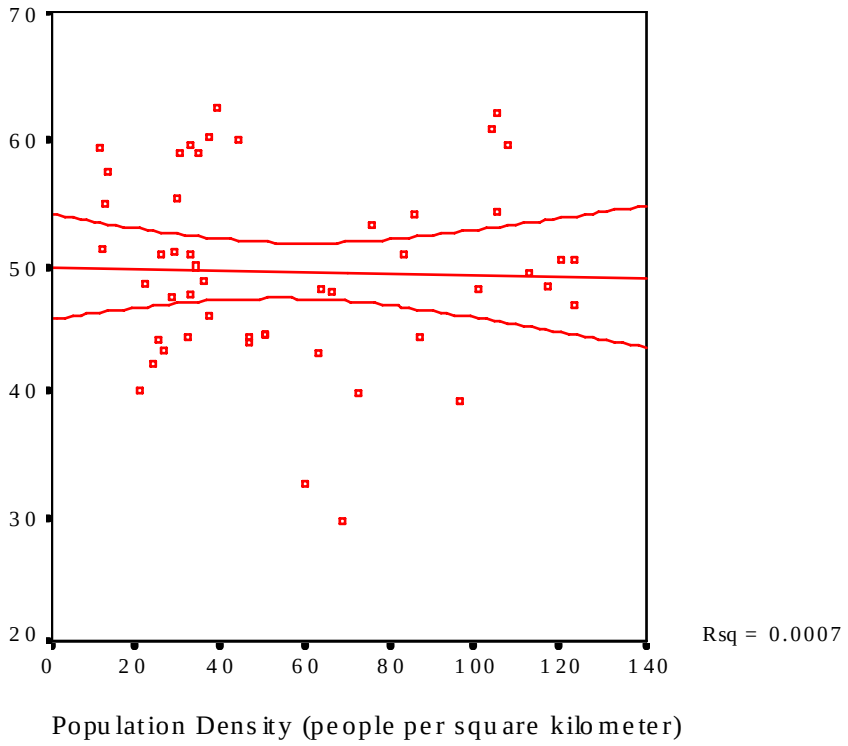

Figure 5-12. Scatterplot of population density

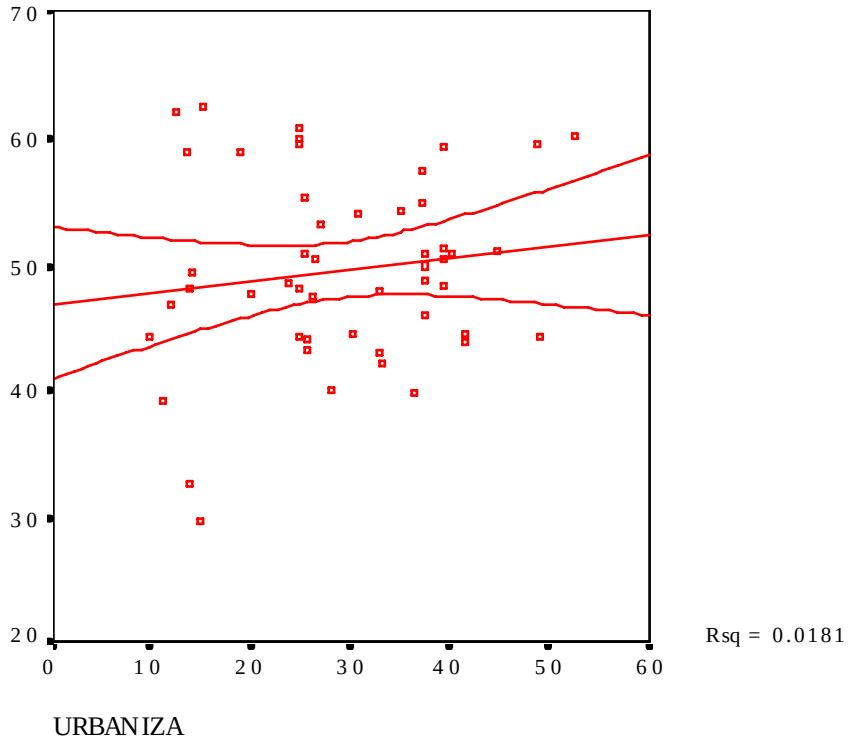

Figure 5-13. Scatterplot of urbanization

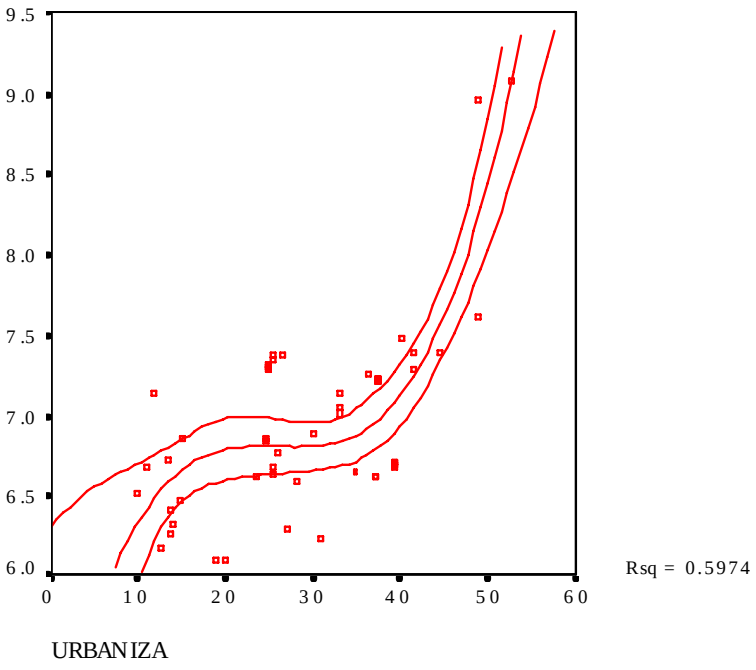

Figure 5-14. Scatterplot of non-linear (cubic) relationship between urbanization and log of GDP ppp per capita

Table 5-13. Correlations of urbanization, inequality and growth

		Gini Coefficient	GDP ppp per capita	Log GDP ppp per capita	Urbanization (%)	Population Density
Gini Coefficient	Pearson Correlation	1	.273	.198	.135	-.027
	Sig. (2-tailed)	.	.055	.169	.352	.854
GDP ppp per capita	Pearson Correlation	.273	1	.883	.515**	-.123
	Sig. (2-tailed)	.055	.	.000	.000	.394
Log GDP ppp per capita	Pearson Correlation	.198	.883	1	.619**	-.103
	Sig. (2-tailed)	.169	.000	.	.000	.476
Urbanization (%)	Pearson Correlation	.135	.515**	.619**	1	-.308*
	Sig. (2-tailed)	.352	.000	.000	.	.029
Population Density	Pearson Correlation	-.027	-.123	-.103	-.308*	1
	Sig. (2-tailed)	.854	.394	.476	.029	.

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

Table 5-14. Correlations of landlocked dummy variable

		Landlocked	Log of GDP ppp per capita (international US$)
Landlocked	Pearson Correlation	1	-.387****
	Sig. (2-tailed)	.	.006
Log of GDP ppp per capita (international US$)	Pearson Correlation	-.387	1
	Sig. (2-tailed)	.006	.

**** Correlation is significant at < 0.01 level

CHAPTER 6
DISCUSSION

Empirical Contributions

The role of agriculture, as measured through production and exports in relationship to income inequality in sub-Saharan Africa has seldom been addressed by previous research. While previous studies have investigated the impact of inequality on growth, or vice versa, as well as the relationship between income inequality and other socio-economic variables, the findings developed in our regression models statistically significantly show that there appears a strong relationship between inequality and agricultural production and exports in sub-Saharan Africa, confirming our main hypotheses.

This main finding should not come as a surprise. Given the complexities of the dependent variable, inequality, and the independent variable of interest, agriculture, it might strike us as a surprise, however, which specific variables were found to be significant and insignificant in the models respectively. One might be surprised to find that agricultural variables still were the most significant, even when placed in a model with conventional inequality-shaping variables, such as degree of urbanization, infant mortality, or GDP ppp per capita. Given that urbanization was significant in some models, the most surprising non-factor in the equation might arguably be infant mortality, which might have been expected to measure to some degree socio-economic inequalities as reflected in mortality figures according to Sen (1998).

The least surprising of the independent significant variables appears to be the percentage of value added of agriculture to the GDP. Given the overall complexities of the agricultural sector's forces, this broad variable seems well-fit to capture the overall strength and importance of agricultural production in a country. While partially reminiscent of the Kuznets hypothesis, the countries with a higher share of value added of agriculture seem to enjoy a lower amount of

income inequality. It is clearly difficult to pinpoint specifically to a single factor influencing this result, such as a heavier taxation of the sector, immobility of labor due to lack of employment opportunities in other sectors and being tied to the land, or successful development aid policies targeting agriculture. Even though failing to highlight specific complexities, as shown in Chapter 4, the agricultural sector plays an important role in a majority of the citizens under study and thus appears to reflect well the importance it plays not only on their economic developments, through income and growth, but also on inequality. Consequently, similar to such case studies as Adams (1995), these findings put forward the claim that agricultural production matters in relationship to inequality.

The other agricultural variables found significant, agricultural food exports and total agricultural exports as percentage of total merchandise exports, allow us to delve below the surface of the previous variable, as it highlights the importance of agricultural exports. Consequently, while the previous variables measured agricultural production, this variable measures agricultural production that resulted in exports. The regression models show that the share of agricultural exports is significantly related to the amount of income inequality observed in our countries. However, beyond that significant relationship, it also contributes to the growing body of existing scholarship on the impact of trade and exports (sometimes broadly labeled as globalization), by displaying a negative relationship between an increased share of agricultural exports and income inequality. This finding, compared to the previous variable's empirical contribution, appears far more contentious, as it seems to support arguments in favor of an export-oriented agricultural sector in connection with reducing inequality. The slope of the variable appears to indicate that an increase in agricultural export commodities, most likely cash crops, is correlated with a lower amount of inequality at the national scale. This argument is

strengthened by the negative and significant correlation between cash crop exports in a given year and the Gini coefficient, as well as the robustness of the variable's importance. This appears to support Adams findings that cash crops are able to positively influence income-distributions through the creation of new income and employment opportunities (1995, 467). One of the countries that is displaying a high amount of exports and a low amount of inequality is for example Ethiopia. Recalling Ethiopia's agricultural sector's structure, it is heavily dominated by coffee exports produced by smaller-scale farmers. Consequently, given this more equal distribution of cash crop productions in Ethiopia, as opposed to South Africa or Kenya, the country appears to be a prime example supporting this variable's direction of the slope.

It is important to note that scale is a key factor in our analysis. At the local and regional level the introduction of export production and/or cash crops might increase the gap between the richer and the poorer farmers. Since our study focuses on the national level, this would not be the case on this aggregated level for the following reason. Given the lower starting point of wealth for the rural wealthier farmers, their increased share of income would be inequality reducing at the national scale, as they move upwards on the ladder from the bottom towards the middle tier, effectively reducing national inequality.

Since the variable measures the *share* and not the absolute *amount* of agricultural food exports, it could be derived that, similarly to the previous dependent variable on agricultural GDP, that a large manufacturing export sector, on other hand, has an inequality increasing impact, placing South Africa at the other end of the strata. However, the formal statistical analysis undertaken on that variable (as agricultural exports as percentage of GDP) was not significant. Nevertheless, while appearing to contribute to the literature by highlighting the negative relationship between agricultural exports and income inequality, with inequality

decreasing, there is a chance that the variable might just measure agricultural exports vis-à-vis a weak manufacturing sector. However, given the lack of correlation, the models support the empirical finding that this variable adds a unique, significant dimension to our understanding of inequality.

This finding of the importance of the export-orientation of agricultural production gains further weight by the third agricultural variable found to be significant: the WTO time dummy. As indicated by the positive slope, countries' income inequalities are statistically significantly lower after the end of the Uruguay Round and the creation of the WTO. While the variable certainly could measure other important factors, such as the wave of democratization and increasing stability that swept across the African landscape in the 1990s, even in its broader interpretation it appears to hold its weight. In fact, as observed in our case studies, almost every country has undergone by the end of the 20th century a process of liberalization and/or privatization of its agricultural sector. These reforms included a reduction of export barriers, and benefiting from facilitated access to some main export markets, i.e. EU, in the aftermath of the implementation of the Uruguay Round. Of course, this transformation was by no means linear. Nevertheless, it appears to add strength to the previous variable's findings that increased export orientation is not related to increased, but overall decreased inequality. Observing the lack of correlations between the WTO dummy and measures of development (GDP ppp per capita), it appears that the impact of the independent dummy variable is applicable only to income inequality, as the experience in terms of economic development are more diverse. Consequently, while not necessarily increasing the overall income, as identified in the case of Uganda for example (Kayizzi-Mugerwa 2001), the post-1994 time dummy might hint at the ability of poorer farmers of benefiting from higher prices of their crops in the aftermath.

The control variable, urbanization, holds also a negative slope in several of our models, as an increase in urbanization is related to a decrease in income inequality. While not as significant as the other agricultural variables, it appears to capture forces that are not increasing the urban-rural dualism per se. Consequently, the direction of the slope could hint at the potential decline in the urban bias in sub-Saharan Africa (Lipton 1977), as it also might run counter to Bates' claim of the urban interests creating policies hostile to farmers (Bates 2005). Furthermore, it could hint at an overall increase in local demand by the new urbanites for agricultural products for consumption and manufacturing (Tiffen 2003), the creation of backward- and forward-linkages, and a subsequent increase in the availability of non-farm income opportunities, including remittances, further stabilizing the livelihoods of the rural poor. From a political perspective, the relationship between urbanization and income inequality in our regression model could also stem from an observed increase in bargaining power of farmers, something that was not likely to occur in previous decades (Bassett 2001). It is this latter argument concerning the bargaining power that will be pursued in the next section concerning the policy implications of these findings. Overall though, by observing the interactions between the urbanization variable and the Gini coefficient in our correlation analysis (Table 5-11), it surprisingly is not significant, indicating the weakness of a linear relationship on the one hand, while furthermore highlighting the very strong correlations between urbanization and GDP ppp per capita, as an increase in urbanization is associated with a significantly higher level of development.

Agriculture is also statistically significant in explaining patterns of GDP ppp per capita, as measured by the independent variables of the value share of three of the top 20 agricultural exports and agriculture value added. The latter has been shown to be highly significant, with a negative slope, indicating that an increase of the contribution of agriculture to the GDP is related

with a decrease in the level of development, a finding that appears not to be surprising and seems to confirm previous findings, such as by the FAO (2004) and Grant and Agnew (1996). Similarly, the dependency variable appears to support the previous claim that a lack of diversity will hold a negative impact on economic development in the long-run. This variable's relationship to GDP ppp per capita is unique, and no significant correlation has been identified with the Gini coefficient.

While not found in the regression model, another key variable, arable land, is correlated with the Gini coefficient, yielding a positive correlation value, as proved previously in the literature (Dollar and Kray 2002). It consequently appears to support than an increase in arable land (ha per person) is correlated with a higher Gini coefficient. This finding was expected after the literature review and thus only adds to the previous scholarship. Recalling South Africa's struggle with land redistribution, the country is a case in point, as it actually holds around .4 ha per capita, well-above the mean of .25 ha per capita, and one of the highest Gini coefficients in our sample around 60.

Overall, the findings that agricultural variables significantly explain a great degree of income inequality in our case studies greatly contributes to the prior research and understanding on inequality in sub-Saharan Africa. While these findings appear to support the Kuznets hypothesis, GDP ppp per capita was not found to be significant in our income inequality models, highlighting that agriculture and the overall structure of the economy appears to better capture the complexities in our sample. Consequently, given the lack of linear relationship between the Gini coefficient and GDP ppp per capita, even if logged, the findings appear to place an important question mark behind its contribution towards affirming this age-old hypothesis, as it highlights the importance of the overall structure of the economy, as opposed to its gross output.

