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"Trade Matters in the Fight Against Poverty": Narratives, Perceptions, and (Lack of) Evidence in the Case of Fish Trade in Africa

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Summary. — Two opposing views exist in the literature on the potential role that international fish trade plays in economic development. While some claim that fish trade has a pro-poor effect, others denounce the negative effect of fish export on local populations' food security and doubt its contributions to the macro-economy. In this paper, we explore this debate in sub-Saharan Africa. Our analysis did not find any evidence of direct negative impact of fish trade on food security; neither did it find evidence that international fish trade generates positive, pro-poor outcomes. This paper discusses the possible reasons for this apparent lack of development impact and highlights the unsupported assumptions underlying the current discourse about international fish trade. We suggest that, given lack of evidence for the development benefits of fish trade between Africa and developed countries, fisheries policy could consider support for regional (Africa-to-Africa) trade that meets the growing African demand for lower-value fish. Means of overcoming barriers to intra-African trade in fish are discussed.

Key words — food security, international fish trade, poverty reduction, small-scale fisheries, Africa

1. INTRODUCTION

> If a fair share of the significant 'benefits' from international trade (…) does not reach those who labour to produce it, the problem is indeed importantly with the structure of trade and the nature of control over it. (Kurien, 2004, p. 73)

In the current debate about how best to achieve poverty reduction, economic growth and global trade have been assumed to play a central role (Dollar & Kraay, 2004; Timmer, 1997; Wolf, 2004). The real effect of economic growth on poverty reduction is, however, still contentious (Edward, 2006; Melchior, 2001; Naschold, 2004; Ravaillon, 2004; Reddy & Minoiu, 2005; Wade, 2004) with an increasing number of scholars and policy analysts insisting on the crucial role of equity and income distribution (e.g., Basu, 2006; Goldberg & Pavcnik, 2007; Kalwij & Verschoor, 2007; Reddy & Pogge, 2003). In a similar way, the role of trade, globalization, and a free market, while strongly advocated (e.g., OECD, 2008), is still highly debated (Ackerman, 2005; Collins & Graham, 2004; Goodman & Watts, 1997; Madeley, 2000; Raynolds & Murray, 1998; Wade, 2004). Several recent studies question in particular the positive role of open economies and trade in economic growth, highlighting that, historically, some of the most prosperous periods in the world economy have been associated with relatively strong protectionist policies (e.g., Clemens & Williamson, 2001; O'Rourke, 2000). More broadly, some academics, activists and non-governmental organizations still express strong reservation regarding the real benefits of open economies and trade for developing countries, in particular in relation to agricultural commodities which usually represent a major part of their exports (Busch & Bain, 2004; Leclair, 2002; Oxfam, 2002; Ponte, 2002; Sick, 1997).

The international fish trade is at the heart of this debate. In a recent campaign promoting pro-poor trade entitled "Trade matters in the fight against Poverty," the UK-Department for International Development (DFID) recalls that "[t]he anger people feel about the inequity of the global trading system is captured in the fish on our plates" (DFID, 2005). Indeed, today, two opposed views coexist in the literature about the impacts of fish trade on economic development. Following the general theory on trade, the first view claims that fisheries development and trade are good for poverty alleviation. Fish

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export, it is argued, can act as an engine of growth for developing countries endowed with large fish resources (Cunningham, 2000; EU, 2006; FAO, 2007; Schmidt, 2003). The main argument advanced by this "pro-fish trade" narrative is that international fish trade, which has experienced exponential growth in the last three decades, can contribute to economic growth in developing countries by providing an important source of hard cash flow (Ahmed, 2003; Bostock, Greenhalgh, & Kleih, 2004; Thorpe, 2004; Valdimarsson, 2003; World Bank, 2004). For many of those developing countries that are short of revenues, the foreign exchange generated by this trade can be a critical 'life-raft' to buoy-up their economy as it can be used to service international debt, pay fast growing import bills, and fund the operations of national governments. Foreign exchange earnings can also be used to import much larger volumes of low cost food to supply the domestic market, thus contributing to national food security (FAO, 2005, 2007; Valdimarsson & James, 2001). Additionally, fisheries trade can indirectly contribute to economic development through the creation of new jobs, the increase of incomes within the sector and secondary flow on effects such as migrant workers sending money to families and dependents at home (Kurien, 2005).[1]

In contrast, the "anti-fish trade" group contends that fisheries trade impacts negatively on food security, the local economy, and livelihoods options for the poor (Abgrall, 2003; Abila & Jansen., 1997; Jansen, 1997; Kent, 1997; Ruddle 2008). They further argue that fishing agreements signed between high income countries (importers) and developing nations (exporters) usually take advantage of the developing states without providing fair returns (Alder & Sumaila, 2004; Kaczynski & Fluharty, 2002; UNEP, 2002). They cite as evidence the apparently minimal economic benefits that developing states have managed to derive so far from these agreements (Petersen, 2003; Porter, 1999), pointing out the low rates of revenue reinvested back into the sector and the low usage of local processing facilities and infrastructure by foreign operations. It is also argued that global-trade fishery policies lead to losses of local jobs and adversely affects the development of the domestic fishing industry (Abgrall, 2003; Abila, 2003; Jansen, 1997; Kaczynski & Fluharty, 2002; Porter, 2001). Finally, it is argued that revenues generated from fish exports in countries where the high-value market chain is dominated by a small number of firms, or by foreign investors, may simply 'leak' out of the national economy in the form of capital flight and expenditure on luxury imports, leaving little to be reinvested in development (Wilson & Boncoeur, 2008).

International media coverage has brought these controversies to wider public attention. On July 17, 2007, the *Wall Street Journal* printed an article headlined "Global Fishing Trade Depletes African Waters" arguing that fish trade not only impacts negatively on the fish supply of West African countries, but also jeopardizes the ecological sustainability of the exploited resources (Miller, 2007). A few months later, the *New York Times* published a series of front-page articles on Europe's growing demand for fish and the consequences of this trend on developing countries' fish supply (NY Times, 2008a, 2008b).

In this context, it is not surprising that the question of a potential 'nexus' between fish trade and food security has emerged recently as a dominant theme of international fisheries governance and research, and a prominent strand of trade and poverty reduction debates. At global level, the Code of Conduct for Responsible Fisheries promoted by the Food and Agriculture Organization (FAO, 1995) appeals to states, development agencies and other international organizations to ensure that:

> . . .promotion of international fish trade and export production do not result in environmental degradation or adversely impact the nutritional rights and needs of people for whom fish is critical to their health and well being and for whom other comparable sources of food are not readily available or affordable (FAO, 1995 , article 11.2.15).

In a similar vein, the Kyoto Declaration following the "International Conference on the Sustainable Contribution of Fish to Food Security" also made a direct reference to the problem. The Declaration encouraged states to:

> [e]nsure that trade in fish and fishery products promotes food security, (. . .) does not undermine applicable global, regional and sub-regional conservation and management measures and is conducted in accordance with the principles, rights and obligations established in the WTO Agreement (FAO & Japan, 1995).

While this paper will draw partially upon and discuss some of the main conclusions highlighted by these various documents,[2] our objective is to focus the debate on the specific case of fish trade in sub-Saharan Africa. The justification for concentrating on this particular region is threefold. First, although the fishing sector in this part of the world is not as important—in terms of overall production and monetary value—as it is in some parts such as South and South East Asia,[3] the degree of general poverty and food insecurity that prevails in Africa, and in particular its sub-Saharan part, is recognized to be one of the highest in the world. Africa was home to 15 of the 16 countries where the prevalence of hunger already exceeded 35% before the 2007 food crisis. It is estimated that this food crisis added another 24 million undernourished people in Africa (FAO, 2008). By 2015, 53% of the world population classed as poor will be living in Africa (UNDP, 2005). Thus, investigating whether or not trade in food commodities help or exacerbate these conditions is a priority for development research.

The second reason for this focus on sub-Saharan Africa is that—as the literature review below reveals—a large number of the countries quoted in this pro *versus* anti-fish trade debate are from the African continent. Senegal, Uganda, Namibia, Mauritania, and Kenya are some of the countries that are frequently presented as success stories by the pro-fish trade narrative, and just as frequently pointed out as empirical evidence of the negative impact of fish trade by the anti-fish trade group. In this heated debate, the Lake Victoria Nile perch fishery has been under particular scrutiny.

The third reason, related to the above two, is that although the contribution of Africa to global fish supplies is minor compared to those from other continents, Africans have a relatively high nutritional dependence on fish,[4] and a significant number of them depend upon small-scale fisheries as a source of full-time, seasonal, part-time, or occasional income.[5] Thus, the question of whether to orientate fisheries policy toward export promotion for poverty reduction has important potential implications for the existing role that fisheries (and in particular small-scale fisheries) play in sustaining the livelihoods of those fish-dependent households.

So, does international fish trade effectively contribute to economic and human development in sub-Saharan Africa? Is support for increased global trade and a management strategy to optimize the production of exportable fish species and maximize resource rents the policy package that will contribute most to poverty reduction in Africa?

To address these questions the rest of the paper is articulated as follows. After a brief section describing the fish trade data used in this research, the main theoretical and empirical

arguments advanced by the proponents of the fish trade narrative are presented, followed by a similar analysis of the anti-fish trade arguments. We then turn more specifically to the sub-Sahara situation. First the main characteristics of the sub-Sahara fish trade are analyzed, both at the global level through a comparison with the world aggregate trade and at the sub-regional level, through an analysis of the data rearranged into four regions: Western, Central, Southern, and Eastern Africa. In the following section a series of statistical tests are run, using FAO fisheries trade statistics and UNDP and World Bank socio-economic development indicators, with the objective to test whether fish trade has had any demonstrable positive or negative effects on the economy and food security of sub-Sahara African countries. The results of these tests and their implications in terms of trade and fisheries management policy are then discussed in the final section of the paper.

2. FISH TRADE DATA

The FAO fisheries statistics system (FISHSTAT) is so far the only international database that provides a relatively complete coverage, both geographically and across time, of fisheries data around the world. This data set is used here as our main source of information on fish trade. For the analyses, the following data were considered: total production (landings) and fish trade (import and export) recorded in monetary values (US$) and quantity (tonnes) of fish for human consumption (i.e., fish oil and fishmeal products excluded [6]) over the period 1990–2001. For each country, the fish 'supply' was defined as the total landing recorded *plus* the total import *minus* the total export. When normalized to reflect *per capita* ratio, these fisheries data were adjusted using the total population of the country (UN Secretariat, 2004) as recorded in the closest year for which the population data were available. Forty-seven sub-Saharan countries were included in the analyses. They were further grouped into the four sub-regions West, Central, Southern, and East Africa as shown in Table 1.

Table 1. *List of the 47 sub-Sahara countries included in the analysis and grouped by sub-region*

West Africa	Central Africa	Southern Africa	East Africa
Benin	Cameroon	Angola	Burundi
Burkina Faso	Central African Rep	Botswana	Comoros
Cape Verde	Chad	Lesotho	Djibouti
Cote d'Ivoire	Dem Rep of Congo	Malawi	Eritrea
Gambia	Rep of Congo	Mozambique	Ethiopia
Ghana	Equatorial Guinea	Namibia	Kenya
Guinea	Gabon	South Africa	Madagascar
Guinea-Bissau	Sao Tome and Principe	Swaziland	Mauritius
Liberia		Zambia	Rwanda
Mali		Zimbabwe	Seychelles
Mauritania			Somalia
Niger			Tanzania
Nigeria			Uganda
Senegal			
Sierra Leone			
Togo			

3. FISH IN AFRICA: FOOD SECURITY ***THROUGH*** TRADE OR FOOD SECURITY ***VERSUS*** TRADE ?

Since the 1980s and the seminal work of Sen (1981) the concept of food security has experienced a fundamental shift in its perspective—from a "self-sufficiency" to a "self-reliance" conception (FAO, 2003a; Stevens, Devereux, & Kennan, 2003), offering at the same time a firmer foundation and a new legitimacy to the international trade theory. Through his entitlement framework, Sen demonstrated that in terms of food security, the *production of* food commodities (self-sufficiency) was perhaps not as important as the conditions that ensure the *access to* these food commodities (self-reliance), and that, along with direct production, food security could be ensured through trade, labor, and transfers (Sen, 1981, pp. 2–4). This analysis provided an explicit link to the classical trade theory where emphasis is put on exchange (import/export) to ensure the adequate supply of needed commodities. In this regard, Sen's trade-based entitlement categories correspond to commercial food imports at the national level, and food purchase/exchange at the household level. Following this approach, it is entirely possible and economically rational for a country—or an individual farming household—to try to achieve food security by growing high-value crops instead of staple grains, and to import/purchase some proportion of the food it requires with the revenues generated from its export/farm surplus crop sales. This is the "food security through trade" approach.