Policy Implications

Translating the above empirical contributions into policy implications, there are two major implications that stand out: strengthening the WTO negotiations and supporting pro-poor agricultural development strategies focused on diversification.

Strengthening the WTO negotiations

Positive impacts of a successful (and meaningful) WTO Doha Development Round have been widely discussed in relationship to improved world commodity prices at the international level, increased export revenue at the national level trickling down and resulting in a subsequent reduction of poverty ultimately. While questions concerning the long-term viability and economic, environmental sustainability of such an agreement remain, its impact on inequality has rarely been discussed (Ledermann and Moseley 2006). This study's findings consequently add another important variable to the negotiating table for discussion. As an agreement is likely to increase the share of agriculture's contribution towards the economy, especially exports, it seems clear that it subsequently will have a positive impact on reducing inequality. Thus, it appears to add another key argument to both the First and Third world negotiators' toolset.

Given the First world policymakers' increasing interest in reducing inequality through development, it appears that this goal, which is usually targeted specifically through aid, could be greatly impacted by achieving a truly historic breakthrough towards more 'free and fair' trade of agricultural goods, guided by the principle of equitable growth. This additional argument of decreasing inequality might hold little weight in the public arena of the interest groups most likely to lose by a reduction of subsidies and tariffs in the developed worlds, such as farmers and agro-businesses. Nevertheless, a narrative could be constructed highlighting symbiotic relationship between lesser dependency on aid in Africa and increased ability to support

domestic programs, such as farm payments made for ecological, not economic reasons, as is the case in Switzerland.

From a Third world negotiators' perspective, the finding that a potential increase in agricultural production and exports might have a positive impact on inequality further showcases the importance of achieving a successful agreement. Negotiators, with their smaller technical capacities, are certainly likely already at their limits and undertaking all steps possible. It however could substantially add another meaningful component to their bargaining power, as they could publicly increase awareness that a successful outcome is not only likely to increase growth, reduce poverty, but also holding the potential to reduce inequality. Given their governments' increasing concerns at improving the livelihoods of a majority of people, a successful outcome consequently had the potential of increasing domestic support at home, as well as improve their standing in the face of international donors and organizations by achieving greater success at reducing poverty. Even beyond the connection with agriculture, any achieved reduction in inequality is likely to translate growth more efficiently into poverty reduction results (Fosu 2005).[36]

Pro-Poor Development Strategies focused on Agricultural Diversification

Given this described potential positive contribution towards the policy environment surrounding the Doha Round, it is important to place the significance of inequality and agriculture within the broader spectrum of development policy. First, lower inequality, by no means, is currently (nor either likely to be) the maxim of development, as reduced poverty and increased growth continue to dominate the policy arena. Secondly, agricultural development per

[36] This process of course will vastly differ, based upon the current commodity chains in place. As discussed in Chapter 4, Ethiopian coffee farmers, for example, are receiving a significantly smaller share of the world price than their Eastern African counterparts.

se is not a panacea for development. As shown in the empirical study, an increase in the agricultural sector's share of the economy is related to a lower GDP ppp per capita, indicating the need for countries to diversify outside of the sector in order to achieve higher growth.

Given these two important limitations, based upon our findings an important avenue for agricultural development appears to exist through the strengthening of pro-poor growth policies that emphasize agricultural diversification cation (Dorward et al. 2004). Since a decreased dependency on a few crops has been found to hold a positive relationship with GDP ppp per capita, and an overall increase in agricultural production holds a positive one with inequality, agricultural development policies focused on diversifying export production and promoting diversification through support and education to the local farmers could ideally have both an inequality reducing and growth increasing impact.

Any potential increase of development efforts in the agricultural sector however should be undertaken in conjunction with a clear policy aimed at addressing the disparaging problems surrounding land inequality. While the land variable has not been found to be statistically significant in our model, there is a clear need to address the issue in several of our case studies, including Kenya and South Africa, in order to achieve progress on land redistribution and equality. A lack of land equality might seriously undermine any potential positive impact of both the WTO agreement or diversification efforts, as farmers are limited in their small land holdings to respond to the incentives created by higher world prices and lower export barriers, expand production and consequently reap the benefits of those policy achievements or changes.

CHAPTER 7
CONCLUSION AND FURTHER AVENUES

This study on inequality and growth stemmed from an intricate and growing curiosity to investigate the multiple roles played by the agricultural sector in sub-Saharan Africa. As referenced in the introduction, a keen aspect of the research is to highlight the way policies and policy makers are shaping this sector across all scales, from the global to the local. Consequently, while the thesis' proximate goal was to evaluate the links between agriculture, inequality and growth, its ultimate aim is to translate the findings into policy implications. Having established, both quantitatively and qualitatively that the agricultural production and exports in our case studies explain a significant variation in their patterns of income inequality, we have moved beyond the empirical findings by highlighting possible policy implications.

In summary, the study not only builds upon previous studies on income inequality in sub-Saharan Africa, but takes a step further successfully arguing that a great degree of variation in income inequality in sub-Saharan Africa can be explained through differences in the agricultural sectors. Especially astonishing are the overall robustness of these agricultural variables across numerous regression models in lieu of other variables such as infant mortality and urbanization, as well as their positive contribution towards reducing pressures of greater income inequality at the national scale. It consequently highlights once again the far reaching importance of this primary sector beyond economic growth on the path towards development into the 21st century.

The lack of in-field work and primary data sources clearly looms as one of the brightest avenues for future research in this case. Ideally, fieldwork could be undertaken that investigates the ten countries' agricultural policies at greater depth at the national level. In addition, as highlighted by most of our case studies, scale plays a key role in the measuring inequality, as vast differences tend to exist between various regions, most prominently rural and urban areas.

Working within the limitations of our national-level dataset, one clearly can only hint at the important role they play. Consequently, any fieldwork on policy should ideally be supplemented with local, household-level case studies across multiple years in order to get an understanding of not only the decision-making and adaptation strategies at that scale, but also of the importance or prevalence of inequality (perceived and actual). It is within this context that one might not only acquire better data[37] and a sense of the importance of scale, but also most importantly be able to support and articulate more telling empirical contributions.

Addressing these limitations would ultimately allow for the achieving of the goal of contributing towards the shaping of the policies. While such ambitious work would be extensive, laborious and certainly time-consuming, it appears both necessary and rewarding given the potential implementation of a drastically liberalized trade regime at the international scale in the aftermath of a successful and meaningful end of the WTO Doha Trade Round in the coming years, and the need for a more coherent understanding and managing of its impacts from an African perspective.

[37] One key variable that is of great interest for future investigation is terms of trade, which could provide fertile grounds for a more poignant evaluation of the impacts of trade forces on inequality and growth.

APPENDIX A
NORMALITY

Table A-1. Model 1:Test of normality

	Shapiro-Wilk Statistic	df	Sig.
GINI	.956	38	.138
PREWTO	.633	38	.000
URBANIZA	.957	38	.151
AGVALUE	.962	38	.216
LOGGDPPP	.857	38	.000
INFANTMO	.971	38	.413
TOTAGEXP	.887	38	.001
LNAGXGDP	.864	38	.000

* This is a lower bound of the true significance.
a Lilliefors Significance Correction

Table A-2. Model 2:Test of normality

	Shapiro-Wilk Statistic	df	Sig.
GINI	.956	38	.138
PREWTO	.633	38	.000
URBANIZA	.957	38	.151
AGVALUE	.962	38	.216
TRADFOOD	.925	38	.014
LOGGDPPP	.857	38	.000
INFANTMO	.971	38	.413
SQRTRARA	.892	38	.002

* This is a lower bound of the true significance.
a Lilliefors Significance Correction

Table A-3. Model 3:Test of normality

	Shapiro-Wilk Statistic	df	Sig.
GINI	.966	50	.156
PREWTO	.634	50	.000
ARABLAND	.833	50	.000
VALAGRI3	.940	50	.014
URBANIZA	.960	50	.091
AGVALUE	.960	50	.087
TRADFOOD	.903	50	.001
TRADRAW	.584	50	.000
GDPPPPCA	.436	50	.000
POPDENSI	.897	50	.000
INFANTMO	.972	50	.287

* This is a lower bound of the true significance.
a Lilliefors Significance Correction

Table A-4. Arable land test of normality

	Shapiro-Wilk Statistic	df	Sig.
LOGARABL	.937	50	.010
ARABLAND	.833	50	.000
SQARABL	.891	50	.000

a Lilliefors Significance Correction

Table A-5. Population density test of normality

	Shapiro-Wilk Statistic	df	Sig.
SQPOPDEN	.937	50	.010
LNPOPDEN	.949	50	.031
POPDENSI	.897	50	.000

* This is a lower bound of the true significance.

a Lilliefors Significance Correction

Table A-6. Value of Top 3 Exports Tests of Normality

	Shapiro-Wilk Statistic	df	Sig.
VALAGRI3	.940	50	.014
LOGAGRI	.873	50	.000
SQRAGRI	.912	50	.001

a Lilliefors Significance Correction

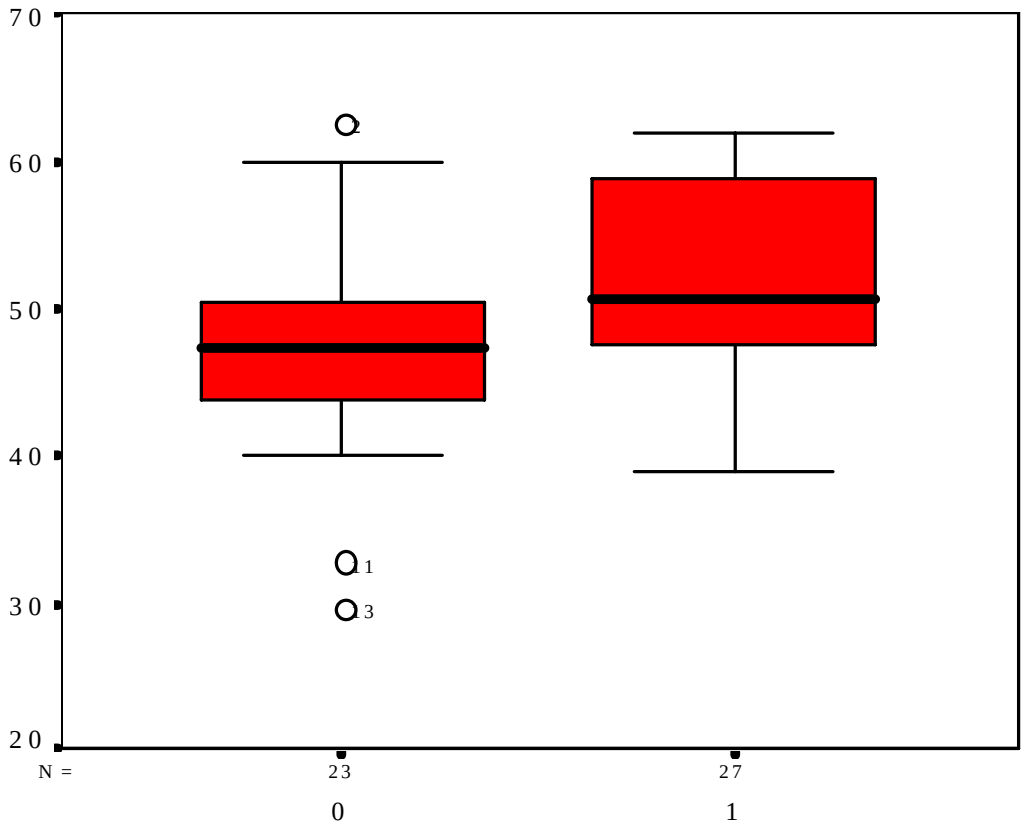

Figure A-1. Before WTO

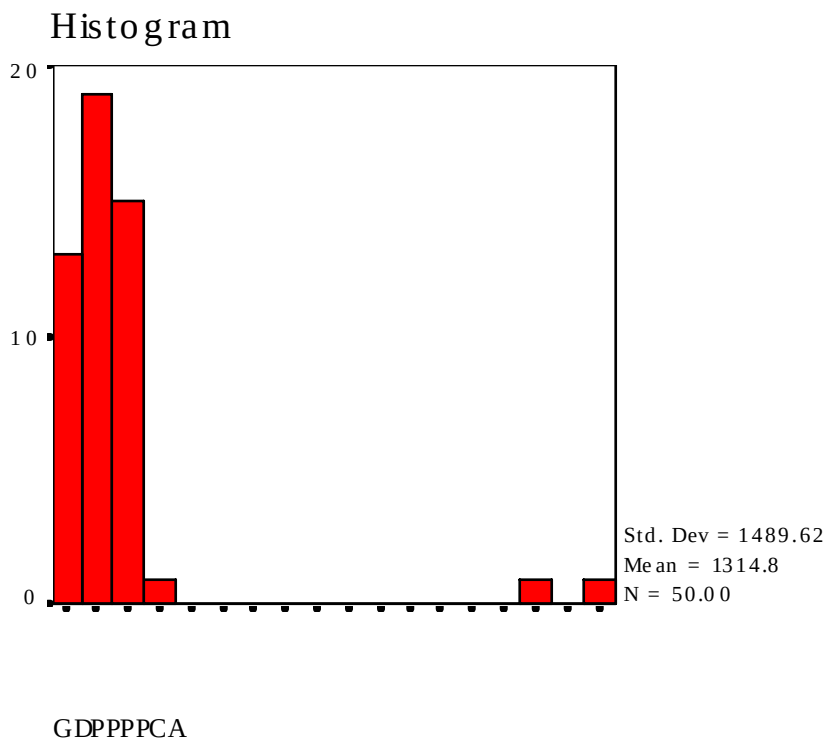

Figure A-2. GDP per capita transformations

Table A-7. GDP ppp per capita test of normality

	Shapiro-Wilk Statistic	df	Sig.
SQGDPPPP	.642	50	.000
GDPPPPCA	.436	50	.000
LOGGDPPP	.856	50	.000