Applying this principle to fish, an increasing numbers of experts and development agencies argue that developing countries well endowed with coastal and/or inland fish resources should favor export-oriented strategies in order to seize the comparative advantage offered by those existing resources. The implicit understanding is that the revenues generated through these exports would then be 're-injected' into the national economy, and would in particular compensate for the loss of direct sources of animal protein induced in the first place by the fish export (e.g., FAO, 2003a, 2003b; Valdimarsson, 2003). [7]

The evidence and arguments that underpin this pro-fish trade narrative are numerous and impressive. FAO, in its most recent State of Fisheries and Aquaculture Report, observes that the total world trade in fish and fishery products reached a record value of US$71.5 billion (export value) in 2004, representing a 23% growth relative to 2000. In real terms (adjusted for inflation), exports of fish and fishery products increased by 17.3% during the period 2000–04, confirming fish as one of the most highly traded food and feed commodities (FAO, 2007). The fish trade balance of developing countries (i.e., the total value of their exports less the total value of their imports) has shown a continuing rising trend over the past two decades, growing from US$4.6 billion in 1984 to US$16.0 billion in 1994, and to US$20.4 billion in 2004. These figures are significantly higher than those for other main traded agricultural commodities such as rice, coffee, or tea (Figure 1). At the same time, the world aggregate level of *per capita* fish consumption has risen from 9.0 kg in 1961 to an estimated 16.5 kg in 2003 (FAO, 2007).

At the country level as well, evidence that support the pro-fish trade position seem undisputable. In Uganda for instance, export earnings have increased from US$ 1.4 million in 1990 to about US$ 90 million in 2002 (Bostock *et al.*, 2004). In Bangladesh, fish trade accounts for 76% of the total agricultural export value (this is mainly from shrimp aquaculture); and is of similarly high importance in the export figures of Morocco (58%) and Peru (62%) (Thorpe, 2004). In Mauritania the fisheries sector generates 27% of the total state budget (Alder & Sumaila, 2004).

Based on these figures, the legitimacy of continuing to emphasize revenues from fish export, as a national objective, seems hard to question. One would have noticed, however,

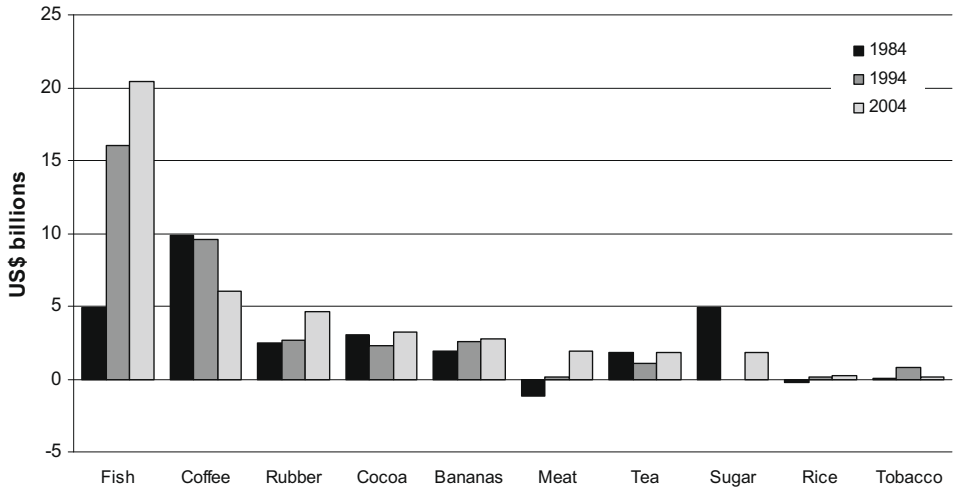

Figure 1. *Fishery net exports (US$ million) of developing countries compared to other main traded agricultural commodities (redrawn from FAO, 2007).*

that all these figures are about revenues or foreign exchange earnings, *not* about actual economic growth, food security, or poverty alleviation. To recognize the link between foreign exchange earnings and poverty alleviation and/or food national self-reliance, one must therefore make the additional assumption that there exists either some direct investment of revenue in sectors or projects that contribute to national economic growth, or some redistribution mechanism, such as a "trickle down" effect that ensures that—at least part of—these enormous profits generated through fish trade do effectively benefit the rest of the economy.

This point is one of the core-arguments advanced by the anti-fish trade group to question the legitimacy of promoting fish export-oriented policies as a poverty reduction strategy (Porter, 1999; Ruddle, 2008). One of their main claims is that fish export has a negative effect on local populations' food security, as it transfers fish from the African poor consumer's plate toward the rich European consumer's table. In other words, they claim that one has to choose: fish trade, *or* food security. In the case of the Lake Victoria fishery for instance, where the debate about the potential nexus between fish trade and local food security has been particularly heated (see e.g., Sauper, 2004), many local researchers and activists argue that very little of the massive foreign exchange and tax revenues earned from the exports is reinvested in infrastructural and human development at the local level.[8] The African Center for Technology Studies (Mugabe, Jansen, & Ochieng, 2000) for example, quote a government official report that showed that the town of Kisumu in Kenya, where 80% of the export-orientated Nile perch factories were located in the mid-1990s, had the highest percentage of population suffering from food deficiency and absolute poverty, among all urban areas in the country.

The anti-fish trade group does not simply question the pro-poor dimension of fish trade; its proponents actually claim that export-oriented fish policy works *against* the poor (Ruddle 2008). Based on their own research, Abila (1997) estimate for instance that about 15,000 jobs in the traditional small-scale fish processing and marketing sector around Lake Victoria have been lost as a result of the development of the export trade industry.[9] Jansen also refers to what he terms "reverse proprietorship," claiming that 83% of the active fishers no longer own their productive assets (boats or fishing gear).

The anti-fish trade line of argument goes beyond the potential negative impact of export on the livelihoods (employment and direct food security) of the local population. In the case of fishing agreements between African countries and the European Union (EU) countries, Kaczynski and Fluharty (2002) argue that those fisheries agreements are fundamentally unequal—the EU countries gaining much with little regard for the development of the African countries or the sustainability of their marine resources. To illustrate their point, these authors take the case of Guinea-Bissau. They calculated that EU fisheries license revenues earn Guinea-Bissau only 10.5% of the estimated value of the coastal resources exploited by EU vessels, and less than 0.5% in the case of the offshore tuna fisheries (Kaczynski, 1998). In Namibia where the fishery sector is reported to generate a substantial share of the total government revenues, Lange, Hassan, and Alfredi (2003) argue that the country recovers only a small portion of the resource rent from the fisheries sector and has failed so far to reinvest that rent into social or economic development. To justify their argument the authors point out that despite the massive inflow of fisheries' foreign exchange earnings, Namibia's real *per capita* GDP has declined at an annual rate of −0.025% over the last 20 years.

In brief, the controversy about fish trade is still very much unresolved. Contributing to this is the increasing 'polarization' of the two discourses, where both pro- and anti-fish trade supporters would tend to ignore the other side of the story. Thus, the anti-fish trade proponents tend to forget the number of jobs created by the exporting processing factories, while the pro-fish trade advocators tend to be silent about the increasing difficulties of local traditional fish traders to find fish supply for their small-scale business. Paradoxically, in this heated debate, both proponents and critics have been extensively using African fisheries examples (sometimes from the same countries) to try to substantiate their cases. The supporters of the fish trade, however, also tend to rely heavily on global/world level statistics and reason essentially in value, not quantity. At both the country and world level, these figures are essentially the compilations of foreign exchange earnings and/or revenues derived from fish trade, not real evidence of the effects of these revenues on the national economy of the countries or the livelihoods of their populations. At the other end, the fish trade sceptics are essentially relying on data from local case studies to advance their counter-arguments. The nature of this evidence (local data), however, severely limits the potential generalization of their arguments, which probably explains their difficulty in gaining wider acceptance amongst development researchers and policy analysts.

4. INTERNATIONAL FISH TRADE: REVISITING SOME DEEP-ROOTED PERCEPTIONS

One of the most misleading perceptions about fish trade and development is the implicit link that is often made between the substantial growth in world fish exports and the increase in fish *per capita* supply observed at the aggregated level—as if the latter was the direct result of the former. While this false correlation may 'look true' at the world aggregate level, the analysis at the continent level reveals a very different situation, in particular for sub-Saharan Africa. In this part of the world, fish supply *per capita* has declined by 14% over the last 12 years (Figure 2) reaching a world-low record of 6.7 kg/year. In fact, sub-Saharan Africa is the only part of the developing world where fish supply per person is declining while production is still increasing. [10]

The comparative analysis of fisheries data in production, trade, and *per capita* supply (Table 2) reveals some other major divergences between the world aggregate trend and the African one, suggesting structural differences between the African and the world situations. First, while the world fisheries production has plateaued during the course of the 1990s, African fisheries production is still increasing—albeit at a moderate rate. While no over-optimism should be derived from this observation, since—like in many other parts of the world—an important number of African fisheries (both large- and small-scale fisheries) are thought to be over-exploited (FAO, 2007), this positive trend in production suggests that, overall, African fisheries have not yet reached full capacity and that there is still potential for further development and expansion (in particular in aquaculture, and in some inland fisheries—countries such as the Democratic Republic of Congo being particularly good examples of this potential). This contrasts with many other fisheries worldwide that are estimated to be fully or over-exploited.

At the sub-Sahara regional level, the comparison of fish trade data (imports and exports) with production shows different trends. In East Africa, fisheries exports have increased substantially while production has stagnated and imports plunged down after a growth period, indicating that fisheries trade may be affecting local fish supply (as suggested by a declining *per capita* supply). In the other sub-regions, however, trends in production are not considerably different from trends in fisheries trade. Declining or stagnating *per capita* supply in these regions cannot, therefore, be explained by the fish trade alone.

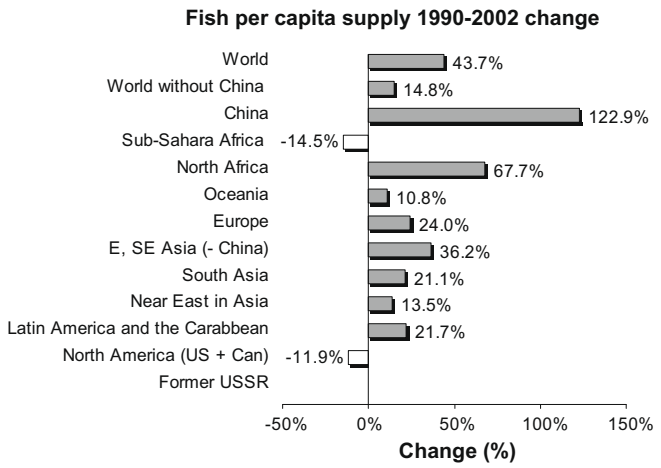

Figure 2. *Change in fish per capita supply in different regions of the world for the period 1990–2002. Source: FAO FISHSTAT.*

Other factors must play an important role, including the rapid population growth, weaknesses in the artisanal (local) market chain inducing important post-harvest losses, [11] but also possibly the increasing price of fish products, even at the local level, [12] in comparison with the declining purchasing power of a large number of households across the continent.

When fisheries trade and production are compared at country level (Figure 3), it is apparent that fish trade is being driven by a limited number of countries. Only six countries produce more than 250,000 tonnes per year: Tanzania, Ghana, Nigeria, Senegal, Namibia, and South Africa. Interestingly none of those countries (nor any of the other majors fishing nations such as Uganda and Kenya) has a positive fish trade balance when considered in quantity (Figure 3). In fact, a more thorough analysis reveals a fundamental structural unbalance in fish trade in sub-Saharan Africa. While trade measured in value terms has increased from almost zero in 1990 to US$750 million in 2001, the same balance has remained negative in quantity (Figure 4). This situation is true not only at the aggregate level but also at the individual country level: no country in sub-Saharan Africa has a positive fish trade balance. This situation has some particularly important implications. If, as a rule of thumb, we can assume that reasoning in value is rather favorable to the high-value products exported to Europe and other developed countries, in contrary reasoning in quantity reflects the regional demand for low-value fish. [13] The systematic negative fish trade balance observed here suggests therefore a structural disequilibrium. Incidentally, when fish trade is discussed in the literature, it is usually through its (positive) value figures, not its (negative) quantity ones. [14] Putting emphasis on the value products, however, means that African governments and development agencies assume that the indirect food security mechanism "food security through trade" is working effectively.