a Lilliefors Significance Correction

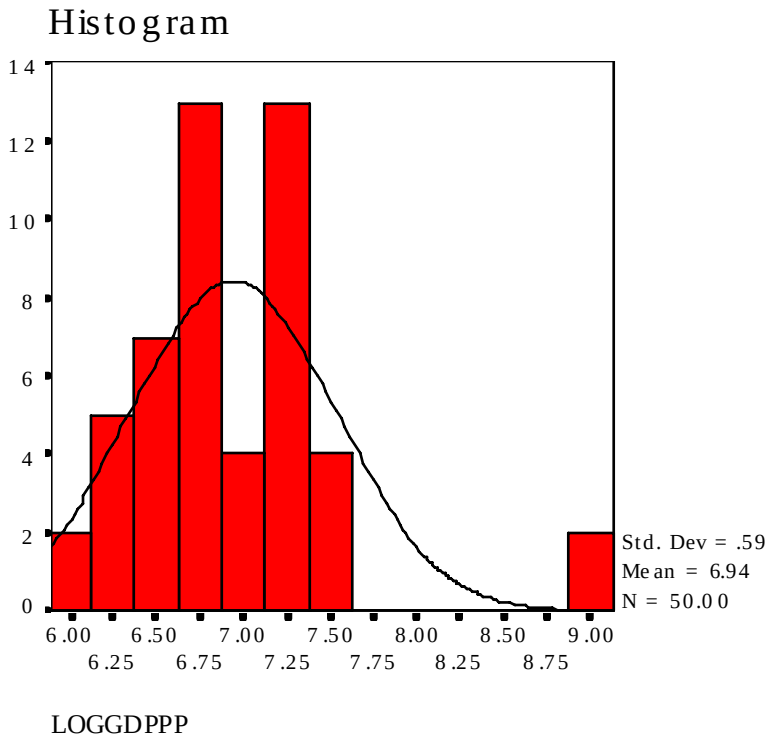

Figure A-3. Histogram of log GDP ppp per capita transformation

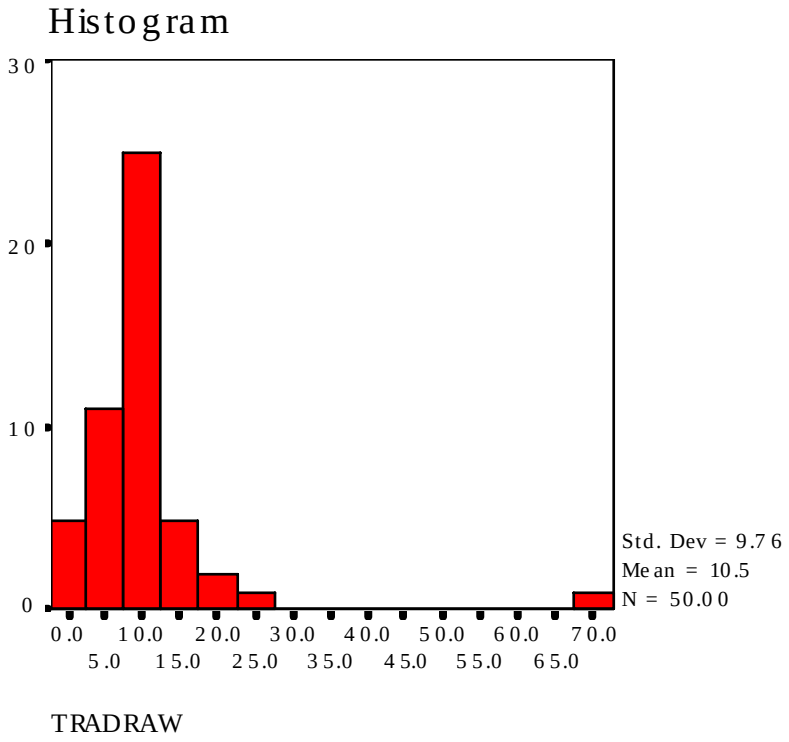

Figure A-4. Histogram of raw trade agricultural goods

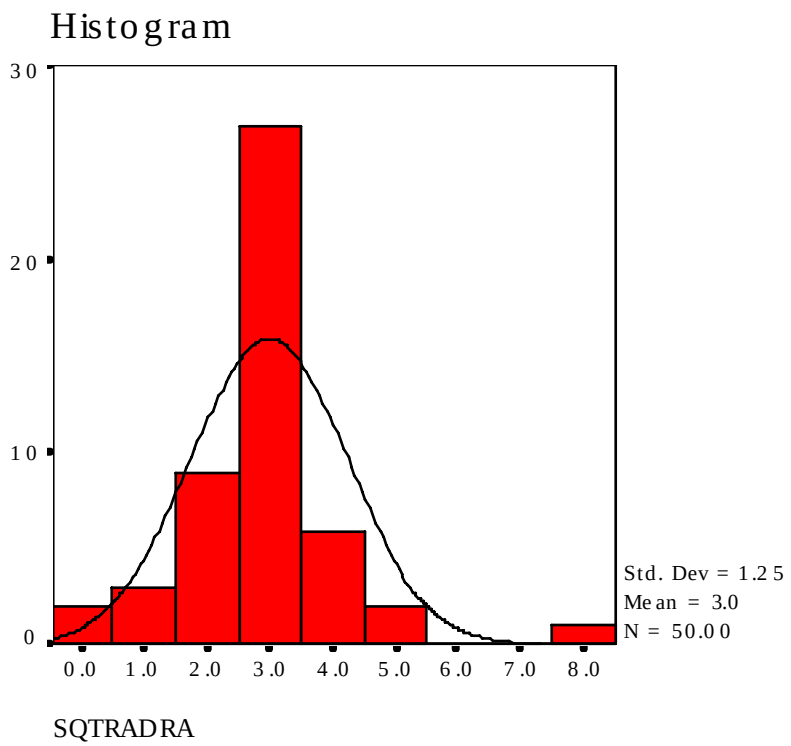

Figure A-5. Histogram of raw agriculture transformation

Table A-8. Trade agricultural raw materials tests of normaliy

	Shapiro-Wilk Statistic	df	Sig.
TRADRAW	.584	50	.000
SQTRADRA	.850	50	.000

a Lilliefors Significance Correction

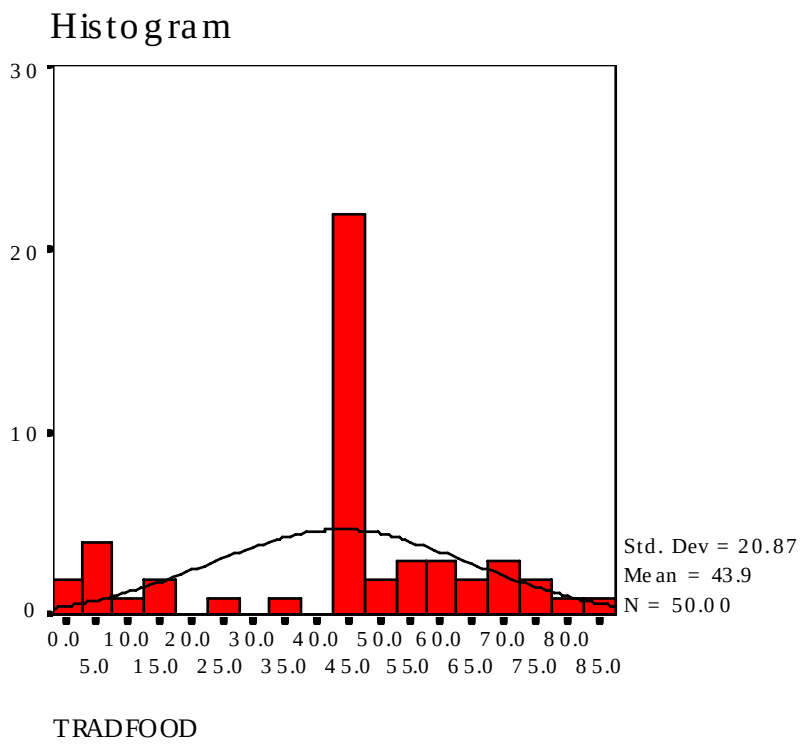

Figure A-6. Histogram trade food exports

Table A-9. Post-Transformation Tests of Normality

	Shapiro-Wilk Statistic	df	Sig.
GINI	.966	50	.156
PREWTO	.634	50	.000
LOGARABL	.937	50	.010
VALAGRI3	.940	50	.014
URBANIZA	.960	50	.091
AGVALUE	.960	50	.087
TRADFOOD	.903	50	.001
SQTRADRA	.850	50	.000
LOGGDPPP	.856	50	.000
LNPOPDEN	.949	50	.031
INFANTMO	.972	50	.287

* This is a lower bound of the true significance.

a Lilliefors Significance Correction

APPENDIX B
OUTLIERS

Table B-1. Model 1 residual statistics

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	38.7646	63.1213	49.9818	5.59221	38
Std. Predicted Value	-2.006	2.350	.000	1.000	38
Standard Error of Predicted Value	1.60781	4.70189	2.78931	.62445	38
Adjusted Predicted Value	40.2407	65.4977	49.9593	6.05972	38
Residual	-11.5136	14.8874	.0000	5.60597	38
Std. Residual	-1.849	2.391	.000	.900	38
Stud. Residual	-2.009	2.563	.001	.999	38
Deleted Residual	-13.5861	17.1021	.0225	6.96381	38
Stud. Deleted Residual	-2.123	2.851	.010	1.036	38
Mahal. Distance	1.494	20.130	6.816	3.612	38
Cook's Distance	.000	.164	.031	.041	38
Centered Leverage Value	.040	.544	.184	.098	38

a Dependent Variable: GINI

Table B-2. Model 1 outliers

Country	Year	GINI	Mahal D	Cook's D	Leverage
Burkina Faso	1994	58.90	4.07924	.00168	.11025
Burkina Faso	1998	62.50	3.81768	.12215	.10318
Cameroon	1996	50.80	6.84780	.07044	.18508
Cameroon	2001	44.20	9.49318	.00036	.25657
Cote d`Ivoire	1985	50.60	9.51945	.00640	.25728
Cote d`Ivoire	1995	43.90	5.65703	.00096	.15289
Cote d`Ivoire	1998	44.40	5.78623	.00297	.15638
Ethiopia	1995	32.70	7.14803	.04274	.19319
Ethiopia	2000	29.70	4.67063	.09081	.12623
Gambia	1993	60.86	2.32193	.00802	.06275
Gambia	1994	59.45	2.06468	.00515	.05580
Gambia	1998	50.20	8.24548	.04833	.22285
Ghana	1992	39.70	7.77637	.03850	.21017
Ghana	1998	50.70	6.04525	.04832	.16339
Guinea	1991	50.70	10.34476	.06216	.27959
Guinea	1994	55.10	6.67054	.00373	.18028
Kenya	1992	59.90	6.18728	.01969	.16722
Kenya	1994	44.30	4.34378	.03943	.11740
Kenya	1997	44.50	3.79572	.00503	.10259
Madagascar	1993	48.50	7.41296	.00677	.20035
Madagascar	1997	44.00	2.34465	.00722	.06337
Madagascar	2001	47.40	4.31458	.01030	.11661
Malawi	1993	62.00	6.07669	.10578	.16423
Malawi	1997	49.30	6.16731	.00256	.16668
Mozambique	1997	40.00	7.76913	.00004	.20998
Mozambique	2003	42.00	1.49400	.01382	.04038
Nigeria	1985	53.80	6.35705	.00056	.17181
Nigeria	1996	48.30	6.69889	.01145	.18105
Nigeria	1997	50.20	20.13034	.16439	.54406
South Africa	1993	59.50	13.68649	.04597	.36991
South Africa	1997	60.10	13.61450	.00490	.36796
Tanzania	1991	58.90	3.74551	.05208	.10123
Tanzania	1993	47.70	3.79126	.00056	.10247
Uganda	1989	44.30	11.23542	.11089	.30366
Uganda	2000	46.90	7.86212	.00371	.21249
Zambia	1993	51.10	5.79890	.00397	.15673
Zambia	1996	54.80	8.15003	.00176	.22027
Zambia	1998	57.40	7.53513	.00829	.20365

Table B-3. Model 2 residual statistics

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	36.6165	63.6560	49.9818	6.17281	38
Std. Predicted Value	-2.165	2.215	.000	1.000	38
Standard Error of Predicted Value	1.42610	4.71758	2.45566	.60476	38
Adjusted Predicted Value	37.8261	66.1581	49.9187	6.31344	38
Residual	-12.0342	11.9001	.0000	4.95945	38
Std. Residual	-2.185	2.161	.000	.900	38
Stud. Residual	-2.343	2.351	.004	.993	38
Deleted Residual	-13.8438	14.0848	.0631	6.07305	38
Stud. Deleted Residual	-2.549	2.559	.008	1.031	38
Mahal. Distance	1.507	26.171	6.816	4.284	38
Cook's Distance	.000	.127	.028	.034	38
Centered Leverage Value	.041	.707	.184	.116	38

a Dependent Variable: GINI

Table B-4. Model 2 outliers

Country	Year	GINI	Mahal D	Cook's D	Leverage
Burkina Faso	1994	58.90	3.80324	.00147	.10279
Burkina Faso	1998	62.50	26.17143	.04349	.70734
Cameroon	1996	50.80	7.69390	.05344	.20794
Cameroon	2001	44.20	9.24690	.00127	.24992
Cote d`Ivoire	1985	50.60	9.11601	.01161	.24638
Cote d`Ivoire	1995	43.90	5.48210	.00143	.14816
Cote d`Ivoire	1998	44.40	4.79566	.00008	.12961
Ethiopia	1995	32.70	7.75715	.02555	.20965
Ethiopia	2000	29.70	3.86274	.10323	.10440
Gambia	1993	60.86	2.33784	.00754	.06318
Gambia	1994	59.45	2.06511	.00537	.05581
Gambia	1998	50.20	4.06209	.02937	.10979
Ghana	1992	39.70	7.68583	.05686	.20773
Ghana	1998	50.70	6.23507	.10648	.16852
Guinea	1991	50.70	9.98365	.04915	.26983
Guinea	1994	55.10	6.58664	.00374	.17802
Kenya	1992	59.90	6.30099	.01741	.17030
Kenya	1994	44.30	4.39199	.04978	.11870
Kenya	1997	44.50	3.95964	.00263	.10702
Madagascar	1993	48.50	5.12738	.00635	.13858
Madagascar	1997	44.00	2.41769	.00387	.06534
Madagascar	2001	47.40	3.65847	.00094	.09888
Malawi	1993	62.00	4.76563	.12680	.12880
Malawi	1997	49.30	8.20754	.08383	.22183
Mozambique	1997	40.00	6.09805	.00025	.16481
Mozambique	2003	42.00	1.50688	.01938	.04073
Nigeria	1985	53.80	7.27245	.00048	.19655
Nigeria	1996	48.30	6.01937	.00451	.16269
Nigeria	1997	50.20	9.24111	.01250	.24976
South Africa	1993	59.50	12.93092	.06865	.34948
South Africa	1997	60.10	13.96243	.04545	.37736
Tanzania	1991	58.90	3.90183	.05724	.10545
Tanzania	1993	47.70	3.95451	.00289	.10688
Uganda	1989	44.30	9.84909	.04327	.26619
Uganda	2000	46.90	7.98479	.00006	.21581
Zambia	1993	51.10	5.55977	.00823	.15026
Zambia	1996	54.80	7.79237	.00482	.21060
Zambia	1998	57.40	7.21171	.00190	.19491

Table B-5. Model 3 residuals statistics

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	37.8060	61.3916	49.5928	5.16343	50
Std. Predicted Value	-2.283	2.285	.000	1.000	50
Standard Error of Predicted Value	1.37668	4.53990	2.21080	.57068	50
Adjusted Predicted Value	35.7108	62.3716	49.3800	5.19473	50
Residual	-12.6963	12.4716	.0000	5.28143	50
Std. Residual	-2.226	2.186	.000	.926	50
Stud. Residual	-2.349	2.342	.015	1.005	50
Deleted Residual	-14.1375	14.3111	.2128	6.32884	50
Stud. Deleted Residual	-2.490	2.482	.017	1.029	50
Mahal. Distance	1.874	30.054	6.860	4.658	50
Cook's Distance	.000	.416	.027	.062	50
Centered Leverage Value	.038	.613	.140	.095	50

a Dependent Variable: GINI

Table B-6. Model 3 outliers

Country	Year	Gini	Mahal D	Cook's D	Leverage
Burkina Faso	1998	62.5	30.05417	0.41623	0.61335
Burkina Faso	1994	58.9	4.30376	0.00625	0.08783
Cameroon	1996	50.8	8.94271	0.03521	0.1825
Cameroon	2001	44.2	10.64911	0.0038	0.21733
Cote d`Ivoire	1985	50.6	6.3553	0.00491	0.1297
Cote d`Ivoire	1986	49.9	2.33501	0.00042	0.04765
Cote d`Ivoire	1987	48.8	2.33418	0.00124	0.04764
Cote d`Ivoire	1988	45.9	2.47294	0.00479	0.05047
Cote d`Ivoire	1995	43.9	5.1076	0.0026	0.10424
Cote d`Ivoire	1998	44.4	5.02732	0.00085	0.1026
Ethiopia	1997	48.2	7.24036	0.10051	0.14776
Ethiopia	1995	32.7	6.45135	0.02639	0.13166
Ethiopia	2000	29.7	4.01499	0.07826	0.08194
Gambia	1998	50.2	5.0811	0.01863	0.1037
Gambia	1992	48.13	2.62044	0.01361	0.05348
Gambia	1994	59.45	2.23204	0.00873	0.04555
Gambia	1993	60.86	3.86335	0.02237	0.07884
Ghana	1998	50.7	7.08766	0.06663	0.14465
Ghana	1987	42.9	6.14281	0.00197	0.12536
Ghana	1992	39.7	6.00973	0.02059	0.12265
Ghana	1989	47.9	5.59623	0.0057	0.11421
Guinea	1994	55.1	7.50708	0.00049	0.15321
Guinea	1991	50.7	11.58709	0.03042	0.23647
Kenya	1992	59.9	6.35134	0.03043	0.12962
Kenya	1994	44.3	4.21343	0.01841	0.08599
Kenya	1997	44.5	4.7671	0.00206	0.09729
Madagascar	1993	48.5	4.62309	0.00144	0.09435
Madagascar	1997	44	2.74552	0.00353	0.05603
Madagascar	1999	43.1	4.16232	0.02848	0.08495
Madagascar	2001	47.4	4.15416	0.0008	0.08478
Malawi	1993	62	5.31815	0.10112	0.10853
Malawi	1997	49.3	9.14537	0.03267	0.18664
Mozambique	2003	42	1.87372	0.01603	0.03824
Mozambique	1997	40	6.75419	0.0052	0.13784
Nigeria	1980	53	8.30717	0.01478	0.16953
Nigeria	1985	53.8	11.49635	0.00015	0.23462
Nigeria	1992	54.2	4.8374	0.00027	0.09872
Nigeria	1996	48.3	5.81723	0.00733	0.11872
Nigeria	1997	50.2	12.81475	0.00025	0.26153
South Africa	1993	59.5	15.74307	0.01081	0.32129
South Africa	1997	60.1	16.75582	0.045	0.34196
Tanzania	1993	47.7	3.87176	0.0003	0.07902
Tanzania	1991	58.9	3.88768	0.04881	0.07934
Uganda	1989	44.3	7.31874	0.00914	0.14936