In short, the comparison of value with quantity reveals that, despite the huge revenues generated by the international fish export in a few individual sub-Sahara countries, this trade has failed to compensate for the increasing gap between fish demand and supply at the African level. When the distinction is made between high-value and low-value fish, there is even greater cause for concern. Using the FAO data for 1973, 1985, 1997 and a supply-demand model to compute a projection for 2020, an IFPRI analysis (Delgado, Wada, Rosegrant, Meijer, & Ahmed, 2003) found that this gap is expected to widen further in the future, with the high-value fish trade remaining just above zero (import equalling export) while the projection for the low-value fish trade plunges drastically to a level close to the value of 1973, half a century earlier (Figure 5). Not surprisingly, Africa fish *per capita* supply is also expected to fall below 6.6 kg/*per capita*/year in 2020.

5. IMPACT OF FISH TRADE ON DEVELOPMENT

In this section, we propose to examine the potential effects of fish export on economic and human development in sub-Saharan Africa. For this, we draw on a series of economic and social well-being indicators derived from the World Bank database (World Bank, 2007) and the UNDP Human development Index reports (UNDP, 2007). As we are interested in investigating the effect(s) of fish trade not only on macro-economic indexes, but also on poverty reduction (understood in a large multi-dimensional sense), four different development indicators are considered: mortality rate, malnutrition prevalence, mean monthly *per capita* income, and *per capita* Gross Domestic Product (GDP). This combination of human and

Table 2. *Summary of trends in fisheries production, imports, exports and per capita supply at the worldwide, African, sub-Saharan African, and regional African level from 1990 to 2001*

Region	Production	Imports	Exports	*per capita* supply
World	Plateauing	Quantity and value Increasing	Quantity and value increasing	Slightly increasing, plateauing in recent years
Africa	Increasing	Quantity overall increasing, with recent plateau Value increasing	Quantity and value increasing	Declining
Sub Saharan Africa	Increasing	Quantity stagnated Slight decrease for value	Quantity and value increasing	Slightly declining
West Africa	Increasing	Large fluctuation in quantity and value around constant trend	Quantity and value fluctuating with no clear trend	Stagnating
	Pelagic fish followed closely by fresh-water fish are largest contributor	Pelagic fish have largest import value and quantity Much higher import value compared to other regions	Pelagic fish have largest export quantity Pelagic fish and cephalopods have largest export value	Pelagic fish biggest contributor to food supply
Central Africa	Increasing	Large fluctuations in quantity and value around constant trend	Quantity and value increasing	Strongly declining but still highest level of *per capita* supply
	Fresh-water fish largest contributor	Marine and pelagic fish have highest import value and quantity	Lowest export value in Africa	Pelagic fish biggest contributor to food supply
	Lowest production levels in Africa			
East Africa	Stagnated	Fluctuating quantity and value	Quantity and value substantially increasing, mainly freshwater fish	Strongly declining
	Fresh-water fish are largest contributor	Overall increasing trend in quantity, value increases until 1998 followed by sharp decline Pelagic fish have largest import value and quantity		
Southern Africa	Increasing	Fluctuating quantity and value with overall decreasing trend	Quantity and value increasing	Stagnating
	Highest production levels in Africa	Pelagic fish have largest import value and quantity	Highest export value in Africa	
	Pelagic marine fish are largest contributor		Demersal fish have highest export value, Demersal now equal to pelagic export quantity	

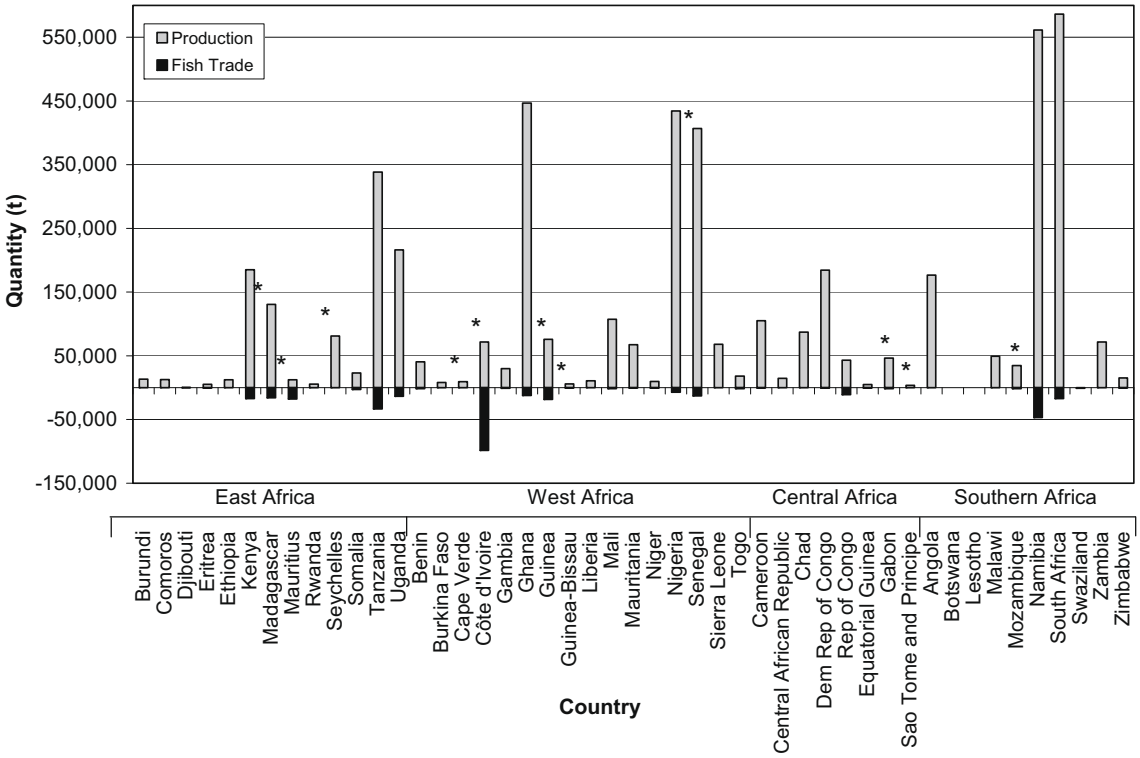

Figure 3. *Total fisheries production and trade (tonnes) for African countries. Values are averages for period 1990–2001 (the symbol * indicates countries with European Fisheries Agreements. Source: FAO FISHSTAT.*

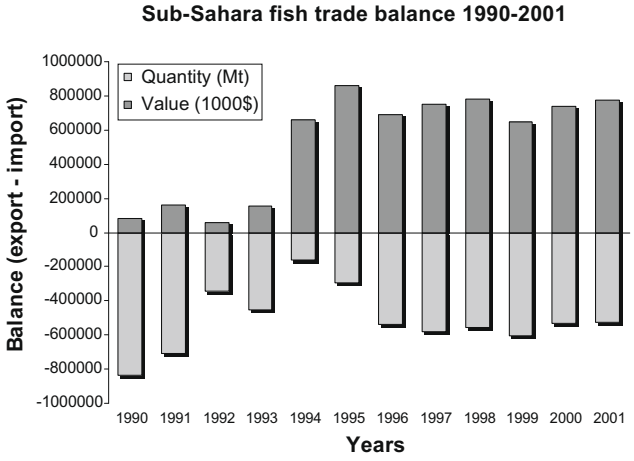

Figure 4. *Fish trade balance of sub-Saharan Africa during 1990–2001 measured in both value and quantity. Source: FAO (2005).*

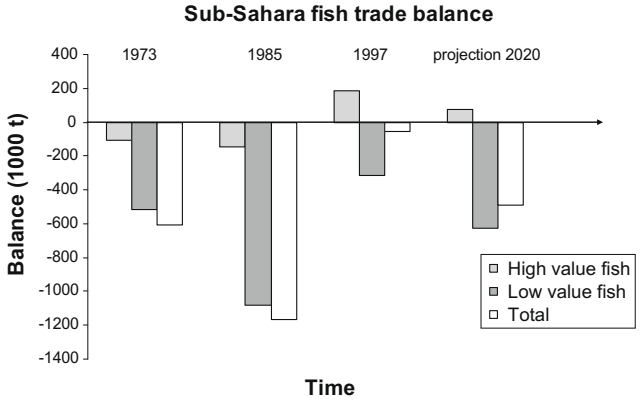

Figure 5. *Evolution of sub-Sahara fish trade balance for low-value, high-value, and total fish trade during 1973–2020 (projection). Source: Delgado et al. (2003)*

economic development indicators reflects the current recognition in the development literature of the need to broaden the definition of development beyond economic growth and the recent emphasis highlighting the multidimensional nature of poverty as reflected in the Millennium Development Goals approach.

(a) *Fish-trade indicators*

To study the potential effect of fish trade on human and/or economic development we used a series of five fish-trade indicators (Table 3). First we considered the percentage of fish production exported (i.e., the ratio of fish export over total fish production—in quantity), seen as a proxy for the country's fish export policy 'openness': irrespective of its absolute quantity, a country that exports, say, 80% of its total fish production would be considered more 'open' than a country that exports only 30% of its national production. Second, we considered the *per capita* fish export values, as a proxy for the relative importance of fish export revenues adjusted by the total population of the country. The idea is that the same revenues generated through fish export, say US20 million per year, are in theory expected to have a bigger impact on the economy of a country with 1.5 million people than on the economy of one with a population of 150 million. The third fish-trade indicator selected is the value of fish export as a percentage of the total

Table 3. *The five fish-trade indicators used in the analysis*

Fish-trade indicators	Rational
Percentage of fish production exported[a]	Reflects the countries' fish export policy 'openness'
per capita fish export value[b]	Reflects the relative importance of fish export revenue in the countries' economy
Fish export as a percentage of the total agriculture export value[c]	Reflects the relative importance of fish as a trade commodity for the country's economy
per capita fish production[d]	Reflects the importance of the fishery sector as a whole
Presence of fishery agreements with EU	Indicates countries which receive specific revenues through those fishery agreements

[a] Share of fish production (in quantity) exported—average 1999–2001.
[b] Export values (in US$) averaged over 1990–2001 and population in 2001.
[c] Fish export values (in US$) as a share of agriculture export values in 2001.
[d] Average 1995–2001.
Source data: FAO FISHSTAT.

agriculture export value. Like the *per capita* fish export value, this third indicator reflects the relative importance of fish as a trade commodity for the country's economy. [15] Note however that the two indicators capture different dimensions of this fish trade importance. A country may display a high *per capita* fish export value because the country has a relatively small population, for example, Namibia, or because the country does not export any other major agricultural commodity (e.g., Gabon). In both cases, the effect of fish trade on the country economy is expected to be high, but not for the same reason. The fourth fish-trade indicator is the *per capita* fish production. This indicator is assumed to reflect the importance, not merely of fish trade activities, but more broadly of the fishery sector as a whole. Finally, the fifth and last fishery indicator considered is the presence of fishery agreements (FAs) between African countries and EU countries. These agreements grant EU countries the right to fish in the exclusive economic zones of African countries. They are therefore, indirectly, a component of fish exports, although they are not always included as such in trade statistics. The estimated total value of bilateral FA between Sub-Saharan African countries and the European Union is estimated to exceed €229 million over the period 2001–11 (i.e., an average of €4.3 million per year per country) (CEC, 2005). Presumably, FA revenues could have positive effect on the economies of those countries.

(b) *Statistical analysis*

To test the effect of fish trade activities on the economic and human development indicators of sub-Saharan countries, we considered the four development indicators identified previously (mortality rate, malnutrition prevalence, mean monthly *per capita* income, and *per capita* GDP) and regressed them against the five-fish trade indicators presented above, in combination with 15 additional sets of cross-sectional indicators reflecting the macro-economic, infrastructure, governance and trade policy environments of the countries (see Table 4 for summary statistics and details of those indicators).

As GDP is often expected to play a central role in economic and human development processes, we first investigated potential links between *per capita* GDP and other macro-economic variables [16]—details of the models' specification testing and diagnostic checking are displayed in Annex 1. The analysis shows that in sub-Saharan Africa *per capita* GDP can be correlated to a linear combination of five other macro-level indicators: industrial value added, government expenditure on education, internet users index, political stability and trade policy (model7 in Annex 1) with relatively satisfactory R^2 and adjusted R^2 values, given the limited size of the sample. The effects of fish trade on *per capita* GDP are then tested by regressing *per capita* GDP against the five fish-trade indicators, along with the macro-economic variables identified in model7. Table 5 displays the results of this OLS identification. The analysis shows that none of the five fish-trade indicators has a statistically significant effect on *per capita* GDP. R^2 and *F*-test confirm that the other independent variables are valid regressors and Breusch–Pagan heterogeneity tests indicate that there is no correlation with the error terms, confirming the statistical validity of the analysis.

We then investigate the potential effects of fish trade on the three other development indictors (mortality rate—Table 6; malnutrition prevalence—Table 7; and *per capita* income—Table 8) with proper controls in place for possible confounding variables and endogeneity problems. In particular, as GDP can be suspected to be endogenous in some of those regressions, we use two-stage least squares (2SLS) models to account for those possible endogeneities. For the 2SLS estimates, we use the five macro-economic factors identified in the preceding analysis (industrial value added, expenditure on education, internet users index, political stability, and trade policy) as excluded instruments for *per capita* GDP, while the remaining macro-economic indicators initially considered (Table 4) are used as included instruments. [17] Sargan and Cragg–Donald Wald tests indicate that the excluded instruments are reasonably correlated to the suspected endogenous variable and are uncorrelated to the error terms. Durbin–Wu–Hausman χ^2 tests reveal, however, that *per capita* GDP is endogenous in only two of the 15 models tested (model2 for mortality and model4 for malnutrition). We use the 2SLS regressions for those two endogeneity cases and OLS for the other models. In all cases, none of the five fish-trade indicators shows any significant effect (even at 10%) on the development indicators—see Tables 6–8). Breusch–Pagan tests confirm the absence of correlation with the error terms.

In summary, our analyses show that despite a wide range of models and indicators tested, and after controlling for potential endogeneity and effects of growth-related variables reflecting trade environment, good (or bad) governance, infrastructure, and macro-economic context, no demonstrable correlations were found between fish trade and economic and/or human development in sub-Saharan Africa. One important point to highlight is that these results, by failing to demonstrate any impact, either positive or negative, do not simply question the pro-fish trade narrative. They also refute the fish trade—food security nexus denounced by the anti-fish trade narrative. Note that our analysis, however, only investigated the potential links at the country level. At the local level, one would expect the impacts (positive or negative) of fish trade on the various development indicators to be more visible. This hypothesis remains, however, to be systematically tested across countries, something that the lack of local data in most countries in sub-Sahara Africa makes at the present

Table 4. *Descriptive statistics of the variables—including the fish-trade indicators—used in this analysis*

Variables	Unit	Obs	Mean	Std. Dev.	Min	Max
Human/economic development indicators (dependent variables)						
Mortality rate[a]	nber	47	91.55	34.65	12	165
Malnutrition prevalence[b]	nber	41	22.75	8.78	8.8	44.3
per capita GDP[c]	US$	45	1046.44	1510.19	139	7435
per capita monthly income[d]	US$	31	70.88	45.12	25.21	221.65
Macro-economic indicators (independent variables)						
Poverty gap[e]	%	29	16.39	12.66	0.2	43.3
Debt service[f]	%	34	12.07	12.04	1.37	69.83
per capita education expenditure[g]	US$	42	34.97	68.95	2.69	383.59
per capita health expenditure[h]	US$	44	137.84	173.89	16	748
Road paved[i]	%	32	0.22	0.22	0.02	0.99
Industry, value added[j]	%	45	27.79	16.51	11.5	89.84
Internet users[k]	nber	46	2.18	3.66	0.03	17.83
Net Foreign Investment[l]	%	39	0.03	0.04	0	0.19
Accountability[m]	ranking nber	43	32.08	20.0	1	75
Political stability[n]	ranking nber	43	34.94	23.82	0.5	92.8
Trade Policy[o]	ranking nber	29	93.65	23.99	6	125
External environment[p]	ranking nber	29	67.21	46.48	1	125
Institutional environment[q]	ranking nber	45	134.84	40.45	30	178
Trade facilitation[r]	ranking nber	38	105.61	27.68	24	149
Trade outcome[s]	%	43	92.26	50.7	1	160
Fish-trade indicators (independent variables)						
per capita fish production	%	47	0.02	0.06	0	0.291
Fish export as agriculture export	US$	42	0.18	0.27	0	1
Percentage of fish exported	%	45	11.19	23.28	0.001	133.9
per capita fish export value	kg	46	1.38	4.73	0	24.235
Fishery agreement	1 = yes 0 = no	45	0.24	0.43	0	1

[a,b,f–k]*Data source*: World Development Indicators database, April 2007. http://ddp-ext.worldbank.org/ext/DDPQQ/member.do?method=getMembers&userid=1&queryId=135.
[m,n]*Data source*:Worldwide governance indicators 1996-2007 http://info.worldbank.org/governance/wgi/sc_country.asp.
[o–s]*Data source*: World Bank's World Trade Indicators 2008 http://info.worldbank.org/etools/wti2008/1a.asp?regionID=r6&periodID=12&vr=Rank&h_country=Select%20Country.
[a] Infant mortality rate per 1000 (2005 data).
[b] Malnutrition prevalence (weight for age, percentage of children under 5)—Average 2001–05.
[c] *per capita* GDP $US (1990–2005 average) Data source: International Monetary Fund, World Economic Outlook Database, September 2006.
[d] Average monthly *per capita* income/consumption expenditure. *Data source*: WorldBank Povcal Net website. Data downloaded July 2007.
[e] Mean distance below the poverty line as a proportion of the poverty line. Data downloaded July 2007, using standard default setting of $32.74 per month as the poverty line.
[f] Total debt service (% of exports of goods, services and income. Average 2001–05.
[g] *per capita* government expenditure in education.
[h] *per capita* government expenditure in health.
[i] Road paved (as percentage of total roads). Average 2001–05.
[j] Industry, value added (as share of GDP). Average 2001–05.
[k] Internet users (per 100 people). Average 2001–05.
[l] Net Foreign Investment (as share of GDP 2002). *Data source*: World Development Indicators database 2002.
[m] Accountability Index as defined in Governance matters, Worldwide governance indicators 1996–2007.
[n] Political stability as defined in Governance matters, Worldwide governance indicators 1996–2007.
[o] Trade Policy TTRI (MFN applied tariff) as defined in World Bank's World Trade Indicators 2008.
[p] External environment MA-TTRI (applied tariff incl. prefs.) as defined in World Bank's World Trade Indicators 2008.
[q] Institutional environment: rank (of 178)—as defined in World Bank's World Trade Indicators 2008.
[r] Trade facilitation LPI –as defined in World Bank's World Trade Indicators 2008.
[s] Trade outcome = Real growth in total trade (g + s, %)—as defined in World Bank's World Trade Indicators 2008.

time impossible. [18] We also reiterate that what is being claimed by the pro-trade view is that international export-orientated policies in fisheries—including licensing of foreign vessels to catch fish—have led to national-level benefit, so that is the claim that we evaluated.

6. PRO-FISH TRADE: EVIDENCE-BASED NARRATIVE OR ADVOCACY?

In the rest of the paper, the discussion focuses more specifically on the pro-fish trade narrative. There are two reasons for this. First, while the data show a rather unclear picture—at least as far as fish trade in sub-Sahara is concerned—at the same time an increasing number of international institutions seem to have embarked on a general pro-trade oriented approach across sectors. The OECD for instance states through its Trade Liberalization Programme's webpage that "[t]rade and investment liberalisation has proven to be both a powerful stimulus to economic growth and a key factor in integrating an expanding number of developing countries in the world economy" (OECD, 2008).

Other organizations concur with this position. The European Commission for instance through its Directorate-General for Trade (DG-T) is "committed to helping world trade and development, thereby boosting competitiveness, jobs

Table 5. *Correlation analysis between fish trade and per capita* GDP *in sub-Saharan Africa (OLS estimates)*

Independent variables	Transf	Dependent variable = *per capita* GDP (log)				
		Model1	Model2	Model3	Model4	Model5
Industry, value added	Log	**1.11**	**1.07**	**1.05**	**1.1**	**1.07**
		(0.000)	(0.000)	(0.000)	(0.000)	(0.001)
Education expenditure	Log	0.504	**0.464**	**0.414**	**0.412**	**0.423**
		(0.002)	(0.001)	(0.002)	(0.002)	(0.003)
Internet users	$\sqrt[3]{}$	0.875	**0.878**	**1.03**	0.823	**0.874**
		(0.083)	(0.085)	(0.05)	(0.133)	(0.099)
Political stability	nber	**0.007**	**0.007**	**0.007**	**0.007**	**0.007**
		(0.045)	(0.055)	(0.059)	(0.052)	(0.064)
Trade policy	nber	**0.008**	0.007	0.005	0.004	0.005
		(0.095)	(0.127)	(0.312)	(0.447)	(0.218)
per capita fish export	Log	−0.191				
		(0.246)				
per capita fish production	Log		−0.341			
			(0.345)			
Percentage fish export	Log			−0.0379		
				(0.308)		
Fish export as% agricultural export	Log				−0.703	
					(0.231)	
Fish agreement	1 = yes					−0.067
						(0.734)
Intercept		−0.411	−0.891	0.135	0.251	0.093
		(0.672)	(0.511)	(0.878)	(0.789)	(0.918)
Statistical summary						
N		27	28	28	26	27
R^2		0.894	0.886	0.887	0.892	0.887
Adj R^2		0.862	0.854	0.855	0.859	0.853
Root MSE		0.387	0.392	0.390	0.396	0.4
$F(k, N-k-1)$		28.1	27.3	27.5	26.3	26.2
Prob > F		0.000	0.000	0.000	0.000	0.000
Breusch–Pagan heteroskedasticity test H_0: homoskedasticity						
$\chi^2(k-1)$		6.6	5.68	7.76	4.2	4.36
Prob > χ^2		0.359	0.459	0.257	0.650	0.628

Note: t-values of estimated coefficients are indicated in parentheses.

and growth in the process" (EC, nd). A long list of 'success-stories' and case-studies is annexed to the DG-T website to substantiate the statement. These case-studies cover various economic sectors, from agriculture and horticulture to services, and also fisheries. In relation to this last commodity, the FAO fisheries department has also taken a clear pro-fish trade position. In the section "Responsible fish trade and food security" published in the latest State of the World Fisheries and Aquaculture document (FAO, 2007), it is stated:

> "[I]nternational trade in fishery products has had a positive effect on food security in the developing countries participating in such trade. International fish trade has increased dramatically over the past 20 years [(...) and d]eveloping countries have particularly benefited from this increase". [In] Thailand, one of the world's largest fish-exporting countries, (...) a considerable increase in rural incomes [occurred] as a result of the overall export orientation of the economy. Fishers are likely to have benefited to the extent that their harvesting and production were linked to export-oriented species. Poverty levels in the rural areas have also dropped significantly. Without doubt, in LIFDCs the earnings for international trade in fishery products contribute to ensuring food security at the aggregate level." (FAO, 2007, pp. 113–114).

Indisputably, such a categorical statement, made by an UN agency, carries substantial weight. As such, it is likely to create (or contribute to creating) an overwhelming impression that fish trade is, indeed, the solution for poverty alleviation, irrespective of the country and the fishery considered. It may be worth noting however that the FAO section quoted here was, in theory, supposed to summarize the main findings of another, earlier study co-commissioned by FAO and the Royal Norwegian Ministry of Foreign Affairs (Kurien, 2004). As we shall see below, however, the conclusions of this initial well-regarded study were much more equivocal and nuanced than the section summarized in the quote above tends to suggest.

We argue in the next section that beyond the potential ideological dimension of this choice, such an unconditional support may lead to situations where national and international institutions and decision-makers overlook, or take for granted, some of the critical assumptions and mechanisms that underlie (fish) trade theory. This may lead them, in some cases, to mis-allocate their limited resources and make choices that eventually cancel out the real positive effects that fish trade can generate.