Table B-6. Continued

Country	Year	Gini	Mahal D	Cook's D	Leverage
Uganda	1992	39	5.82977	0.07284	0.11897
Uganda	2000	46.9	7.43776	0.00004	0.15179
Zambia	1991	59.3	8.63906	0.02242	0.17631
Zambia	1993	51.1	7.14074	0.00552	0.14573
Zambia	1996	54.8	8.49363	0.00224	0.17334
Zambia	1998	57.4	7.48437	0.00323	0.15274

APPENDIX C
NORMALLY DISTRIBUTED ERROR

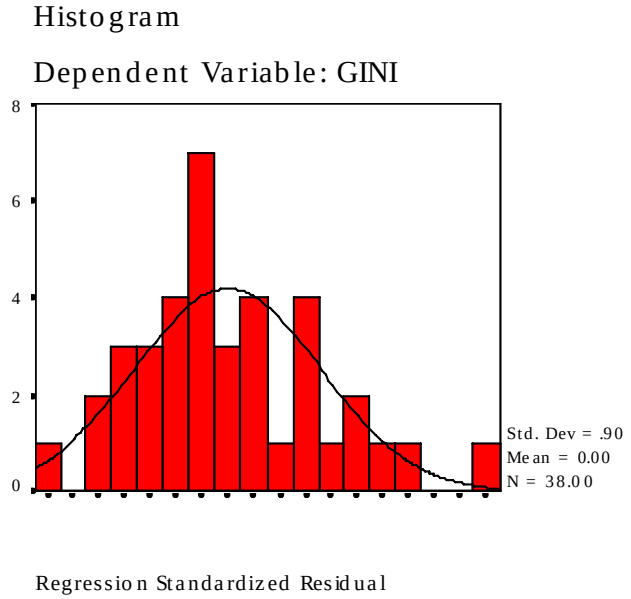

Figure C-1. Histogram GINI Model 1

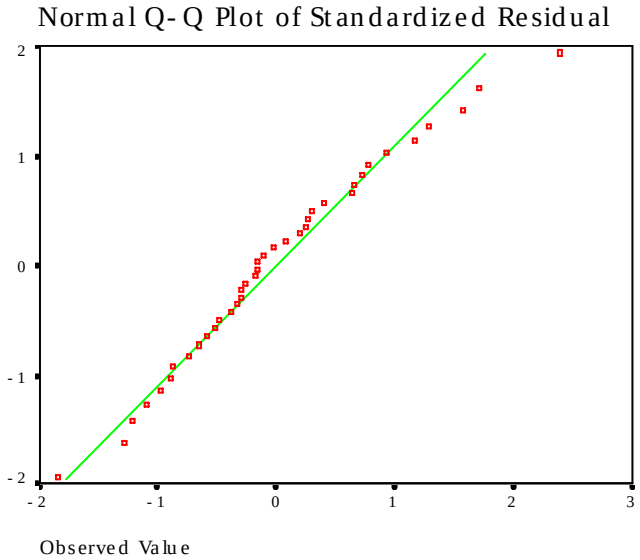

Figure C-2. Residuals plot Model 1

Table C-1. Normality test Model 1

	Shapiro-Wilk Statistic	df	Sig.
Standardized Residual	.979	38	.690

* This is a lower bound of the true significance.

a Lilliefors Significance Correction

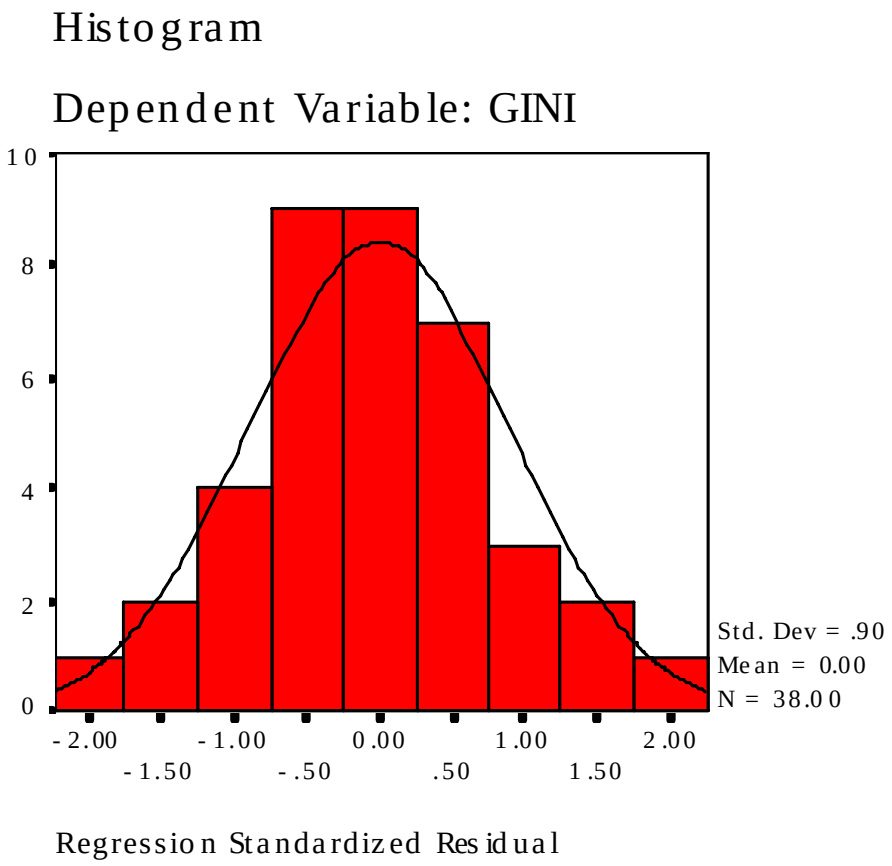

Figure C-3. Histogram standardized residuals Model 2

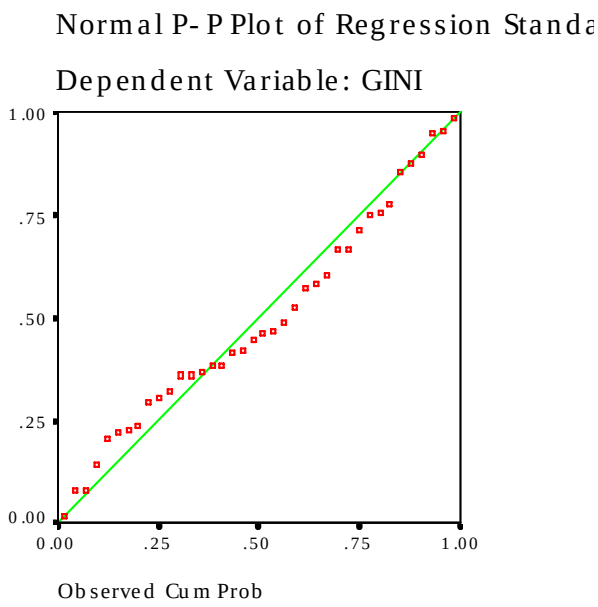

Figure C-4. Regression plot residuals Model 2

Table C-2. Test of normality Model 2

	Shapiro-Wilk Statistic	df	Sig.
Standardized Residual	.983	38	.814

* This is a lower bound of the true significance.

a Lilliefors Significance Correction

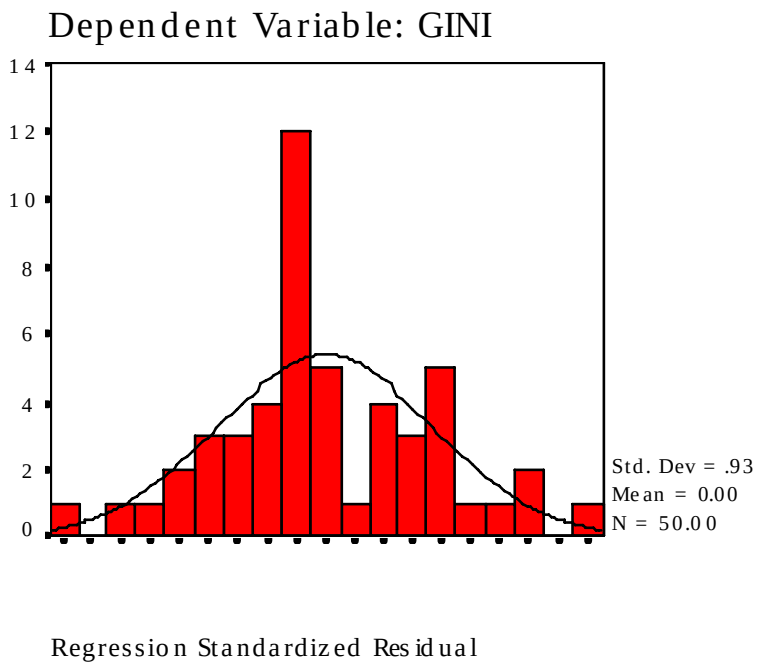

Figure C-5. Histogram standardized residuals Model 3

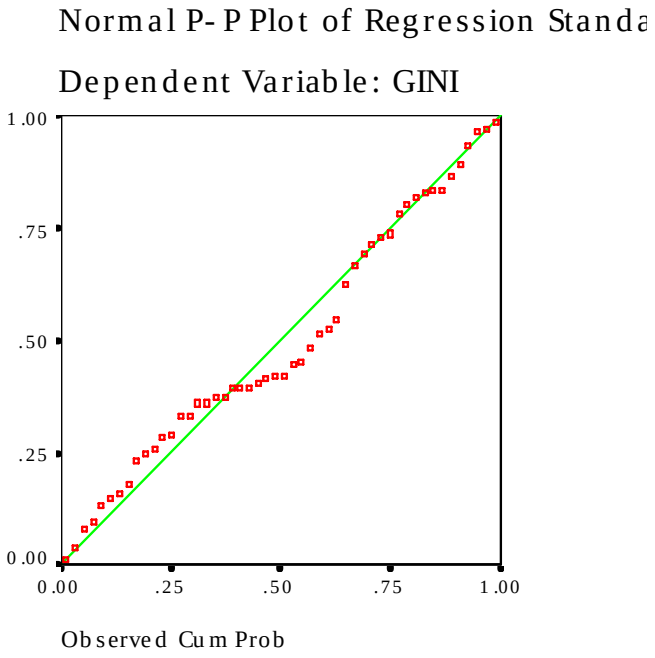

Figure C-6. Regression plot residuals Model 3

Table C-3. Test of normality Model 3

	Shapiro-Wilk Statistic	df	Sig.
Standardized Residual	.984	50	.706

a Lilliefors Significance Correction

APPENDIX D
HOMOSCEDASICITY

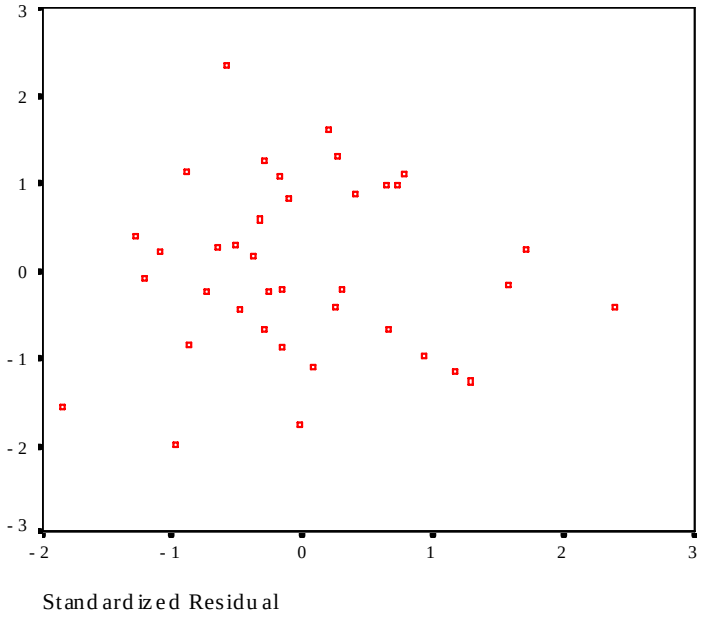

Figure D-1. Scatterplot Model 1

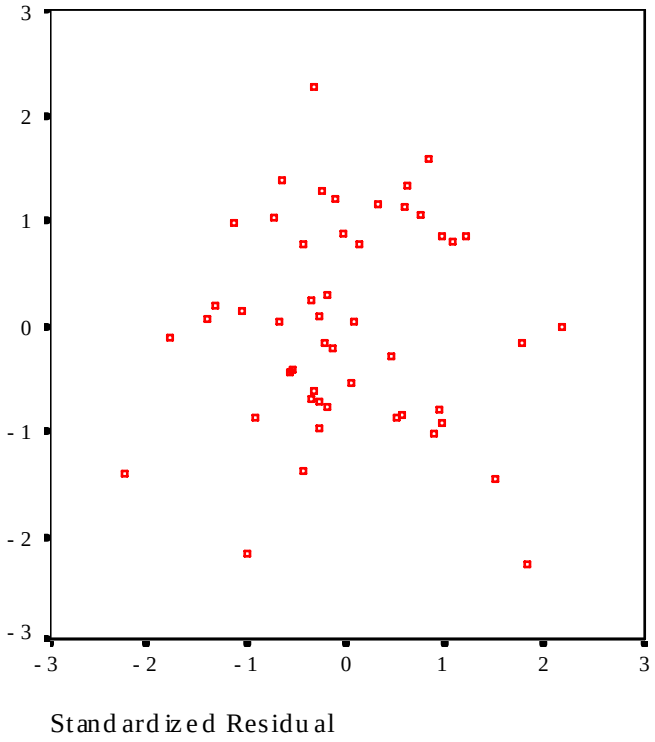

Figure D-2. Scatterplot Model 3

APPENDIX E
NONLINEARITY

Table E-1. Model 1 nonlinearity

	GINI	Unstandardized Residual
N	38	38
Mean	49.9818	.0000000
Std. Deviation	7.91832	5.60596701
Minimum	29.70	-11.51358
Maximum	62.50	14.88744

Table E-2. Model 2 nonlinearity

	GINI	Unstandardized Residual
N	38	38
Mean	49.9818	.0000000
Std. Deviation	7.91832	4.95945197
Minimum	29.70	-12.03422
Maximum	62.50	11.90005

Table E-3. Model 3 nonlinearity

	N	Minimum	Maximum	Mean	Std. Deviation
GINI	50	29.70	62.50	49.5928	7.38610
Unstandardized Residual	50	-12.69630	12.47162	.0000000	5.28142726