The second reason that led us to focus on the pro-fish trade approach in the rest of this paper is that, despite our strong reservations against the current fish trade approach, we also believe that a real pro-poor fish trade is possible in Africa. The current fish trade strategy adopted and promoted by many African governments and international development agencies is one that consists of targeting developed countries' markets (in particular Europe) with high-value products. We contend that investment in strengthening an existing regional (Africa-to-Africa) trade that would draw on the growing intra-regional demand for lower-value fish would be much more beneficial to the economies of those sub-Sahara countries.

Table 6. *Correlation analysis between fish trade and mortality in sub-Saharan Africa (OLS or 2SLS estimates)*

Independent variables	Transf	Dependent variable = Mortality rate				
		Model1 OLS	Model2 2SLS	Model3 OLS	Model4 OLS	Model5 OLS
GDP	Log	**−11.9**	−8.37	**−12.7**	−6.9	**−12.6**
		(0.049)	(0.181)	(0.037)	(0.199)	(0.033)
Poverty gap[a]	%	**3.09**	**3.32**	**3.15**	**4.23**	**3.31**
		(0.044)	(0.036)	(0.027)	(0.007)	(0.024)
Poverty gap2	^2	**−0.056**	**−0.066**	**−0.056**	**−0.084**	**−0.061**
		(0.098)	(0.056)	(0.078)	(0.014)	(0.061)
Net Foreign Investment[b]	Log	**−14.3**	−8.38	**−15.9**	**−11.6**	**−15**
		(0.022)	(0.169)	(0.009)	(0.064)	(0.015)
Trade outcomes[c]	%	0.109	0.133	0.117	**0.229**	0.105
		(0.204)	(0.138)	(0.174)	(0.022)	(0.222)
per capita fish export	Log	−6.56				
		(0.62)				
per capita fish production	Log		−75.8			
			(0.115)			
Percentage fish export	Log			−0.133		
				(0.94)		
Fish export as% agricultural export	Log				19.7	
					(0.407)	
Fish Agreement	1 = yes					−2.81
						(0.808)
Intercept		71.3	−95.9	65.1	31.2	70.7
		(0.112)	(0.39)	(0.141)	(0.509)	(0.125)
Statistics summary						
N		25	21	26	22	25
R^2		0.618	0.583	0.602	0.638	0.614
Adj R^2		0.491	0.404	0.476	0.493	0.485
Root MSE		20.6	17.9	20.8	18.1	20.7
$F(k, N - k - 1)$		4.85	3.43	4.78	4.41	4.77
Prob > *F*		0.004	0.027	0.004	0.009	0.005
Endogeneity tests H_0: Regressor is exogenous						
Durbin–Wu–Hausman χ^2 test		1.257	2.933	2.267	2.556	2.068
(*P*-value)		0.262	0.087	0.132	0.109	0.150
Overidentification tests H_0: Excluded regressors are uncorrelated to errors						
Sargan χ^2 test		7.001	8.718	8.146	4.333	6.660
(*P*-value)		0.136	0.068	(0.086)	0.363	0.155
First-stage regression estimators significance H_0: Regressors are underidentified						
Cragg–Donald Wald χ^2 test		232.95	230.27	215.81	212.75	232.95
(*P*-value)		0.000	0.000	0.000	0.000	0.000
Heteroskedasticity tests H_0: Homoskedasticity of included instruments						
Breusch–Pagan/Cook–Weisberg χ^2 test		2.27	7.734	3.32	4.28	6.16
(*P*-value)		0.893	0.655	0.768q	0.639	0.405

Note: *t*-values of estimated coefficients are indicated in parentheses.

7. QUESTIONING THE TRICKLE-DOWN EFFECT

The absence of correlation between the fish-trade indicators and the development indicators highlighted in the previous section could have two explanations. Either there is effectively no relationship between fish trade contribution and development, irrespective of how this contribution is measured (i.e., irrespective of the type of fish-trade indicators we used) or what we think development is about (i.e., irrespective of the development indicators we used). Or, a relationship exists but our analysis did not detect it.

There is no doubt that fish trade advocates would tend to agree with our second interpretation. If it is, indeed, the case that a relationship exists but that the official FAO and other major international agencies' data sets used in this analysis failed to identify it, then we have simply reversed the burden of proof, and it is now the task of those fish trade advocates to provide the empirical evidence that fish trade (in its current form) effectively contributes to economic growth and/or poverty alleviation in sub-Saharan Africa. Anticipating this, here we explore further why no demonstrable correlation was found in the case of sub-Saharan Africa.

One explanation could be that the contribution of fishery exports is too small relative to the rest of the national economy. Our country-level comparison suggests that this could indeed be the case for a large number of sub-Saharan countries where the volumes of both production and exports appear to be relatively low (*cf.* Figure 3). Considering the contribution of fisheries to GDP also provides support to this argument. For the sub-Saharan countries for which the information is available, the average figure is usually less than 2%. Even in Namibia and Ghana—the two African countries with the highest

Table 7. *Correlation analysis between fish trade and malnutrition in sub-Saharan Africa (OLS or 2SLS estimates)*

Explanatory variables	Transf	Dependent variable = Malnutrition rate				
		Model1 OLS	Model2 OLS	Model3 OLS	Model4 2SLS	Model5 OLS
GDP	Log	−4.12	**−4.24**	**−3.77**	**−7.7**	**−4**
		(0.151)	(0.083)	(0.099)	(0.018)	(0.092)
Net Foreign Investment	Log	−1.4	−1.66	−1.2	**−3**	−1.23
		(0.339)	(0.251)	(0.409)	(0.075)	(0.373)
External environment	nber	**−0.059**	**−0.052**	**−0.054**	**−0.069**	**−0.06**
		(0.046)	(0.079)	(0.056)	(0.048)	(0.04)
Health expenditures	Log	**−7.35**	**−7.98**	**−8.23**	−4.46	**−7.48**
		(0.008)	(0.003)	(0.003)	(0.169)	(0.006)
Trade facilities	nber	**0.102**	**0.089**	**0.078**	**0.132**	**0.1**
		(0.042)	(0.059)	(0.102)	(0.026)	(0.036)
per capita fish export	Log	−1.11				
		(0.762)				
per capita fish production	Log		0.866			
			(0.95)			
Percentage fish export	Log			−0.338		
				(0.483)		
Fish export as% agricultural export	Log				3.42	
					(0.628)	
Fish Agreement	1 = yes					−2.19
						(0.401)
Intercept		**68.3**	**72.8**	**72.3**	**68.9**	**69.4**
		(0.000)	(0.054)	(0.000)	(0.000)	(0.000)
Statistics summary						
N		22	23	23	20	22
R^2		0.814	0.804	0.81	0.801	0.821
Adj R^2		0.739	0.731	0.738	0.709	0.75
Root MSE		4.68	4.7	4.62	4.85	4.59
$F(k, N-k-1)$		10.9	10.9	11.4	9.12	11.5
Prob > *F*		<0.001	<0.001	<0.001	<0.001	<0.001
Endogeneity tests H_0: Regressor is exogenous						
Durbin–Wu–Hausman χ^2 test		0.17744	1.08094	0.6454	3.50111	0.10308
(*P*-value)		0.673	0.298	0.421	0.061	0.748
Overidentification tests H_0: Excluded regressors are uncorrelated to errors						
Sargan χ^2 test		1.134	1.447	0.731	1.023	1.474
(*P*-value)		0.889	0.836	0.947	0.906	0.831
First-stage regression estimators significance H_0: Regressors are underidentified						
Cragg–Donald Wald χ^2 test		99.78	116.37	141.20	94.89	148.08
(*P*-value)		0.000	0.000	0.000	0.000	0.000
Heteroskedasticity tests H_0: Homoskedasticity of included instruments						
Breusch–Pagan/Cook-Weisberg χ^2 test		9.26	7.96	10.8	9.338	9.25
(*P*-value)		0.159	0.240	0.095	0.500	0.159

Note: *t*-values of estimated coefficients are indicated in parentheses.

contribution—the fisheries share to GDP is less than 8% (Béné, 2006).[19] In these conditions, even if the redistribution of fish export revenues was to be effective in this group of countries, the amount redistributed may still not be large enough to have a significant impact on national indicators. In other words, what is going on in the other 92–98% of the economy simply masks any "fisheries effect."

For some other, better-endowed countries, one could argue that fisheries do generate an amount of revenues that is significant enough to have potentially an effect on the rest of the economy (Thorpe, 2004). For instance in Senegal, fish export represents 60% of the total agriculture exports. Nevertheless, for poverty alleviation to occur, or even for economic growth to take place, wealth created from the fisheries sector must "trickle down" through some form of redistribution mechanism (Basu, 2006; Kalwij & Verschoor, 2007; Reddy, 2003; Wade, 2004). This principle is also true for small-scale fisheries (see Figure 1, p. 85 in Béné, Bennett, & Neiland, 2004). The absence of correlation between fish trade and development indicators was observed in our case even for the largest African exporters, suggesting that those redistribution mechanisms are not working effectively.

This issue of lack of trickle down effect is not completely new. It had already been highlighted by the anti-fish trade narrative in the case of agreements between African countries and European fisheries (e.g., Kaczynski & Fluharty, 2002; Lange *et al.*, 2003; Petersen, 2003; Porter, 1999) or in the case of the Lake Victoria fisheries (e.g., Abila, 1997; Alder & Sumaila, 2004). Using those analyses in the present case to challenge the trickle down assumption would, however, inevitably result in being viewed as biased in support of the anti-fish trade argumentation.

Table 8. *Correlation analysis between fish trade and monthly income in sub-Saharan Africa (OLS and 2SLS estimates)*

Independent variables	Transf	Dependent variable = Monthly income (log)				
		Model1 OLS	Model2 OLS	Model3 OLS	Model4 OLS	Model5 OLS
GDP	Log	**0.426**	**0.434**	**0.436**	**0.434**	**0.432**
		(0.000)	(0.054	(0.000)	(0.000)	(0.000)
Accountability	Nber	0.006	0.006	0.006	0.005	0.006
		(0.152)	(0.119)	(0.126)	(0.207)	(0.147)
External environment	Nber	**0.003**	**0.003**	**0.003**	0.003	**0.003**
		(0.104)	(0.101)	(0.083)	(0.128)	(0.101)
per capita fish export	Log	0.041				
		(0.846)				
per capita fish production	Log		−0.297			
			(0.671)			
Percentage fish export	Log			−0.006		
				(0.813)		
Fish export as% agricultural export	Log				0.0576	
					(0.896)	
Fish Agreement	1 = yes					0.047
						(0.755)
Intercept		1.03	0.329	0.966	0.997	0.984
		(0.112)	(0.842)	(0.112)	(0.125)	(0.118)
Statistics summary						
N		23	24	24	22	23
R^2		0.672	0.674	0.672	0.656	0.673
Adj R^2		0.599	0.605	0.603	0.575	0.6
Root MSE		0.296	0.287	0.288	0.304	0.296
$F(k, N-k-1)$		9.21	9.82	9.72	8.09	9.26
Prob > *F*		<0.001	<0.001	<0.001	<0.001	<0.001
Endogeneity tests H_0: Regressor is exogenous						
Durbin–Wu–Hausman χ^2 test		1.957	2.016	2.067	1.508	2.637
(*P*-value)		0.162	0.156	0.150	0.220	0.104
Overidentification tests H_0: Excluded regressors are uncorrelated to errors						
Sargan χ^2 test		4.85	4.673	4.877	5.162	4.672
(*P*-value)		0.303	0.313	0.300	0.271	0.323
First-stage regression estimators significance H_0: Regressors are underidentified						
Cragg–Donald Wald χ^2 test		203.60	197.18	174.49	130.65	203.60
(*P*-value)		0.000	0.000	0.000	0.000	0.000
Heteroskedasticity tests H_0: Homoskedasticity of included instruments						
Breusch–Pagan/Cook–Weisberg χ^2 test		1.82	1.54	2.93	4.87	3.76
(*P*-value)		0.768	0.819	0.569	0.301	0.439

Note: *t*-values of estimated coefficients are indicated in parentheses.

Interestingly, documents and data that have been published by authors who are openly critics of the anti-fish trade narrative also suggest that this trickle down is not occurring. In what appears to be a rather disparaging article against the "anti-export monologue" in which they, for instance, claim that the arguments of the anti-fish trade activists are "seriously flawed," [20] Kim Geheb and his colleagues were nevertheless forced to admit that the Lake Victoria Nile Perch fishery had not created any apparent trickle down effect at the local level. Despite the very substantial revenues generated by the export industry (estimated to be around US$ 250 million in 2006), only 20% of the 1433 landing sites identified in their 2004 frame survey were reported to have communal lavatory facilities, a mere 4% served by electricity and 6% only supplied with potable water. Similarly, while emphasizing that the Nile Perch fishery had created large numbers of jobs in the sector, Geheb had also to recognize that "the relationships between fishermen [and the factories] are highly unequal. Conditions within the fishery are tough, and income from it very unevenly distributed" (Geheb *et al.*, 2007, p. 15). [21]

Beyond the specific and polemical case of Lake Victoria (see, e.g., Molony, Richey, & Ponte, 2007), or the even less clear situation of the sub-Saharan Africa region as a whole, the hypothesis of a poor (or lack of) trickle down of fishery export revenues has also been brought forward in many other parts of the world. Based on a review of 11 case studies from the developing world, [22] John Kurien carried out recently an in-depth analysis of the contributions of fish trade to food security (Kurien, 2004). In his carefully worded analysis, he stresses the implicit nature often given to the trickle down hypothesis but finds "little evidence of significant real improvement in the general well-being of local households (both producers and consumers) that could be directly associated with harvesting or producing high priced fishery products for export" (2004, p. 45). He illustrates his point with the case of Chile, one of the world's largest fish exporters, where entire regions have been devoted to export-oriented aquaculture. The Lakes Region, in particular, is the region of Chile with the highest concentration of export-oriented salmon farming. Kurien observes that this region is also the region with the lowest average *per capita* income in Chile. He concludes:

> "The evidence from most of our case studies belies the proposition that merely enhancing the national economic pie through international fish trade will benefit the poorest sections of society through their increased labour participation (p. 76). Clearly, the 'trickle down' theory has little credibility. The shark's share of the benefits from international fish trade accrues somewhere between the rich-country consumer and the poor-country producer." (Kurien, 2004, p. 46)

Although our analysis does not offer any answer to Kurien's question on where this "shark's share" falls exactly, it certainly supports his conclusion. Indeed, even in the case of the sub-Saharan countries that derive substantial revenues from fish export, the absence of correlation between these fish trade revenues and the development indicators seriously challenge the hypothesis of a trickle down effect, and suggests instead that trade revenues are 'dissipated' before they have the chance to impact on any economic and/or human development indexes.

This situation can be linked with the so-called "resource curse" theory, frequently brought forward in the political economy literature to describe the fact that developing countries with abundant natural resources such as mineral—gold, diamond—petroleum, and timber, often appear to perform less well than their resource-poor counterparts (see e.g., Auty, 1994; Ross, 1999; Stevens, 2003; Wheeler, 1984). In what appears to be one of the most comprehensive empirical studies on this issue to date, Sachs and Warner (2001), examining cross-sectional data from 97 countries, shows that countries with a high ratio of natural resource export to GDP (including a large number of sub-Saharan African countries) display slower growth rates than countries with lower ratios. Some other studies (e.g., Mehlun, Moene, & Torvik, 2006) relate economic growth to indices of institutional performance and governance, and argue that weak public management institutions and/or private sector corruption can give rise to this resource curse.

Perhaps fish, with the substantial export revenues that it can generate, is not so different from some of those other high-value natural resources such as timber or cobalt? From this perspective, it then does not appear so aberrant that sub-Saharan countries well endowed with fish resources do not necessarily perform better than the rest of the continent.

As far as the other sub-Saharan countries that derive more modest revenues from fish export are concerned, those revenues are not even large enough (irrespective of whether effective trickle down mechanisms exist or not) to impact their macro-economy. In summary, in either case (substantial revenues or more modest ones), no quantifiable effects are identifiable in sub-Saharan Africa, explaining the lack of statistical correlation observed in our analysis.

8. REVERSING THE TIDE: MAKING FISH TRADE WORK FOR THE POOR

The European Union and other developed countries are not expected to lower the technical barriers and quality standard requirements that are being imposed on fish products and other food commodities coming from developing countries (Bostock *et al.*, 2004; Henson & Mitullah, 2004; Stevens *et al.*, 2003). On the contrary, one can expect that these measures will continue to get tougher (Ponte, Raakjaer, & Campling, 2007). In the exporting countries, the impositions of those higher standards will in turn induce an escalading 'race' to upgrade the fish processing facilities, pushing the sector toward more vertical integration and greater capitalization. Today, increasingly, fish processing factories (which are often owned by importing countries or multinationals) operate their own vessels, hire their own crew, control other enterprises relating to fish supply acquisition, transporting fish, product distribution, and export marketing (Crosoer, van Sittert, & Ponte, 2006; Jansen, 1997). As in other agri-food industries (Dolan & Humphrey, 2000; Gibbon & Ponte, 2005; Holloway, Nicholson, Delgado, Staal, & Ehui, 2000; Jaffee & Morton, 1995), this process excludes further an increasing number of small-scale producers (fishers) and fish processors who were already operating on the margin of the export sector.[23] Those become less and less able to keep up with the level of investments and technical conditions requested (e.g., compliance to HACCP procedures), reducing further their competitiveness and their chance to integrate with the global market (Gibbon, 1997; Henson, Brouder, & Mitullah, 2000; Henson & Mitullah, 2004; Kambewa Ingenbleek, & van Tilburg, 2008). An alternative to the imperative for global market integration exists, however. This alternative is the Africa-to-Africa (or Africa-for-Africa) fish trade. We discuss in the rest of this section why we believe this regional fish trade to be preferable to the current global market model. As our examination will reveal however, this alternative is not without challenges.

Africa is a very important potential fish market for its own production. In Africa, more than 200 million people regularly eat fish (Heck *et al.*, 2007), and this figure is rising as the African population is growing fast and its urbanized segment is expanding even faster. It has been estimated that in order to maintain its current consumption level, Africa will need about 27% more fish per year in 2020 (WorldFish Center, 2005). If one were to try to improve the Africa *per capita* supply in order to match the world current figure (14.2 kg *per capita*—excluding China) by 2020, another 10.16 million tonnes of fish would have to be supplied per year in Africa at current levels of production and export.

Although demand for fresh fish is increasing in Africa (in particular in urban areas), smoked, dried, and low-quality processed fish still represents by far the largest majority of the fish consumed by the rural populations but also by the low income classes in urban areas. These low-value fish are caught and processed by small-scale operators, working in labor intensive, mostly self-employed enterprises (SFLP, 2002). In fact, more than 95% of the men and women fishers and fish processors in sub-Saharan Africa are artisanal operators who trade fish locally (Abbott, Campbell, Hay, Tor, & Purvis, 2007; Gordon, 2005; Overa, 2003). If one accounts not simply for coastal full-time professional fishers and whole-sale merchants, but includes also the seasonal inland fishers, fisher-farmers, part-time or full-time small-scale fish processors and traders, it is between 6 and 9 million households that are engaged to various degrees in fish-related activities in sub-Saharan Africa (Heck *et al.*, 2007). At the present time, however, the bulk of these small-scale, unorganized, and unskilled African producers and traders are excluded from the high-value fish trade activities promoted by the current trade model, as they are unable to comply with the food quality-standards requirements imposed by international trade institutions (e.g., WTO) and the importing countries (Gibbon & Ponte, 2005; Henson *et al.*, 2000; Kambewa, Ingenbleek, & van Tilburg, 2008; Mittulah, nd).

One challenge for this intra-regional fish trade is the general lack of data and statistics, especially on low-value, dried, or smoked products in Africa. The bulk of fishes' food security contribution in sub-Saharan Africa is ensured by informal and unrecorded overland and coastal trade of dried, smoked, or salted fish for which very limited and fragmented

information and statistics are available. When those data exist, however, they illustrate—sometimes forcefully—the great potential that intra-regional fish trade represents in Africa. One particularly instructive example is the Lake Chad Basin fish trade. In this part of Africa particularly affected by extreme destitution and marginalization, a series of studies (Jolley *et al.*, 2002; Neiland & Béné, 2004a) estimated the annual revenues generated by the fish trade to be around US$ 50 million (first sale value). If appropriately supported by national and regional policies, the potential contribution of this fish trade for poverty alleviation and regional development would be tremendous.

As correctly pointed out by the pro-fish trade supporters, the trade of high-value fish exported to rich countries' markets (Europe, Japan, North America) does not necessarily remove *directly* fish from the African consumer's table (since they often involve different species and/or different products). But it does *indirectly*, in a more surreptitious way, by distracting national and international policy-makers' attention, research and development efforts, management support and donors' money away from the small-scale fisheries producers and traders, to refocus these limited resources on the export-oriented, 'more remunerative,' and fisheries. [24]

We recognize here however that the dichotomy between small-scale and 'export-oriented' larger fisheries is somewhat misleading. In sub-Saharan countries (as in other parts of the developing word) the exportable fish may sometimes come from the small-scale fishing sector, while some of the fish used for drying and processing for local consumption may derive from the catches landed by industrial vessels. The structure of the trade (export *vs.* domestic) is in fact often conditioned by the type of production and quality of the product. If small-scale fisheries, using more benign fishing techniques, can produce good quality fresh fish, it may—at least theoretically—be linked to the high-value export-oriented fresh fish trade channels. If, on the other hand, the fish from industrial vessels, caught using trawls, is bulk-landed and of lower quality, it may well suit the purchasing power and the processing needs of small-scale women processors catering to the traditional, domestic dry and smoked fish trade.

The increasing influence and impact of China's and other large Asian economies on the rest of the world adds an extra layer of complexity to this last point. In West Africa, for instance, where small pelagic fish (sardinella) caught by industrial fleets are an important cheap form of food protein for local and regional markets, there are increasing concerns that emergent markets for food fish in Asia, particularly in China and India, as well as demand from the animal feed industry might have already started to divert an increasing volume of low-value fish from African markets.

Having recognized these caveats, we nevertheless argue that for the fish trade's trickle down mechanisms to have a better chance to generate any effective pro-poor impact in sub-Saharan Africa, one needs to move the policy focus away from the high-value export oriented industry and to re-orientate at least part of those fish trade investments toward the millions of small-scale operators who supply low-value products to the local, provincial, and national markets in Africa.

For this to happen a large number of structural problems would need to be overcome—weaknesses in domestic markets, barriers to regional trade, infrastructure limitations, insecurity, poor governance, the illegal/unreported nature of much of this inter-regional trade, and the inability of governments to benefit from it. Huge financial and capacity building investments are therefore needed to improve the poor quality and safety conditions of all segments along the local, national, and regional market chains: landing, transport, cold storage, and distribution. Innovations on low cost processing and preservation technologies adapted to the institutional bottlenecks and poor conditions that affect the vast majority of the post harvest activities operated in Africa (e.g., lack of electricity, remoteness and lack of access to input supply) are also urgently needed. Programs on literacy, capacity building for collective action, micro-finance, saving, and credits will be essential. The arguments for these development investments in strengthening the capacity of small-scale fishing and trading in Africa follow from a series of development programs and policy reforms since the late 1990s, guided by a sustainable livelihoods approach (Allison, 2005; Allison & Horemans, 2006; Neiland & Béné, 2004b). [25]

Despite those immense challenges, the great opportunity that an Africa-for-Africa trade would offer is that it is one where the supply (low quality processed, dried, or smoked fish) would match the regional demand for low-value fish. [26] Phrased into the trade theory jargon, one could contend that this situation constitutes an indisputable 'comparative advantage' for Africa. The debate, therefore, does not lie in whether "fish trade is good or bad" for Africa, but on the *type* of trade that is appropriate for its population and economic development.

9. CONCLUSION

Because it is today one of the most highly traded food commodities, fish holds a particular position in the current debate on market globalization and the role that international trade plays on economic development and poverty alleviation.