APPENDIX F
MULTICOLLINEARITY

Table F-1. Correlations Model 1

		GINI	PREWTO	AGVALUE	TOTAGEXP	LNAGXGDP	URBANIZA	LOGGDPPP	INFANTMO
Pearson Correlation	GINI	1.000	.377	-.442	-.418	-.180	.072	.235	-.198
	PREWTO	.377	1.000	.081	-.145	-.022	-.242	-.070	-.030
	AGVALUE	-.442	.081	1.000	.361	.069	-.563	-.689	.323
	TOTAGEXP	-.418	-.145	.361	1.000	.721	-.524	-.169	.185
	LNAGXGDP	-.180	-.022	.069	.721	1.000	-.156	.050	-.075
	URBANIZA	.072	-.242	-.563	-.524	-.156	1.000	.644	-.359
	LOGGDPPP	.235	-.070	-.689	-.169	.050	.644	1.000	-.570
	INFANTMO	-.198	-.030	.323	.185	-.075	-.359	-.570	1.000
Sig. (1-tailed)	GINI	.	.010	.003	.004	.139	.334	.077	.117
	PREWTO	.010	.	.315	.192	.448	.072	.339	.429
	AGVALUE	.003	.315	.	.013	.341	.000	.000	.024
	TOTAGEXP	.004	.192	.013	.	.000	.000	.155	.133
	LNAGXGDP	.139	.448	.341	.000	.	.175	.383	.326
	URBANIZA	.334	.072	.000	.000	.175	.	.000	.013
	LOGGDPPP	.077	.339	.000	.155	.383	.000	.	.000
	INFANTMO	.117	.429	.024	.133	.326	.013	.000	.
N	GINI	38	38	38	38	38	38	38	38
	PREWTO	38	38	38	38	38	38	38	38
	AGVALUE	38	38	38	38	38	38	38	38
	TOTAGEXP	38	38	38	38	38	38	38	38
	LNAGXGDP	38	38	38	38	38	38	38	38
	URBANIZA	38	38	38	38	38	38	38	38
	LOGGDPPP	38	38	38	38	38	38	38	38
	INFANTMO	38	38	38	38	38	38	38	38

Table F-2. Coefficients Model 1

Model		Collinearity Statistics	
		Tolerance	VIF
1	(Constant)		
	PREWTO	.697	1.436
	AGVALUE	.415	2.408
	TOTAGEXP	.184	5.432
	LNAGXGDP	.325	3.074
	URBANIZA	.273	3.667
	LOGGDPPP	.248	4.027
	INFANTMO	.590	1.696

a Dependent Variable: GINI

Table F-3. Correlations Model 2

		GINI	PREWTO	AGVALUE	TRADFOOD	SQRTRARA	LOGGDPPP	URBANIZA	INFANTMO
Pearson Correlation	GINI	1.000	.377	-.442	-.489	-.125	.235	.072	-.198
	PREWTO	.377	1.000	.081	-.076	-.225	-.070	-.242	-.030
	AGVALUE	-.442	.081	1.000	.294	.278	-.689	-.563	.323
	TRADFOOD	-.489	-.076	.294	1.000	.291	-.196	-.491	.158
	SQRTRARA	-.125	-.225	.278	.291	1.000	.075	-.202	.057
	LOGGDPPP	.235	-.070	-.689	-.196	.075	1.000	.644	-.570
	URBANIZA	.072	-.242	-.563	-.491	-.202	.644	1.000	-.359
	INFANTMO	-.198	-.030	.323	.158	.057	-.570	-.359	1.000
Sig. (1-tailed)	GINI	.	.010	.003	.001	.228	.077	.334	.117
	PREWTO	.010	.	.315	.326	.087	.339	.072	.429
	AGVALUE	.003	.315	.	.036	.045	.000	.000	.024
	TRADFOOD	.001	.326	.036	.	.038	.119	.001	.171
	SQRTRARA	.228	.087	.045	.038	.	.327	.112	.367
	LOGGDPPP	.077	.339	.000	.119	.327	.	.000	.000
	URBANIZA	.334	.072	.000	.001	.112	.000	.	.013
	INFANTMO	.117	.429	.024	.171	.367	.000	.013	.
N	GINI	38	38	38	38	38	38	38	38
	PREWTO	38	38	38	38	38	38	38	38
	AGVALUE	38	38	38	38	38	38	38	38
	TRADFOOD	38	38	38	38	38	38	38	38
	SQRTRARA	38	38	38	38	38	38	38	38
	LOGGDPPP	38	38	38	38	38	38	38	38
	URBANIZA	38	38	38	38	38	38	38	38
	INFANTMO	38	38	38	38	38	38	38	38

Table F-4. Coefficients Model 2

Model		Collinearity Statistics	
		Tolerance	VIF
1	(Constant)		
	PREWTO	.765	1.306
	AGVALUE	.385	2.599
	TRADFOOD	.668	1.498
	SQRTRARA	.613	1.632
	LOGGDPPP	.235	4.254
	URBANIZA	.354	2.826
	INFANTMO	.635	1.574

a Dependent Variable: GINI

Table F-5. Correlations Model 3

		GINI	PRE-WTO	URBAN-IZA	AG-VALUE	TRAD-FOOD	LOG-GDPPP	INFANT-MO	SQTRAD-RA
GINI	Pearson Correlations	1	.304	.135	-.482	-.457	.198	-.122	-.123
	Sig.(2-tail)	.	.032	.352	.000	.001	.169	.400	.395
	Sum of Squares	2673.2	55.3	537.1	-2100.3	-3450.8	42.0	-960.1	-55.5
	Covariance	54.5	1.1	11.0	-42.9	-70.4	.857	-19.6	-1.1
PREWTO	Pearson Correl	.304	1	-.113	.027	-.107	-.037	-.047	-.119
	Sig.(2-tail)	.032	.	.435	.850	.459	.801	.747	.409
	Sum of Squares	55.3	12.4	-30.7	8.1	-55.1	-.530	-25.2	-3.7
	Covariance	1.129	.253	-.626	.166	-1.125	-.011	-.513	-.075
URBANIZA	Pearson Correl	.135	-.113	1	-.555	-.475	.619	-.330	-.208
	Sig.(2-tail)	.352	.435	.	.000	.000	.000	.019	.147
	Sum of Squares	537.1	-30.7	5964.3	-3616.3	-5358.8	196.6	-3883.7	-140.3
	Covariance	11.0	-.626	121.7	-73.8	-109.4	4.01	-79.3	-2.9
AGVALUE	Pearson Correl	-.482	.027	-.555	1	.319	-.568	.214	.273
	Sig.(2-tail)	.000	.850	.000	.	.024	.000	.135	.055
	Sum of Squares	-2100.3	8.15	-3616.3	7112	3928.8	-196.8	2758.1	200.9
	Covariance	-42.86	.17	-73.8	145.1	80.2	-4.02	56.3	4.1
TRADFOOD	Pearson Correl	-.457	-.107	-.475	.319	1	-.245	.242	.250
	Sig.(2-tail)	.001	.459	.000	.024	.	.087	.091	.079
	Sum of Squares	-3450	-55.1	-5358.8	3928.8	21335	-147.0	5386.2	319
	Covariance	-70.4	-1.13	-109.4	80.2	435.4	-3.0	109.9	6.5
LOGGDPPP	Pearson Correl	.198	-.037	.619	-.568	-.245	1	-.549	.036
	Sig.(2-tail)	.169	.801	.000	.000	.087	.	.000	.804
	Sum of Squares	42.0	-.53	196.6	-196.8	-147.0	16.91	-344.8	1.3
	Covariance	.857	-.011	4.013	-4.016	-3.0	.345	-7.036	.026
INFANTMO	Pearson Correl	-.122	-.047	-.330	.214	.242	-.549	1	.094
	Sig.(2-tail)	.400	.747	.019	.135	.091	.000	.	.515
	Sum of Squares	-960	-25.2	-3883.7	2758.1	5386.2	-344.8	23288	126
	Covariance	-19.6	-.51	-79.26	56.3	109.9	-7.0	475.3	2.6
SQTRADRA	Pearson Correl	-.123	-.119	-.208	.273	.250	.036	.094	1
	Sig.(2-tail)	.395	.409	.147	.055	.079	.804	.515	.
	Sum of Squares	-55.5	-3.7	-140.3	200.9	319.4	1.291	125.7	76.3
	Covariance	-1.134	-.075	-2.863	4.101	6.518	.026	2.566	1.556

* Correlation is significant at the 0.05 level (2-tailed).

** Correlation is significant at the 0.01 level (2-tailed).

Table F-6. Correlations Model 3

Model		Collinearity Statistics Tolerance	VIF
1	(Constant)		
	PREWTO	.932	1.072
	AGVALUE	.532	1.878
	TRADFOOD	.711	1.406
	SQTRADRA	.779	1.283
	URBANIZA	.445	2.247
	LOGGDPPP	.357	2.799
	INFANTMO	.641	1.560

a Dependent Variable: GINI

Table F-7. Alternate stepwise regression model

Model	Variables Entered	Variables Removed	Method
1	AGVALUE	.	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).
2	TRADFOOD	.	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).
3	URBANIZA	.	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).
4	PREWTO	.	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).

a Dependent Variable: GINI

Table F-8. Alternate model summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.482	.232	.216	6.53977
2	.578	.334	.306	6.15253
3	.653	.426	.389	5.77321
4	.692	.479	.433	5.56210

a Predictors: (Constant), AGVALUE
b Predictors: (Constant), AGVALUE, TRADFOOD
c Predictors: (Constant), AGVALUE, TRADFOOD, URBANIZA
d Predictors: (Constant), AGVALUE, TRADFOOD, URBANIZA, PREWTO
e Dependent Variable: GINI

Table F-9. Alternate model ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	620.274	1	620.274	14.503	.000
	Residual	2052.895	48	42.769		
	Total	2673.168	49			
2	Regression	894.046	2	447.023	11.809	.000
	Residual	1779.122	47	37.854		
	Total	2673.168	49			
3	Regression	1139.989	3	379.996	11.401	.000
	Residual	1533.180	46	33.330		
	Total	2673.168	49			
4	Regression	1281.005	4	320.251	10.352	.000
	Residual	1392.163	45	30.937		
	Total	2673.168	49			

a Predictors: (Constant), AGVALUE
b Predictors: (Constant), AGVALUE, TRADFOOD
c Predictors: (Constant), AGVALUE, TRADFOOD, URBANIZA
d Predictors: (Constant), AGVALUE, TRADFOOD, URBANIZA, PREWTO
e Dependent Variable: GINI

Table F-10. Alternate model coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	59.325	2.718		21.829	.000		
	AGVALUE	-.295	.078	-.482	-3.808	.000	1.000	1.000
2	(Constant)	62.394	2.800		22.284	.000		
	AGVALUE	-.229	.077	-.374	-2.979	.005	.898	1.113
	TRADFOOD	-.120	.044	-.338	-2.689	.010	.898	1.113
3	(Constant)	75.697	5.557		13.621	.000		
	AGVALUE	-.338	.083	-.551	-4.093	.000	.688	1.454
	TRADFOOD	-.166	.045	-.468	-3.680	.001	.770	1.299
	URBANIZA	-.264	.097	-.394	-2.716	.009	.593	1.687
4	(Constant)	71.866	5.647		12.727	.000		
	AGVALUE	-.333	.080	-.543	-4.184	.000	.687	1.455
	TRADFOOD	-.149	.044	-.420	-3.370	.002	.745	1.343
	URBANIZA	-.228	.095	-.340	-2.395	.021	.574	1.742
	PREWTO	3.451	1.617	.235	2.135	.038	.953	1.049

a Dependent Variable: GINI

Table F-11. Alternate Model excluded variables

Model		Beta In	t	Sig.	Partial Correlation	Collinearity Statistics		
						Tolerance	VIF	Minimum Tolerance
1	PREWTO	.317	2.660	.011	.362	.999	1.001	.999
	TRADFOOD	-.338	-2.689	.010	-.365	.898	1.113	.898
	SQTRADRA	.009	.068	.946	.010	.926	1.080	.926
	URBANIZA	-.192	-1.272	.210	-.182	.692	1.446	.692
	LOGGDPPP	-.112	-.725	.472	-.105	.678	1.475	.678
	INFANTMO	-.019	-.148	.883	-.022	.954	1.048	.954
2	PREWTO	.282	2.478	.017	.343	.984	1.016	.885
	SQTRADRA	.071	.560	.578	.082	.896	1.116	.859
	URBANIZA	-.394	-2.716	.009	-.372	.593	1.687	.593
	LOGGDPPP	-.145	-.997	.324	-.145	.673	1.485	.643
	INFANTMO	.044	.348	.730	.051	.921	1.086	.867
3	PREWTO	.235	2.135	.038	.303	.953	1.049	.574
	SQTRADRA	.070	.589	.559	.087	.896	1.116	.593
	LOGGDPPP	.026	.170	.866	.025	.538	1.857	.474
	INFANTMO	-.023	-.191	.849	-.028	.881	1.135	.567
4	SQTRADRA	.099	.865	.392	.129	.884	1.131	.574
	LOGGDPPP	.011	.071	.943	.011	.537	1.862	.458
	INFANTMO	-.006	-.048	.962	-.007	.877	1.141	.547

a Predictors in the Model: (Constant), AGVALUE
b Predictors in the Model: (Constant), AGVALUE, TRADFOOD
c Predictors in the Model: (Constant), AGVALUE, TRADFOOD, URBANIZA
d Predictors in the Model: (Constant), AGVALUE, TRADFOOD, URBANIZA, PREWTO
e Dependent Variable: GINI

Table F-12. Collinearity diagnostics

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions (Constant)	AGVALUE	TRADFOOD	URBANIZA	PREWTO
1	1	1.940	1.000	.03	.03			
	2	5.969E-02	5.702	.97	.97			
2	1	2.828	1.000	.01	.01	.02		
	2	.113	5.014	.10	.20	.97		
	3	5.930E-02	6.906	.89	.79	.01		
3	1	3.637	1.000	.00	.01	.01	.00	
	2	.247	3.834	.00	.03	.17	.17	
	3	9.995E-02	6.033	.00	.43	.59	.02	
	4	1.528E-02	15.429	1.00	.53	.22	.81	
4	1	4.217	1.000	.00	.00	.01	.00	.02
	2	.427	3.143	.00	.01	.03	.00	.85
	3	.246	4.144	.00	.03	.15	.17	.02
	4	9.678E-02	6.601	.00	.47	.56	.01	.04
	5	1.409E-02	17.299	1.00	.49	.25	.81	.08

a Dependent Variable: GINI

Table F-13. Collinearity diagnostics

Model 1 Dimension	Eigenvalue	Condition Index	Variance Proportions (Constant)	PRE-WTO	AG-VALUE	TRAD-FOOD	SQTRA	TRAD-URBAN-IZA	LOG-GDPPP	INFANT-MO	
1	7.010	1.000	.00	.01	.00	.00	.00	.00	.00	.00	.00
2	.457	3.918	.00	.83	.00	.01	.01	.00	.00	.00	.00
3	.262	5.170	.00	.02	.03	.12	.01	.11	.00	.00	.00
4	.115	7.791	.00	.00	.02	.38	.58	.01	.00	.00	.00
5	9.166E-02	8.745	.00	.06	.34	.26	.27	.01	.00	.02	
6	4.593E-02	12.353	.00	.00	.24	.10	.00	.12	.00	.42	
7	1.726E-02	20.155	.03	.08	.09	.11	.04	.70	.06	.15	
8	1.069E-03	80.971	.97	.00	.28	.00	.09	.06	.94	.40	

a Dependent Variable: GINI

Table F-14. Residuals statistics

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	38.4346	61.8551	49.5928	5.11302	50
Std. Predicted Value	-2.182	2.398	.000	1.000	50
Standard Error of Predicted Value	1.21497	2.56329	1.72193	.36234	50
Adjusted Predicted Value	36.8488	62.3625	49.5425	5.16151	50
Residual	-12.3980	12.3444	.0000	5.33024	50
Std. Residual	-2.229	2.219	.000	.958	50
Stud. Residual	-2.345	2.335	.004	1.011	50
Deleted Residual	-13.7198	13.6601	.0503	5.93624	50
Stud. Deleted Residual	-2.475	2.463	.007	1.033	50
Mahal. Distance	1.358	9.427	3.920	2.056	50
Cook's Distance	.000	.142	.023	.035	50
Centered Leverage Value	.028	.192	.080	.042	50

a Dependent Variable: GINI

APPENDIX G
INDEPENDENCE

Table G-1. Model 1 summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.706	.499	.382	6.22574	1.807

a Predictors: (Constant), INFANTMO, PREWTO, LNAGXGDP, AGVALUE, URBANIZA, LOGGDPPP, TOTAGEXP
b Dependent Variable: GINI