Historically the trends in fish trade seem to have been rather beneficial to the developing world as a whole and, from a global perspective, the continued significance of international trade in fishery products is undeniable. Relying on those figures, a pro-fish trade narrative has emerged since the 1990s, and an increasing number of national and international institutions are now promoting fish trade as a poverty alleviation tool for developing countries. A more in-depth analysis of the data reveals however that Sub-Saharan Africa stands out as a major exception in this rosy picture and suggests that it would be misleading to rely only on global figures to infer any conclusion at regional level. In particular, while the developing countries as a whole are projected to continue to be net fish exporters in the future, recent projections reveal that sub-Saharan Africa current trade deficit (in quantity) is expected to deepen further and reach substantial negative figures by 2020. In this context, a number of NGOs and academics have voiced concerns about the current strategy that consists of promoting export of high-value fish to developed countries' markets. They claim that this export-oriented approach is not generating the benefits that the theory predicts and may be, in contrast, detrimental to the food security and livelihoods of the local population. These critics argue in particular that fish trade removes fish from African consumers' tables.

Our analysis shows that when sub-Saharan countries' data are considered at the macro-economic (country) level those fears are not substantiated by any statistical evidence. The same data reveal, however, that, contrary to what the pro-fish trade narrative claims, international fish trade does not seem to contribute effectively to economic growth or to poverty alleviation either. In summary, the claims of both pro- and anti-fish trade supporters lack any empirical evidence—at least at the macro-economic level. The question of whether this situation would

also be observed at a lower (provincial, district) level remains open. Testing these local effects in a robust statistical way (i.e., going beyond the case study approach and adopt a rigorous multi-countries household level analysis) would require longitudinal household data which unfortunately do not exist at the present time in sub-Saharan Africa.

The absence of a demonstrable correlation at country level between fish trade and economic and/or human development indexes (despite the colossal revenues that international fish export generates) raises the question of the redistribution of these revenues. In line with some recent well-regarded analyses, we contend that this lack of relationship reflects the structural failure of the fish export sector and national institutions to ensure an effective (re)distribution of the fish trade revenues. The orientation toward wealth-creation in fisheries through global trade therefore lacks any empirical support, which raises questions about its ability to contribute to achieving poverty reduction objectives in Africa. In other words, the trickle down hypothesis that underlies the pro-fish trade narrative remains undemonstrated. Very little seems to trickle down effectively to the rest of the population and in particular to the small-scale fishers and traders who make up the large majority of the sector. Similarly, in the case of fishery agreements signed with countries of the European Union, the rent generated by these fishery agreements can in some cases be substantial but appears to be predated or 'dissipated' within the different levels of the central administration, or even 'evades' the country, before it can be reinjected in the countries' economy and benefit their populations. There is therefore a need to better understand and document the nature and mechanisms of this dissipation before reforms can be made to the supply chain and its links to government and other stakeholders.

Despite those negative outcomes, we remain convinced that fish trade can effectively *become* an engine of economic growth for sub-Saharan Africa and play a substantial role as an entry point in poverty reduction and human development through for instance the contribution of small-scale fisheries to the Millennium Development Goals (see e.g., Heck *et al.*, 2007). However, we argue that what sub-Saharan Africa fisheries need is another type of fish trade, quite different from the one currently promoted by the pro-fish trade narrative; one that refocuses the policy makers' attention toward the millions of small-scale operators, men and women, who are engaged in the labor intensive production and trade of low-quality fish products across Africa. By supporting this intra-regional trade, one would certainly continue to recognize and support the idea that "trade matters in the fight against poverty" as claimed by DFID. One would however have to do it in a manner that not only includes the largest number of income-poor households depending on fish activities in Africa, but also contributes directly to reducing the gap between demand and supply of fish, thus positively and effectively improving food security and poverty alleviation in Africa.

NOTES

1. In this respect, the pro-fish trade narrative agrees with the standard fisheries economic theory. Fisheries economists argue that the ultimate goal of fisheries governance should be to maximize fishery rents (Cunningham, Dunn, & Whitmarsh, 1985; Gordon, 1954; WHAT, 2000) with the idea that the wealth thus generated can contribute to sectoral or even national economic growth and thus to poverty reduction—for example, by using part of government revenues from taxes and licence fees levied on fish exports for social sector expenditure (Cunningham & Neiland, 2005; Kelleher, Arnasson, & Willmann, 2008). Proponents of the wealth-based approach contrast this potentially beneficial contribution to poverty reduction with what they perceive as the policy weaknesses in current fisheries governance, which allow the over-exploitation of fisheries and the dissipation of resource rents to support misguided goals of maintaining rural employment and local food security (Sumaila, 2008).

2. The question of a potential nexus between fish trade and food security in exporting developing countries also led to the organization of a number of international expert consultations. The three most important were probably the "Expert Consultation on International Fish trade and Food Security" organized by the FAO in January 2003 (FAO, 2003a); the "Study on the Impact of International trade in Fishery Product on Food Security" commissioned conjointly by FAO and the Royal Norwegian Ministry of Foreign Affairs (Kurien, 2004, 2005); and the "Meeting on Trade and Sustainable Approaches to Fisheries Negotiations under WTO/EPA" organized by the Commonwealth Secretariat and the Indian Ocean Commission with the support of the DFID and GTZ (Commonwealth Secretariat & IOC, 2007).

3. Sub-Saharan Africa accounts for about 7% of the total fish landing in the world (excluding China)—while South and South East Asia account for 9% and 20%, respectively (FAO, 2005).

4. In Africa, more than 200 million people regularly consume fish which contributes on average 32% of animal protein intake on the African continent, and up to 70% in some countries (FAO, 2005).

5. It is estimated that over two and half million people are engaged in full-time fishing activities across the continent and that more than three times as many processors, traders, and other small-scale operators are engaged in associated activities (FAO, 2005). Taking into account their families and dependents, Heck, Béné, and Reyes-Gaskin (2007) estimate that a total of 50–60 million people directly rely on income from fisheries in Africa. These statistics, however, do not include the millions of other households in rural areas who combine fishing with other farming or non-farming activities. Recent work in Democratic Republic of Congo suggests that for each full-time fisher, another nine fisher-farmers are also involved in the sector (Béné, Steel, Kambala Luadia, & Gordon, 2009a).

6. Over the period 1990–2001, fish oil and fishmeal represented 3.0% of the total African fish production.

7. Additionally, the pro-fish trade advocators also point out that some of the resources that are exported may/would not otherwise be harvested in the absence of such export, and so in a sense, represent "windfall" revenues for the export countries.

8. As correctly pointed out by one of the reviewers, fisher communities are not systemically "the poorest of the poor." Some other socio-economic groups may be even more destitute. In such instances, it would be remiss of the government to assign 100% of the export revenues generated to the local fisher community to the detriment of those more deprived socio-economic groups in other parts of the country.

9. Note however that this estimation does not account for the jobs *created* by the fish export sector, in particular in the processing factories.

10. As aquaculture in sub-Saharan Africa represents less than 5% of the total fish production (FAO, 2007), the lack of information regarding the origin of the product (wild *vs* aquaculture) characterizing African statistics does not distort the analysis.

11. Fish is a highly perishable product and is subject to very significant post-harvest losses in both quality and quantity under current conditions of handling, processing, transport, and storage. It is estimated that fish losses caused by spoilage account for around 10 % of the total world production from capture fisheries and aquaculture (Ababouch, 2003). Post-harvest losses in Africa are recognised to be much higher, exceeding often 30% of the harvest, in both inland and coastal fisheries (WorldFish Center, 2005). Reasons for this include inadequate or poorly adapted technologies, lack of market and transport infrastructures, lack of knowledge and information, and a weak capacity among small-scale processors and traders to invest in enhancing technologies and improving business performance.

12. This issue of increased fish price is worth noticing. In several countries, real fish price at the local level may have increased as a consequence of the export trade (fish diverted to the export market not only makes the product scarcer on the locale market—but also may cause a rise in related fish product prices). Jansen alludes to such phenomenon in the case of the Lake Victoria fisheries (1997).

13. This distinction value/quantity also broadly reflects the distinction direct (self-sufficiency) *versus* indirect (self-reliance) food security.

14. See for example, Figs. 26–30, and Table 11 in FAO (2007); Figs. 4 and 5 in Valdimarsson and James (2001); slides 14–18 in Valdimarsson (2003), Figs.1.3–1.6 in ICTSD (2006); slides 4–11 in Ahmed (2003). One of the rare exceptions to this "trend" is the SFLP policy brief on fish trade in West and Central Africa (SFLP, 2006). Based on volumes, their trade balance analysis concurs with our findings: "[in West and Central Africa] import volumes considerably exceed exports."

15. Thorpe (2004) also used this indictor in his analysis.

16. Given the size of the samples (47 cross-sectional data in the best case), we used 10% as the threshold for type I error for all the statistical tests presented here.

17. See Annex 2 for details of preliminary identification regressions with those factors.

18. For a recent attempt of such an analysis in the case of Lake Victoria, see Geheb *et al.* (2007)—see however our Footnote 22. Implementing such local analysis across as many sub-Sahara African countries as possible would be the only way to go beyond the limiting case-studies approach that characterises the anti-fish trade narrative and to establish rigorously if, as claimed by pro-fish trade advocators, positive effects occur, or if, as claimed by anti-fish trade supporters, negative effects prevail. Note also that even in the case of positive "spin-off/redistributive" effects, this result would corroborate only partially the pro-fish trade narrative, as the latter claims not simply local, but higher level (national) effects, something that our analysis failed to confirm.

19. Note that in most cases, the value added of the sector is rarely included in the calculation of fisheries' share to GDP. When data are available, some recent work (Kebe & Tallec, 2006; SFLP, 2006) suggests that the actual contribution of fisheries (including those value added) may be substantially higher than currently recorded in the countries' GDP statistics.

20. One of Geheb's conclusions is that anti-fish trade activists' "assertions are speculative" (2007, p. 4) for the reason that there is "no direct linear relationship between malnutrition on the [Lake Victoria] lakeshores and the fish export" (2007, p. 15). Instead, Geheb claims "Virtually everyone consulted during the course of this survey and others on the lake suggest that the Nile perch export trade has had a positive impact on lakeside communities especially men." (2007, p. 14).

21. Additional evidence of the lack of redistribution is provided by their nutrition survey (p. 8). While the results of this survey do not show any higher levels of malnutrition amongst children on the shores of the Lake as compared to the national averages—thus contradicting the claims of the anti-fish trade activists that the Nile Perch jeopardize the food security of the local populations— the same results do not show any *lower* rates of malnutrition either, thus questioning the authors' own conclusion according to which the development of the Nile Perch export has had positive impact on the food security of the local populations.

22. Kenya, Ghana, Namibia, Sri Lanka, Thailand, and the Philippines, Nicaragua, Brazil, Chile, Senegal, and Fiji. Note that some of those case-studies also included fish farming (aquaculture) and not simply fisheries.

23. Gereffi, Humphrey, and Sturgeon (2005), in their typology of governance in global value chain, observe that sectoral re-organization that leads to greater vertical integration is generally associated with increasing power asymmetry amongst the different actors of the chains, usually at the expense of the lower levels (producers).

24. Supposedly, fish trade may also increase fish local price—see our previous Footnote 13.

25. As pointed out by one referee of this journal, the potential for empowerment provided by community-based and co-management could be instrumental in supporting the integration of small-scale fish producers (fishers and fish traders) in this Africa-to-Africa fish trade. There is currently little information published on this issue in the case of fisheries. In contrast a much larger body of research (in particular in political ecology literature—see, e.g., Brown and Rosendo (2000))—has been published on similar issues in forestry and timber products. Our experience suggests, however, that the role of local institutions or co-management arrangements in supporting "pro-poor" or local trade can only be successful if these local/community-based institutions are effectively supported by an adequate decentralization process (which is more or less the case in forestry—e.g., forestry management decentralization in Cameroon) but not yet in fisheries—see Béné *et al.* (2009b) for a recent assessment of decentralization in Africa inland fisheries.

26. It may be worth noticing in that respect that the two main species produced in Africa by the emerging aquaculture sector (through pond and/or cage culture) are tilapia and catfish. Those are considered as low value fish and their production is essentially for local and regional markets. A good example is the growing catfish culture for domestic urban markets in Nigeria.

REFERENCES

Ababouch, L. (2003). Impact of fish safety and quality on food security. Paper prepared for the FAO Expert Consultation on international fish trade and food security. Rome: Food and Agriculture Organization. Casablanca Morocco 27–30 January 2003.