Table G-2. Model 2 summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.780	.608	.516	5.50775	2.062

a Predictors: (Constant), INFANTMO, PREWTO, TRADFOOD, SQRTRARA, AGVALUE, URBANIZA, LOGGDPPP
b Dependent Variable: GINI

Table G-3. Model 3 summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.699	.489	.403	5.70459	2.131

a Predictors: (Constant), INFANTMO, PREWTO, SQTRADRA, AGVALUE, TRADFOOD, URBANIZA, LOGGDPPP
b Dependent Variable: GINI

APPENDIX H
COMPLETE DATASET

Table H-1. Complete dataset

COUNTRY	YEAR	GINI	INCDEFN	SOURCE1
Mozambique	2003	42.00	Consumption	Journal Article
Gambia	1994	59.45	Consumption	Deininger & Squire, World Bank 2004
Cote d`Ivoire	1987	48.80	Consumption	Deininger & Squire, World Bank 2004
Cote d`Ivoire	1986	49.90	Consumption	Deininger & Squire, World Bank 2004
Cote d`Ivoire	1988	45.90	Consumption	Deininger & Squire, World Bank 2004
Gambia	1992	48.13	Consumption	Deininger & Squire, World Bank 2004
Madagascar	1997	44.00	Consumption	Deininger & Squire, World Bank 2004
Gambia	1993	60.86	Consumption	Deininger & Squire, World Bank 2004
Tanzania	1993	47.70	Consumption	Deininger & Squire, World Bank 2004
Tanzania	1991	58.90	Consumption	World Bank Poverty Monitoring Database 2002
Ethiopia	2000	29.70	Consumption	World Bank, World Development Indicators 2004
Madagascar	2001	47.40	Consumption	World Bank, World Development Indicators 2004
Madagascar	1999	43.10	Consumption	Deininger & Squire, World Bank 2004
Kenya	1994	44.30	Consumption	World Bank Poverty Monitoring Database 2002
Burkina Faso	1994	58.90	Consumption	Deininger & Squire, World Bank 2004
Madagascar	1993	48.50	Consumption	Deininger & Squire, World Bank 2004
Kenya	1997	44.50	Consumption	World Bank, World Development Indicators 2004
Nigeria	1992	54.20	Consumption	Deininger & Squire, World Bank 2004
Cote d`Ivoire	1998	44.40	Consumption	World Bank, World Development Indicators 2004
Gambia	1998	50.20	Consumption	World Bank, World Development Indicators 2004
Cote d`Ivoire	1995	43.90	Consumption	Deininger & Squire, World Bank 2004
Malawi	1993	62.00	Consumption	World Bank, Africa Department
Ghana	1989	47.90	Consumption	Deininger & Squire, World Bank 2004
Nigeria	1996	48.30	Consumption	Deininger & Squire, World Bank 2004
Uganda	1992	39.00	Consumption	World Bank Poverty Monitoring Database 2002
Ghana	1992	39.70	Consumption	Deininger & Squire, World Bank 2004
Ghana	1987	42.90	Consumption	Deininger & Squire, World Bank 2004
Kenya	1992	59.90	Consumption	Deininger & Squire, World Bank 2004
Cote d`Ivoire	1985	50.60	Consumption	Deininger & Squire, World Bank 2004
Ethiopia	1995	32.70	Consumption	Deininger & Squire, World Bank 2004
Mozambique	1997	40.00	Consumption	World Bank Poverty Monitoring Database 2002
Ghana	1998	50.70	Consumption	Deininger & Squire, World Bank 2004
Zambia	1993	51.10	Consumption	Deininger & Squire, World Bank 2004
Ethiopia	1997	48.20	Consumption	Deininger & Squire, World Bank 2004
Uganda	1989	44.30	Consumption	World Bank Poverty Monitoring Database 2002
Uganda	2000	46.90	Expenditure	Deininger & Squire, World Bank 2004
Zambia	1998	57.40	Consumption	Deininger & Squire, World Bank 2004
Guinea	1994	55.10	Consumption	Deininger & Squire, World Bank 2004
Nigeria	1980	53.00	Consumption	Deininger & Squire, World Bank 2004
Zambia	1996	54.80	Consumption	Deininger & Squire, World Bank 2004
Zambia	1991	59.30	Consumption	Deininger & Squire, World Bank 2004
Cameroon	1996	50.80	Consumption / Expenditure	Deininger & Squire, World Bank 2004
Malawi	1997	49.30	Consumption	World Bank, World Development Indicators 2004
Cameroon	2001	44.20	Consumption / Expenditure	World Bank, World Development Indicators 2004
Nigeria	1985	53.80	Consumption	Deininger & Squire, World Bank 2004
Guinea	1991	50.70	Consumption	Deininger & Squire, World Bank 2004
Nigeria	1997	50.20	Consumption	World Bank Poverty Monitoring Database 2002
South Africa	1993	59.50	Consumption	World Bank Poverty Monitoring Database 2002
South Africa	1997	60.10	Income, Gross	Deininger & Squire, World Bank 2004
Burkina Faso	1998	62.50	Consumption	Deininger & Squire, World Bank 2004

Table H-1. Continued

COUNTRY	YEAR	QUAL	PRE-WTO	ARAB-LAND	VAL-AGRI3	URBAN	AG-VALUE	TRAD-FOOD	TRAD-RAW	GDP-PPPCA
Mozambique	2003	n/a	0	.23	73.88	32.98	24.38	43.79	10.61	1128.00
Gambia	1994	3	1	.16	76.63	24.90	27.50	43.79	8.80	1463.00
Cote d`Ivoire	1987	2	1	.21	49.43	37.50	29.18	43.79	10.61	1338.00
Cote d`Ivoire	1986	2	1	.22	51.26	37.50	28.46	43.79	10.61	1339.00
Cote d`Ivoire	1988	2	1	.21	52.94	37.50	32.04	43.79	10.61	1355.00
Gambia	1992	3	1	.16	73.01	24.90	26.17	43.79	10.61	1456.00
Madagascar	1997	3	0	.19	62.14	25.50	31.55	54.40	6.20	761.00
Gambia	1993	3	1	.15	84.14	24.90	25.24	43.79	3.00	1478.00
Tanzania	1993	3	1	.13	71.09	20.00	48.11	43.79	10.61	440.00
Tanzania	1991	3	1	.13	68.52	19.00	48.14	43.79	10.61	442.00
Ethiopia	2000	3	0	.16	86.06	14.90	47.70	70.60	18.70	636.00
Madagascar	2001	3	0	.17	84.59	26.00	28.60	48.70	3.70	866.00
Madagascar	1999	3	0	.18	55.53	25.50	30.03	35.90	6.10	788.00
Kenya	1994	3	1	.16	70.48	24.70	33.32	56.50	7.90	956.00
Burkina Faso	1994	3	1	.35	86.49	13.60	31.30	43.79	10.61	829.00
Madagascar	1993	1	1	.21	63.55	23.60	28.71	66.30	3.80	749.00
Kenya	1997	3	0	.15	74.54	30.00	30.91	55.60	6.80	983.00
Nigeria	1992	3	1	.31	82.20	35.00	23.80	43.79	10.61	765.00
Cote d`Ivoire	1998	3	0	.19	57.63	41.70	24.12	59.40	11.20	1606.00
Gambia	1998	3	0	.18	82.45	26.40	28.42	76.80	9.70	1582.00
Cote d`Ivoire	1995	3	0	.20	85.96	41.70	24.73	59.10	16.10	1440.00
Malawi	1993	3	1	.19	90.36	12.62	48.90	43.79	10.61	475.00
Ghana	1989	3	1	.17	96.26	32.90	48.97	43.79	10.61	1238.00
Nigeria	1996	3	0	.27	76.18	39.50	30.70	43.79	1.60	793.00
Uganda	1992	2	1	.27	82.85	11.20	51.12	43.79	10.61	787.00
Ghana	1992	3	1	.17	92.97	36.50	44.78	50.90	14.70	1406.00
Ghana	1987	3	1	.18	97.04	32.90	50.60	43.79	10.61	1104.00
Kenya	1992	3	1	.17	71.20	24.70	28.74	43.50	5.50	936.00
Cote d`Ivoire	1985	2	1	.23	49.52	37.50	26.54	68.00	11.90	1354.00
Ethiopia	1995	2	0	.17	83.68	13.90	57.65	72.50	13.40	523.00
Mozambique	1997	3	0	.23	84.30	28.00	37.18	71.70	13.80	718.00
Ghana	1998	3	0	.20	91.89	40.20	36.01	58.40	10.60	1746.00
Zambia	1993	3	1	.58	70.82	39.40	34.10	3.90	.90	815.00
Ethiopia	1997	3	0	.17	89.41	13.90	55.86	78.50	10.80	602.00
Uganda	1989	3	1	.29	96.54	9.90	56.79	43.79	10.61	671.00
Uganda	2000	2	0	.21	77.58	12.00	37.34	67.30	14.10	1244.00
Zambia	1998	3	0	.51	72.76	37.30	21.14	7.10	6.40	749.00
Guinea	1994	2	1	.11	76.37	25.30	21.71	43.79	10.61	1583.00
Nigeria	1980	3	1	.41	75.13	26.90	20.63	43.79	10.61	534.00
Zambia	1996	3	0	.54	80.85	37.30	17.57	6.40	1.90	751.00
Zambia	1991	3	1	.61	45.99	39.40	17.43	43.79	10.61	814.00
Cameroon	1996	1	0	.44	63.65	44.70	41.33	24.30	25.20	1601.00
Malawi	1997	3	0	.18	87.72	14.02	32.59	84.50	3.60	556.00
Cameroon	2001	3	0	.39	69.69	49.00	39.86	16.80	21.30	2022.00
Nigeria	1985	3	1	.36	90.20	30.70	37.31	2.20	.00	508.00
Guinea	1991	3	1	.11	71.13	25.30	24.15	43.79	10.61	1545.00
Nigeria	1997	3	0	.26	74.48	39.50	33.63	1.70	.10	806.00
South Africa	1993	3	1	.38	35.05	48.80	4.17	6.50	2.80	7767.00
South Africa	1997	3	0	.36	34.87	52.60	4.01	10.80	3.90	8752.00
Burkina Faso	1998	3	0	.36	89.37	15.20	34.48	16.40	68.10	940.00

Table H-1. Continued

COUNTRY	YEAR	LOGGDPPP	POPDENSI	INFANTMO	LOGARABL	SQTRADRA	LNPOPDEN
Mozambique	2003	7.03	24.30	104.00	-1.47	3.26	3.19
Gambia	1994	7.29	107.80	96.00	-1.83	2.97	4.68
Cote d`Ivoire	1987	7.20	35.80	103.00	-1.56	3.26	3.58
Cote d`Ivoire	1986	7.20	34.40	103.00	-1.51	3.26	3.54
Cote d`Ivoire	1988	7.21	37.10	103.00	-1.56	3.26	3.61
Gambia	1992	7.28	100.50	103.00	-1.83	3.26	4.61
Madagascar	1997	6.63	25.50	95.00	-1.66	2.49	3.24
Gambia	1993	7.30	104.10	96.00	-1.90	1.73	4.65
Tanzania	1993	6.09	32.90	103.00	-2.04	3.26	3.49
Tanzania	1991	6.09	30.70	102.00	-2.04	3.26	3.42
Ethiopia	2000	6.46	68.50	116.00	-1.83	4.32	4.23
Madagascar	2001	6.76	28.70	84.00	-1.77	1.92	3.36
Madagascar	1999	6.67	27.00	84.00	-1.71	2.47	3.30
Kenya	1994	6.86	46.50	73.00	-1.83	2.81	3.84
Burkina Faso	1994	6.72	35.00	110.00	-1.05	3.26	3.56
Madagascar	1993	6.62	22.60	95.00	-1.56	1.95	3.12
Kenya	1997	6.89	50.30	73.00	-1.90	2.61	3.92
Nigeria	1992	6.64	105.20	115.00	-1.17	3.26	4.66
Cote d`Ivoire	1998	7.38	50.30	115.00	-1.66	3.35	3.92
Gambia	1998	7.37	123.40	92.00	-1.71	3.11	4.82
Cote d`Ivoire	1995	7.27	46.40	110.00	-1.61	4.01	3.84
Malawi	1993	6.16	105.10	133.00	-1.66	3.26	4.65
Ghana	1989	7.12	66.20	78.00	-1.77	3.26	4.19
Nigeria	1996	6.68	117.10	120.00	-1.31	1.26	4.76
Uganda	1992	6.67	96.40	93.00	-1.31	3.26	4.57
Ghana	1992	7.25	71.90	78.00	-1.77	3.83	4.28
Ghana	1987	7.01	62.60	78.00	-1.71	3.26	4.14
Kenya	1992	6.84	43.90	63.00	-1.77	2.35	3.78
Cote d`Ivoire	1985	7.21	33.00	114.00	-1.47	3.45	3.50
Ethiopia	1995	6.26	60.00	123.00	-1.77	3.66	4.09
Mozambique	1997	6.58	21.40	145.00	-1.47	3.71	3.06
Ghana	1998	7.47	83.50	62.00	-1.61	3.26	4.42
Zambia	1993	6.70	12.20	102.00	-.54	.95	2.50
Ethiopia	1997	6.40	63.50	123.00	-1.77	3.29	4.15
Uganda	1989	6.51	86.90	93.00	-1.24	3.26	4.46
Uganda	2000	7.13	123.30	85.00	-1.56	3.75	4.81
Zambia	1998	6.62	13.80	102.00	-.67	2.53	2.62
Guinea	1994	7.37	29.60	129.00	-2.21	3.26	3.39
Nigeria	1980	6.28	75.20	108.00	-.89	3.26	4.32
Zambia	1996	6.62	13.20	102.00	-.62	1.38	2.58
Zambia	1991	6.70	11.60	101.00	-.49	3.26	2.45
Cameroon	1996	7.38	29.30	92.00	-.82	5.02	3.38
Malawi	1997	6.32	112.60	133.00	-1.71	1.90	4.72
Cameroon	2001	7.61	32.60	95.00	-.94	4.62	3.48
Nigeria	1985	6.23	86.10	115.00	-1.02	.00	4.46
Guinea	1991	7.34	26.30	145.00	-2.21	3.26	3.27
Nigeria	1997	6.69	120.10	120.00	-1.35	.32	4.79
South Africa	1993	8.96	32.80	45.00	-.97	1.67	3.49
South Africa	1997	9.08	37.10	45.00	-1.02	1.97	3.61
Burkina Faso	1998	6.85	39.00	107.00	-1.02	8.25	3.66

Table H-1. Continued

COUNTRY	YEAR	GINI	MAH_1	COO_1	LEV_1	ZRE_1	RES_1
Mozambique	2003	42.00	1.87372	.01603	.03824	-1.39730	-7.97103
Gambia	1994	59.45	2.23204	.00873	.04555	.96431	5.50101
Cote d`Ivoire	1987	48.80	2.33418	.00124	.04764	-.35675	-2.03509
Cote d`Ivoire	1986	49.90	2.33501	.00042	.04765	-.20884	-1.19133
Cote d`Ivoire	1988	45.90	2.47294	.00479	.05047	-.68566	-3.91139
Gambia	1992	48.13	2.62044	.01361	.05348	-1.12764	-6.43275
Madagascar	1997	44.00	2.74552	.00353	.05603	-.56283	-3.21071
Gambia	1993	60.86	3.86335	.02237	.07884	1.21247	6.91666
Tanzania	1993	47.70	3.87176	.00030	.07902	-.14064	-.80231
Tanzania	1991	58.90	3.88768	.04881	.07934	1.78558	10.18598
Ethiopia	2000	29.70	4.01499	.07826	.08194	-2.22563	-12.69630
Madagascar	2001	47.40	4.15416	.00080	.08478	-.22154	-1.26381
Madagascar	1999	43.10	4.16232	.02848	.08495	-1.31875	-7.52290
Kenya	1994	44.30	4.21343	.01841	.08599	-1.05399	-6.01261
Burkina Faso	1994	58.90	4.30376	.00625	.08783	.60753	3.46571
Madagascar	1993	48.50	4.62309	.00144	.09435	-.28075	-1.60155
Kenya	1997	44.50	4.76710	.00206	.09729	-.33078	-1.88695
Nigeria	1992	54.20	4.83740	.00027	.09872	.11923	.68015
Cote d`Ivoire	1998	44.40	5.02732	.00085	.10260	-.20669	-1.17906
Gambia	1998	50.20	5.08110	.01863	.10370	.96197	5.48763
Cote d`Ivoire	1995	43.90	5.10760	.00260	.10424	-.35849	-2.04503
Malawi	1993	62.00	5.31815	.10112	.10853	2.18624	12.47162
Ghana	1989	47.90	5.59623	.00570	.11421	.50455	2.87828
Nigeria	1996	48.30	5.81723	.00733	.11872	.56015	3.19542
Uganda	1992	39.00	5.82977	.07284	.11897	-1.76314	-10.05798
Ghana	1992	39.70	6.00973	.02059	.12265	-.92132	-5.25575
Ghana	1987	42.90	6.14281	.00197	.12536	-.28153	-1.60600
Kenya	1992	59.90	6.35134	.03043	.12962	1.08471	6.18782
Cote d`Ivoire	1985	50.60	6.35530	.00491	.12970	.43554	2.48458
Ethiopia	1995	32.70	6.45135	.02639	.13166	-1.00091	-5.70979
Mozambique	1997	40.00	6.75419	.00520	.13784	-.43252	-2.46738
Ghana	1998	50.70	7.08766	.06663	.14465	1.50310	8.57458
Zambia	1993	51.10	7.14074	.00552	.14573	-.43071	-2.45704
Ethiopia	1997	48.20	7.24036	.10051	.14776	1.82204	10.39401
Uganda	1989	44.30	7.31874	.00914	.14936	-.54564	-3.11264
Uganda	2000	46.90	7.43776	.00004	.15179	.03703	.21125
Zambia	1998	57.40	7.48437	.00323	.15274	.31994	1.82510
Guinea	1994	55.10	7.50708	.00049	.15321	-.12406	-.70773
Nigeria	1980	53.00	8.30717	.01478	.16953	-.64008	-3.65140
Zambia	1996	54.80	8.49363	.00224	.17334	-.24579	-1.40215
Zambia	1991	59.30	8.63906	.02242	.17631	.76824	4.38251
Cameroon	1996	50.80	8.94271	.03521	.18250	.94061	5.36580
Malawi	1997	49.30	9.14537	.03267	.18664	.89220	5.08964
Cameroon	2001	44.20	10.64911	.00380	.21733	-.27292	-1.55689
Nigeria	1985	53.80	11.49635	.00015	.23462	-.05183	-.29567
Guinea	1991	50.70	11.58709	.03042	.23647	-.72424	-4.13151
Nigeria	1997	50.20	12.81475	.00025	.26153	.06005	.34257
South Africa	1993	59.50	15.74307	.01081	.32129	-.33159	-1.89157
South Africa	1997	60.10	16.75582	.04500	.34196	.63635	3.63014
Burkina Faso	1998	62.50	30.05417	.41623	.61335	.84070	4.79585

APPENDIX I
REGRESSION RESULTS WITHOUT MISSING VARIABLES

Table I-1. Model summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.680	.463	.442	5.46325	
2	.738	.545	.509	5.12730	1.901

a Predictors: (Constant), AGVALUE
b Predictors: (Constant), AGVALUE, TRADFOOD
c Dependent Variable: GINI

Table I-2. Coefficients

Model		Unstandardized Coefficients B	Standardized Coefficients Beta	t	Sig.	Collinearity Statistics Tolerance	VIF
1	(Constant)	61.007		20.579	.000		
	AGVALUE	-.410	-.680	-4.733	.000	1.000	1.000
2	(Constant)	62.081		21.954	.000		
	AGVALUE	-.325	-.539	-3.582	.001	.804	1.244
	TRADFOOD	-8.479E-02	-.320	-2.126	.044	.804	1.244

a Dependent Variable: GINI

Table I-3. Collinearity diagonstics

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions (Constant)	AGVALUE	TRADFOOD
1	1	1.937	1.000	.03	.03	
	2	6.261E-02	5.563	.97	.97	
2	1	2.785	1.000	.01	.01	.02
	2	.155	4.234	.20	.05	.91
	3	6.010E-02	6.807	.79	.94	.06

a Dependent Variable: GINI

Table I-4. Residuals statistics

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	37.2064	60.1754	47.8536	5.40041	28
Std. Predicted Value	-1.972	2.282	.000	1.000	28
Standard Error of Predicted Value	1.00894	2.50159	1.61632	.46019	28
Adjusted Predicted Value	34.8208	60.3864	47.8065	5.49203	28
Residual	-10.8997	10.9209	.0000	4.93375	28
Std. Residual	-2.126	2.130	.000	.962	28
Stud. Residual	-2.245	2.358	.004	1.017	28
Deleted Residual	-12.1536	13.3792	.0471	5.52242	28
Stud. Deleted Residual	-2.461	2.619	.013	1.072	28
Mahal. Distance	.081	5.463	1.929	1.612	28
Cook's Distance	.000	.417	.040	.083	28
Centered Leverage Value	.003	.202	.071	.060	28

a Dependent Variable: GINI

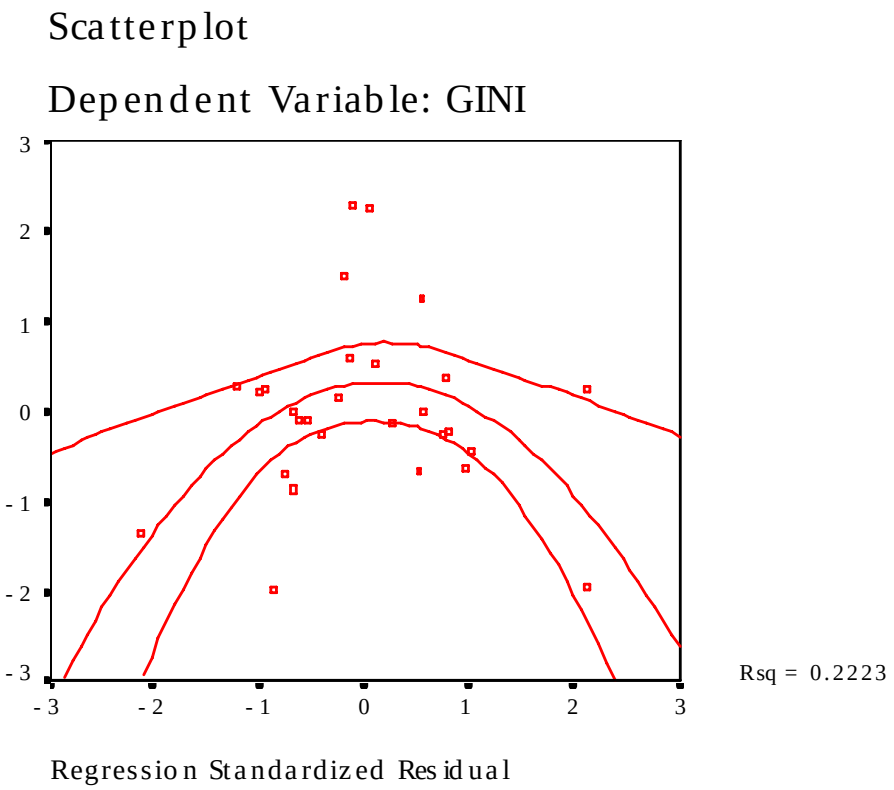

Figure I-1. Residuals scatterplot

APPENDIX J
GDP REGRESSION

Table J-1. Descriptive statistics

	Mean	Std. Deviation	N
LOGGDPPP	6.9637	.64740	38
PREWTO	.45	.504	38
AGVALUE	32.4582	11.75596	38
TOTAGEXP	52.3539	27.15673	38
Arable Land (ha per person)	.2497	.12182	38
Value share of 3 of top 20 agricultural exports	75.2452	14.20099	38

Table J-2. Model summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.744	.554	.484	.46487	1.133

a Predictors: (Constant), Value share of 3 of top 20 agricultural exports, PREWTO, Arable Land (ha per person), AGVALUE, TOTAGEXP
b Dependent Variable: LOGGDPPP

Table J-3. ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	8.592	5	1.718	7.952	.000
	Residual	6.915	32	.216		
	Total	15.508	37			

a Predictors: (Constant), Value share of 3 of top 20 agricultural exports, PREWTO, Arable Land (ha per person), AGVALUE, TOTAGEXP
b Dependent Variable: LOGGDPPP

Table J-4. Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	8.811	.557		15.825	.000		
	PREWTO	-1.865E-02	.164	-.015	-.114	.910	.856	1.168
	AGVALUE	-2.927E-02	.008	-.532	-3.466	.002	.593	1.687
	TOTAGEXP	3.605E-03	.004	.151	.918	.365	.514	1.947
	Arable Land (ha per person)	.279	.833	.052	.335	.740	.567	1.762
	Value share of 3 of top 20 agricultural exports	-1.525E-02	.007	-.335	-2.258	.031	.635	1.575

a Dependent Variable: LOGGDPPP

Table J-5. Collinearity diagnostics

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions					
				(Constant)	PREWTO	AGVALUE	TOTAGEXP	Arable Land (ha per person)	Value share of 3 of top 20 agricultural exports
1	1	5.014	1.000	.00	.01	.00	.00	.00	.00
	2	.537	3.056	.00	.77	.00	.01	.01	.00
	3	.329	3.905	.00	.00	.01	.12	.19	.00
	4	7.641E-02	8.101	.01	.05	.54	.38	.08	.01
	5	3.194E-02	12.529	.13	.07	.29	.37	.53	.24
	6	1.140E-02	20.977	.86	.10	.16	.11	.20	.75

a Dependent Variable: LOGGDPPP

Table J-6. Residuals statistics

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	5.9281	8.3160	6.9637	.48190	38
Std. Predicted Value	-2.149	2.806	.000	1.000	38
Standard Error of Predicted Value	.12069	.25768	.18029	.04074	38
Adjusted Predicted Value	5.7820	7.9893	6.9602	.46641	38
Residual	-.6753	.9018	.0000	.43232	38
Std. Residual	-1.453	1.940	.000	.930	38
Stud. Residual	-1.556	2.054	.003	1.024	38
Deleted Residual	-.8394	1.0907	.0035	.52704	38
Stud. Deleted Residual	-1.593	2.170	.012	1.051	38
Mahal. Distance	1.520	10.395	4.868	2.646	38
Cook's Distance	.000	.275	.038	.061	38
Centered Leverage Value	.041	.281	.132	.072	38

a Dependent Variable: LOGGDPPP

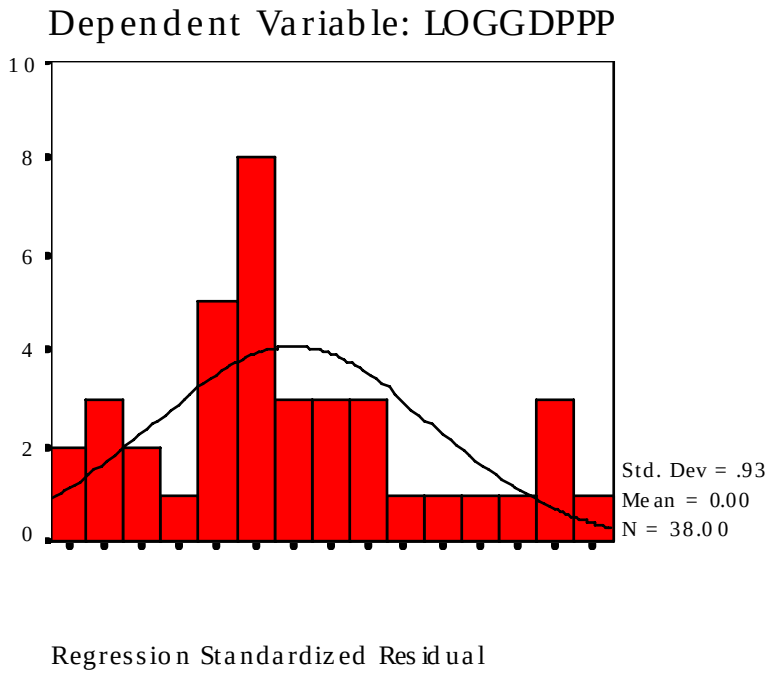

Figure J-1. Histogram regression residuals

APPENDIX K
GDP REGRESSION WITHOUT MISSING VARIABLES

Table K-1. Variables entered

Model	Variables Entered	Variables Removed	Method
1	VALAGRI3	.	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).
2	AGVALUE	.	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).

a Dependent Variable: GDPPPPCA

Table K-2. Model summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.688	.473	.454	1414.59880	
2	.740	.548	.513	1335.53674	2.410

a Predictors: (Constant), VALAGRI3
b Predictors: (Constant), VALAGRI3, AGVALUE
c Dependent Variable: GDPPPPCA

Table K-3. ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	48566620.085	1	48566620.085	24.270	.000
	Residual	54029423.363	27	2001089.754		
	Total	102596043.448	28			
2	Regression	56220925.707	2	28110462.854	15.760	.000
	Residual	46375117.741	26	1783658.375		
	Total	102596043.448	28			

a Predictors: (Constant), VALAGRI3
b Predictors: (Constant), VALAGRI3, AGVALUE
c Dependent Variable: GDPPPPCA

Table K-4. Coefficients

Model		Unstandardized Coefficients B	Standardized Coefficients Beta	t	Sig.	Collinearity Statistics Tolerance	VIF
1	(Constant)	7651.562		6.018	.000		
	VALAGRI3	-83.327	-.688	-4.926	.000	1.000	1.000
2	(Constant)	7397.012		6.130	.000		
	VALAGRI3	-54.402	-.449	-2.565	.016	.567	1.765
	AGVALUE	-58.254	-.363	-2.072	.048	.567	1.765

a Dependent Variable: GDPPPPCA

Table K-5. Collinearity diagonstics

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions (Constant)	VALAGRI3	AGVALUE
1	1	1.978	1.000	.01	.01	
	2	2.157E-02	9.576	.99	.99	
2	1	2.923	1.000	.00	.00	.01
	2	6.159E-02	6.889	.27	.01	.63
	3	1.575E-02	13.622	.72	.99	.36

a Dependent Variable: GDPPPPCA

Table K-6. Residuals statistics

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	-721.1115	5266.4292	1522.8621	1417.00042	29
Std. Predicted Value	-1.584	2.642	.000	1.000	29
Standard Error of Predicted Value	250.08817	711.44415	409.65642	131.50801	29
Adjusted Predicted Value	-1014.6965	4261.4561	1446.6093	1310.27176	29
Residual	-1838.7192	3485.5710	.0000	1286.95540	29
Std. Residual	-1.377	2.610	.000	.964	29
Stud. Residual	-1.453	3.084	.026	1.068	29
Deleted Residual	-2083.7639	4866.5684	76.2528	1589.41194	29
Stud. Deleted Residual	-1.486	3.797	.056	1.164	29
Mahal. Distance	.016	6.980	1.931	1.949	29
Cook's Distance	.000	1.256	.090	.254	29
Centered Leverage Value	.001	.249	.069	.070	29

a Dependent Variable: GDPPPPCA

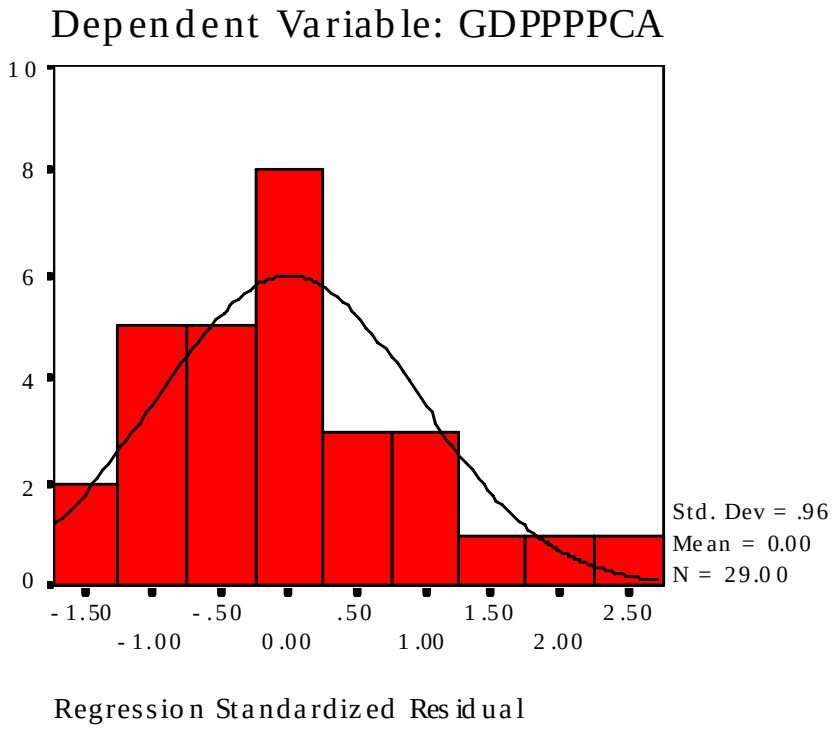

Figure K-1. Histogram regression residuals

APPENDIX L
DEFINITIONS AND DATA RANGES

Table L-1. Arable land (ha) per capita

COUNTRY	YEAR	ARABLAND
Zambia	1998	.51
Cameroon	2001	.39
Burkina Faso	1998	.36
South Africa	1997	.36
Nigeria	1997	.26
Mozambique	2003	.23
Uganda	2000	.21
Ghana	1998	.20
Cote d`Ivoire	1998	.19
Malawi	1997	.18
Gambia	1998	.18
Madagascar	2001	.17
Ethiopia	2000	.16
Kenya	1997	.15
Tanzania	1993	.13
Guinea	1994	.11

Definition: "Arable land (hectares per person) includes land defined by the FAO as land under temporary crops (double-cropped areas are counted once), temporary meadows for
mowing or for pasture, land under market or kitchen gardens, and land temporarily fallow. Land abandoned as a result of shifting cultivation is excluded."
Source: WDI

Table L-2. Value share of top 3 agricultural exports (as % of top 20 agricultural exports)

COUNTRY	YEAR	VALAGRI3
Ghana	1998	91.89
Burkina Faso	1998	89.37
Malawi	1997	87.72
Ethiopia	2000	86.06
Madagascar	2001	84.59
Gambia	1998	82.45
Uganda	2000	77.58
Guinea	1994	76.37
Kenya	1997	74.54
Nigeria	1997	74.48
Mozambique	2003	73.88
Zambia	1998	72.76
Tanzania	1993	71.09
Cameroon	2001	69.69
Cote d`Ivoire	1998	57.63
South Africa	1997	34.87

Definition: Calculated by adding the value (in US$) of the top 3 agricultural export commodities and dividing it by the value of the top 20 agricultural exports. In cases where data was not available, FAO has estimated or corrected them, etc.
Source: FAO

Table L-3. Urbanization (% of urban population) and population density

COUNTRY	YEAR	URBANIZA	POPDENSI
South Africa	1997	52.60	37.10
Cameroon	2001	49.00	32.60
Cote d`Ivoire	1998	41.70	50.30
Ghana	1998	40.20	83.50
Nigeria	1997	39.50	120.10
Zambia	1998	37.30	13.80
Mozambique	2003	32.98	24.30
Kenya	1997	30.00	50.30
Gambia	1998	26.40	123.40
Madagascar	2001	26.00	28.70
Guinea	1994	25.30	29.60
Tanzania	1993	20.00	32.90
Burkina Faso	1998	15.20	39.00
Ethiopia	2000	14.90	68.50
Malawi	1997	14.02	112.60
Uganda	2000	12.00	123.30

Defintion: "Urban Population as a Percent of Total Population is the proportion of a country's total national population that resides in urban areas. Any person not residing in an area classified as urban is counted in the rural population. Definitions of urban populations vary slightly from country to country."

Source: Earthtrends/UN

Table L-4. Agriculture, value added (as % of GDP)

COUNTRY	YEAR	AGVALUE
Tanzania	1993	48.11
Ethiopia	2000	47.70
Cameroon	2001	39.86
Uganda	2000	37.34
Ghana	1998	36.01
Burkina Faso	1998	34.48
Nigeria	1997	33.63
Malawi	1997	32.59
Kenya	1997	30.91
Madagascar	2001	28.60
Gambia	1998	28.42
Mozambique	2003	24.38
Cote d`Ivoire	1998	24.12
Guinea	1994	21.71
Zambia	1998	21.14
South Africa	1997	4.01

Definition: "[P]roportion of total output of goods and services which are a result of the value added by the agricultural sector. The agricultural sector corresponds to International Standard Industrial Classification (ISIC) divisions 1–5 and includes forestry, hunting, and fishing, as well as cultivation of crops and livestock production. Value added is the value of the gross output of producers less the value of intermediate goods and services consumed in production. It is calculated without making deductions for depreciation of fabricated assets or depletion and degradation of natural resources."
Source: Earthtrends/UN

Table L-5. Food exports (as % of total merchandise exports)

COUNTRY	YEAR	TRADFOOD
Malawi	1997	84.50
Gambia	1998	76.80
Ethiopia	2000	70.60
Uganda	2000	67.30
Cote d`Ivoire	1998	59.40
Ghana	1998	58.40
Kenya	1997	55.60
Madagascar	2001	48.70
Guinea	1994	43.79*
Mozambique	2003	43.79*
Tanzania	1993	43.79*
Cameroon	2001	16.80
Burkina Faso	1998	16.40
South Africa	1997	10.80
Zambia	1998	7.10
Nigeria	1997	1.70

*: Missing value replaced with mean of all data points

Definition: "Components may not sum to 100% because of unclassified trade. Food comprises the commodities in SITC sections 0 (food and live animals), 1 (beverages and tobacco), and 4 (animal and vegetable oils and fats) and SITC division 22 (oil seeds, oil nuts, and oil kernels)." World Bank staff estimates from the COMTRADE database maintained by the United Nations Statistics Division.

Source: WID

Table L-6. Agricultural raw exports (as % of total merchandise exports)

COUNTRY	YEAR	TRADRAW
Burkina Faso	1998	68.10
Cameroon	2001	21.30
Ethiopia	2000	18.70
Uganda	2000	14.10
Cote d`Ivoire	1998	11.20
Guinea	1994	10.61*
Mozambique	2003	10.61*
Tanzania	1993	10.61*
Ghana	1998	10.60
Gambia	1998	9.70
Kenya	1997	6.80
Zambia	1998	6.40
South Africa	1997	3.90
Madagascar	2001	3.70
Malawi	1997	3.60
Nigeria	1997	.10

*: Missing value replaced with mean of all data points

Definition: "Components may not sum to 100% because of unclassified trade. Agricultural raw materials comprise SITC section 2 (crude materials except fuels) excluding divisions 22, 27 (crude fertilizers and minerals excluding coal, petroleum, and precious stones), and 28 (metalliferous ores and scrap). World Bank staff estimates from the COMTRADE database maintained by the United Nations Statistics Division."

The main component of interest is division 26 - textile fibres.

For more information, visit:

http://unstats.un.org/unsd/cr/registry/regcs.asp?Cl=14&Lg=1&Co=26

Source: WID

Table L-7. Total agricultural exports (Food and Raw Ag) as % of total merchandise exports

COUNTRY	YEAR	TOTALEXP
Ethiopia	2000	89.30
Malawi	1997	88.10
Gambia	1998	86.50
Burkina Faso	1998	84.50
Uganda	2000	81.40
Cote d`Ivoire	1998	70.60
Ghana	1998	69.00
Kenya	1997	62.40
Guinea	1994	54.40*
Mozambique	2003	54.40*
Tanzania	1993	54.40*
Madagascar	2001	52.40
Cameroon	2001	38.10
South Africa	1997	14.70
Zambia	1998	13.50
Nigeria	1997	1.80

*: Missing value replaced with mean of all data points
Definition: Simple addition of both Food and Raw Ag exports.
Source: WID

Table L-8. GDP ppp per capita & log GDP ppp per capita

COUNTRY	YEAR	GDPPPPCA	LOGGDPPP
South Africa	1997	8752.00	9.08
Cameroon	2001	2022.00	7.61
Ghana	1998	1746.00	7.47
Cote d`Ivoire	1998	1606.00	7.38
Guinea	1994	1583.00	7.37
Gambia	1998	1582.00	7.37
Uganda	2000	1244.00	7.13
Mozambique	2003	1128.00	7.03
Kenya	1997	983.00	6.89
Burkina Faso	1998	940.00	6.85
Madagascar	2001	866.00	6.76
Nigeria	1997	806.00	6.69
Zambia	1998	749.00	6.62
Ethiopia	2000	636.00	6.46
Malawi	1997	556.00	6.32
Tanzania	1993	440.00	6.09

Definition: "GDP per capita based on purchasing power parity (PPP). PPP GDP is gross domestic product converted to international dollars using purchasing power parity rates. An international dollar has the same purchasing power over GDP as the U.S. dollar has in the United States. GDP at purchaser's prices is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources. Data are in constant 2000 international dollars."
Source: WID

Table L-9. Agricultural exports (% of GDP)

COUNTRY	YEAR	AGEXPGDP
Cote d`Ivoire	1998	25.42679325
Malawi	1997	17.74849714
Ghana	1998	17.69871505
Madagascar	2001	10.73272894
Kenya	1997	9.778089314
Burkina Faso	1998	9.647086372
Cameroon	2001	6.933639164
Uganda	2000	6.315187972
Ethiopia	2000	5.532443331
Zambia	1998	4.302988053
Gambia	1998	4.035912
South Africa	1997	3.068714499
Nigeria	1997	0.097177379
Tanzania	1993	
Mozambique	2003	
Guinea	1994	

Definition: Adding Raw&Food Exports, multiply times merchandise export value, then divided by the total GDP, keeping US$ (in both cases) constant.
Source: WID

APPENDIX M
ROBUSTNESS OF MODELS

Table M-1. Comparison of regression model's robustness

Comparison of Variables' Significance in Inequality Regression Models	MODEL 1 n=38/df=30	MODEL 2 n=38/df=30	CLASSICAL MODEL 3 n=50/df=42	REVISED MODEL 4 n=30/df=25	NEW MODEL 5 n=32/df=24	NEW MODEL 6 n=32/df=28	NEW MODEL 7 n=20/df=18
Before WTO	nsig	**	**	nsig	**	***	nsig
Agriculture Value Added (% of GDP)	*	****	****	****	****	**	****
Food Exports (% of merchandise exports)	-	****	****	**	****	**	*
Agricultural Raw Exports (% of merchandise exports)[1]	-	nsig	nsig	nsig	nsig	nsig	*
Total Agricultural Exports (% merchandise exports)[3]	**	-	-	-	-	-	-
Total Agricultural Exports (% of GDP)	nsig	-	-	-	-	-	-
GDP ppp per capita[2]	nsig	nsig	nsig	nsig	nsig	nsig	nsig
Children's Infant Mortality rate	nsig	nsig	nsig	nsig	nsig	nsig	nsig
Urbanization	**	**	*	nsig	nsig	*	nsig

Note: -: not included; nsig: not significant; *: significant at .10 level; **: significant at .05 level, ***: significant at .01 level, ****: significant < 0.01 level

[1]: Transformed (square-root)

[2]: Transformed (logged)

[3]: Transformed (logged)

Table M-1. Continued

Definition of Models	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Missing Variables							
Replaced	x	x	x		x	x	
Not Replaced				x			x
Regression Type							
Enter	x	x	x		x		
Stepwise				x		x	x
Countries Excluded							
Burkina Faso				x			
South Africa 2 points/country	(x)	(x)			x	x	x
Notes	Min.2,Max.3 data points/ country	Min.2,Max.3 data points/ country					
Adjusted R^2	0.382	0.516	0.403	0.509	0.471	0.443	0.483

Table M-1. Continued

Comparison Variables' Significance	NEW MODEL 8 n=20/df=12	NEW MODEL 9 n=32/df=24	NEW MODEL 10 n=32/df=31	NEW MODEL 11 n=20/df=18	HYBRID MODEL 12 n=28/df=21	HYBRID MODEL 13 n=38/df=35	MODEL 14 n=26/df=18	MODEL 15 n=18/df=16
Before WTO	nsig	nsig	**	nsig	nsig	****	nsig	nsig
Agriculture Value Added	****	**	****	****	**	****	****	****
Food Exports	*	-	-	-	-	-	****	-
Agricultural Raw Exports[1]	nsig	-	-	-	-	-	nsig	-
Total Agricultural Exports (% merchandise exports)[3]	-	**	nsig	nsig	nsig	nsig	-	nsig
Total Agricultural Exports (% of GDP)	-	nsig	nsig	nsig	nsig	nsig	-	nsig
GDP ppp per capita[2]	nsig	nsig	nsig	nsig	nsig	nsig	nsig	nsig
Children's Infant Mortality	nsig	nsig	nsig	nsig	nsig	nsig	nsig	nsig
Urbanization	nsig	nsig	nsig	nsig	nsig	nsig	**	nsig

Note: -: not included; nsig: not significant; *: significant at .10 level; **: significant at .05 level, ***: significant at .01 level, ****: significant < 0.01 level

[1]: Transformed (square-root)

[2]: Transformed (logged)

[3]: Transformed (logged)

Table M-1. Continued

Definition of Models	Model 8	Model 9	Model 10	Model 11	Model 12	Model 13	Model 14	Model 15
Missing Variables								
Replaced		x	x			x		
Not Replaced	x			x	x		x	x
Regression Type								
Enter	x	x			x		x	x
Stepwise			x	x		x		
Countries Excluded								
Burkina Faso								
South Africa							x	x
2 points/country	x	x	x	x	(x)	(x)	(x)	x
Notes					Min.2,Max.3 data points/ country	Min.2,Max.3 data points/ country	Min.2,Max.3 data points/ country	
Adjusted R^2	0.614	0.348	0.32	0.483	0.414	0.33	0.602	0.393

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BIOGRAPHICAL SKETCH

Growing up in Kuettigkofen, a small agricultural village in Switzerland, Saemi Thomas Ledermann has been intimately involved with the dynamic relationship of human-environment interactions on a daily basis. During his years at the Gymnasium Solothurn, where he graduated in 2000 with a Matura degree in economics and law, he observed the gradual yet powerful impact that national and international policies had on the viability of local farms. At Macalester College, Saint Paul, MN, he expanded this curiosity to the global scale, majoring with honors in Political Science, Geography, and International Studies with a specific focus on development in Africa. This focus on development culminated in the successful completion of an Honors Thesis entitled "Agricultural Subsidies and the Doha Round: A Historic Breakthrough?", highlighting the potential medium- and long-term socio-economic and environmental impacts of the World Trade Organization's Doha Round on sub-Saharan cotton farmers.

During his graduate studies at the University of Florida, Saemi continued to expand upon his previous studies, developing a further expertise in development in Africa, with specific foci on inequality and agriculture. Entering his PhD studies, his ultimate aim is not only to provide new insights into some of the most pressing issues plaguing African farmers, but also speak towards the policy-makers. Consequently, Saemi is intent on gaining challenging, yet rewarding experiences in academia and beyond.