Abbott, J., Campbell, L., Hay, C., Tor, Naesje., & Purvis, J. (2007). Market-resource links and fish vendor livelihoods in the upper Zambezi river floodplains. *Human Ecology, 35*, 559–574.

Abgrall, J.-F. (2003). Fisheries, food security and trade: governance a key to success. Paper prepared for the FAO Expert Consultation on International Fish Trade and Food Security. Rome: Food and Agriculture Organization. Casablanca Morocco, 27–30 January 2003.

Abila, R. O., & Jansen., E. G. (1997). *From local to global markets. The fish exporting and fishmeal industries of Lake Victoria – Structure, strategies, and socio-economic impacts in Kenya*. IUCN Report No. 2, October, 1997, Nairobi, Kenya: The World Conservation Union (IUCN).

Abila, R. (2003). Fish trade and food security: are they reconcilable in Lake Victoria? Paper prepared for the FAO Expert Consultation on international fish trade and food security. Rome: Food and Agriculture Organization. Casablanca Morocco 27–30 January 2003.

Ackerman, F. (2005). *The shrinking gains from trade: a critical assessment of Doha Round projections*. GDAE working papers 05-01, Medford, MA: Global Development and Environment Institute, Tufts University.

Ahmed, M. (2003). Fish for the poor in a globalized economy – Macro benefits vs micro impacts. Presentation given at the expert consultation on international fish trade and food security. Rome: Food and Agriculture Organization. Casablanca Morocco 27–30 January 2003.

Alder, J., & Sumaila, U. R. (2004). Western Africa: A fish basket of Europe past and present. *Journal of Environment and Development, 13*(2), 156–178.

Allison, E. (2005). The fisheries sector, livelihoods and poverty reduction in Eastern and Southern Africa. In F. Ellis, & A. Freeman (Eds.), *Rural livelihoods and poverty reduction policies* (pp. 256–273). London: Routledge.

Allison, E., & Horemans, B. (2006). Putting the principles of the Sustainable Livelihoods Approach into fisheries development policy and practice. *Marine Policy, 30*, 757–766.

Auty, R. M. (1994). Industrial policy reform in six large newly industrializing countries: The resource curse thesis. *World Development, 22*(1), 11–26.

Basu, K. (2006). Globalization, poverty and inequity: What is the relationship? What can be done?. *World Development, 34*(8), 1361–1373.

Béné, C. (2006). *Small scale fisheries: assessing their contribution to rural livelihoods in developing countries*. FAO Fisheries Circular No. 1008, Rome: Food and Agriculture Organization.

Béné, C., Belal, E., Baba, M. O., Ovie, S., Raji, A., Malasha, I., *et al.* (2009b). Power struggle, dispute and alliance over local resources: analyzing 'democratic' decentralization of natural resource through the lenses of Africa inland fisheries. *World Development, 37*(12), 1935–1950.

Béné, C., Bennett, E., & Neiland, A. E. (2004). The challenge of managing small-scale fisheries with reference to poverty alleviation. In A. E. Neiland, & C. Béné (Eds.), *Poverty and small-scale fisheries in West Africa* (pp. 83–102). Kluwer Academic Publishers and Food and Agriculture Organization.

Béné, C., Steel, E., Kambala Luadia, B., & Gordon, A. (2009a). Fish as the "bank in the water" – Evidence from chronic-poor communities in Congo. *Food Policy, 34*, 104–118.

Bostock, T., Greenhalgh, P., & Kleih, U. (2004). *Policy research – implications of liberalization of fish trade for developing countries*. Synthesis report. Chatham, UK: Natural Resources Institute, University of Greenwich, 68pp.

Brown, K., & Rosendo, S. (2000). Environmentalists, rubber tappers and empowerment: the politics and economics of extractive reserves. *Development and Change, 31*, 201–227.

Busch, L., & Bain, C. (2004). New! Improved? The transformation of the global agrifood system. *Rural Sociology, 69*(3), 321–346.

CEC. (2005). Bilateral agreements. Commission of the European Community Directorate-General for Fisheries and Maritime Affairs. Available at <http://ec.europa.eu/fisheries/cfp/external_relations/bilateral_agreements_en.htm>.

Clemens, M. & Williamson, J. G. (2001). *A tariff-growth paradox? Protection's impact the world around 1875–1997*. Working paper. Cambridge: Center for International Development, Harvard University.

Collins, S., & Graham, C. (2004). *Brooking Trade Forum: globalization, poverty and inequality*. Inc NetLibrary <http://www.brookings.edu/press/Journals/2004/brookingstradeforum2004.aspx>: Brokking Institution.

Commonwealth Secretariat and IOC. (2007). Meeting on trade and sustainable approaches to fisheries negotiations under WTO/EPA. Organised by the Commonwealth Secretariat and the Indian Ocean Commission with the support of the United Kingdom Department for International Development (DFID) and the Deutsche Geselleschaft fur Technische Zusammenarbeit (GTZ) <http://www.thecommonwealth.org/Internal/159719/159720/152996/162490/meeting_on_trade_and_sustainable_approaches_to_fis/>.

Crosoer, D., van Sittert, L., & Ponte, S. (2006). The integration of South African fisheries into the global economy: Past, present and future. *Marine Policy, 30*, 18–26.

Cunningham, S. (2000). Fishing agreement: trade and fisheries management. In A. Hatcher, & D. Tingley (Eds.), *International relations and the Common Fisheries Policy – Proceedings of the fourth Concerted Action workshop on economics and the Common Fisheries Policy* (pp. 255–272). Portsmouth: Center for the Economics and Management of Aquatic Resources.

Cunningham, S., & Neiland, A. E. (2005). The role of fisheries in economic growth and poverty alleviation: towards a wealth-based approach to fisheries management. Key-sheet prepared for the UK Department for International Development (DFID), London.

Cunningham, S., Dunn, M. R., & Whitmarsh, D. (1985). *Fisheries economics: An introduction*. Mansell Publishing Limited.

Delgado, C., Wada, N., Rosegrant, M., Meijer, S., & Ahmed, M. (2003). *Fish to 2020: Supply and demand in changing global markets*. Washington, DC: International Food Policy Research Institute.

DFID. (2005). Trade matters in the fight against world poverty. London: Department for International Development and Department of Trade and Industry.

Dolan, C., & Humphrey, J. (2000). Governance and trade in fresh vegetables: The impact of UK supermarkets on the African horticulture industry. *Journal of Development Studies, 37*(2), 147–176.

Dollar, D., & Kraay, A. (2004). Trade, growth and poverty. *The Economic Journal, 114*, 22–49.

EC. (nd). Trade issue. <http://ec.europa.eu/trade/whatwedo/work/index_en.htm> website last consulted May 2009, Brussel, Belgium: European Commission.

Edward, P. (2006). Examining inequality: Who really benefits from global growth?. *World Development, 34*(10), 1667–1695.

EU. (2006). Fisheries and Maritime Affairs. Fact sheet 4.2. Bi-Lateral Agreement. <http://ec.europa.eu/comm/fisheries/doc_et_publ/factsheets/facts/en/pcpa4_2.htm>, European Commission.

FAO. (1995). Code of conduct for responsible fisheries. Rome: Food and Agriculture Organization.

FAO. (2003). *Report of the expert consultation on international fish trade and food security*. FAO Fisheries Report No. 708. Rome: Food and Agriculture Organization.

FAO. (2003b). *Trade reforms and food security: Conceptualizing the linkages*. Rome: Food and Agriculture Organization.

FAO. (2005). The state of world fisheries and aquaculture 2004. Rome: Food and Agriculture Organization of the United Nations, 153pp.

FAO. (2007). The state of world fisheries and aquaculture 2006. Rome: Food and Agriculture Organization of the United Nations, 160pp.

FAO. (2008). The state of food insecurity in the World: High food prices and food security – Threats and opportunities. Rome: Food and Agriculture Organization, 56pp.

FAO and Government and Japan. (1995). The Kyoto Declaration and Plan of Action on the Sustainable Contribution of Fish to Food Security. In International conference on the sustainable contribution of fish to food security. Rome: Food and Agriculture Organization <http://www.fao.org/docrep/006/AC442e/AC442e00.HTM>.

Geheb, K., Kalloch, S., Medard, M., Nyapendi, A.-T., Lwenya, C., & Kyangwa, M. (2007). Nile Perch and the hungry of Lake Victoria: gender, status and food in an East African fishery. *Food Policy*, doi:10.1016/j.foodpol.2007.06.001.

Gereffi, G., Humphrey, J., & Sturgeon, T. (2005). The governance of global value chains. *Review of International Political Economy, 12*(1), 78–104.

Gibbon, P. (1997). *Of savour and punks: the political economy of the Nile perch marketing chain in Tanzania*. CRD working paper 97.3. Copenhagen: Center for Development Research.

Gibbon, P., & Ponte, S. (2005). *Trading down: Africa, value chains and the global economy*. Philadelphia: Temple University Press.

Goodman, D., & Watts, M. (Eds.) (1997). *Globalizing food: Agrarian questions and global restructuring*. London: Routledge.

Goldberg, P., & Pavcnik, N. (2007). Distributional effects of trade liberalization in developing countries. *Journal of Economic Literature, 45*(1), 39–82.

Gordon, S. H. (1954). The economic theory of a common property resources: The fishery. *Journal of Political Economy, 62*, 124–142.

Gordon, D. (2005). Growth without capital: a renascent fishery in Zambia and Katanga, 1960s to recent times. *Journal of Southern African Studies, 31*(3), 495–511.

Heck, S., Béné, C., & Reyes-Gaskin, R. (2007). Investing in African fisheries: Building links to the Millennium Development Goals. *Fish and Fisheries, 8*(3), 211–226.

Henson, S. J., Brouder, A. M., & Mitullah, W. (2000). Food safety requirements and food exports from developing countries: The case of fish exports from Kenya to the European Union. *American Journal of Agricultural Economics, 82*(5), 1159–1169.

Henson, S. J., & Mitullah, W. (2004). *Kenyan exports of Nile Perch: impact of food safety standards on an export-oriented supply chain*. World Bank Policy research working paper no. 3349, Washington, DC: World Bank.

Holloway, G., Nicholson, C., Delgado, C., Staal, S., & Ehui, S. (2000). Agro-industrialization through institutional innovation: Transaction costs cooperatives and milk-market development in the east-African highlands. *Agricultural Economics, 23*, 279–288.

ICTSD. (2006). *Fisheries, international trade and sustainable development*. Policy Discussion Paper ICTSD Natural Resources, International Trade and Sustainable Development Series. Geneva, Switzerland: International Center for Trade and Sustainable Development, 97pp.

Jaffee, S., & Morton, J. (Eds.) (1995). *Marketing Africa's high-value foods: Comparative experiences of an emergent private sector*. Washington, DC: World Bank.

Jansen, E. G. (1997). *Rich fisheries – Poor fisherfolk. Some preliminary observations about the effects of trade and aid in the Lake Victoria fisheries*. IUCN report no. 1, September 1997. Nairobi, Kenya: The World Conservation Union (IUCN), 23pp.

Jolley, T. H., Quensière, J., Neiland, A. E., Béné, C., Ovie, S. I., Sule, O., Ladu, B., Mindjimba, K., Belal, E., Tiotsop, F., Baba, M., Dara, L. & Zakara, A. (2002). Fisheries production and fish trade in the Lake Chad Basin. In A E Neiland & C Béné (Eds.), *Sustainable development of African continental fisheries: a regional study of policy options and policy formation mechanisms for the Lake Chad Basin* (pp. 102–126). University of Portsmouth and European Commission, EU-INCO Project. Final Report, Appendix 1.

Kaczynski, V. M. (1998). *Relatorio sobre impactos de pesca atuneira na ZEE da Guine-Bissau* (Report on Impacts of Tuna Fisheries in the 200 mile EEZ of Guinea-Bissau). Bissau, Guinea-Bissau: Trade and Investment Promotion Services Project (TIPS).

Kaczynski, V. M., & Fluharty, D. L. (2002). European policies in West Africa: Who benefits from fisheries agreements?. *Marine Policy, 26*, 75–93.

Kalwij, A., & Verschoor, A. (2007). Not by growth alone: The role of the distribution of income in regional diversity in poverty reduction. *European Economic Review, 51*, 805–829.

Kambewa, E., Ingenbleek, P., & van Tilburg, A. (2008). Improving income positions of primary Producers in international marketing channels: The Lake Victoria–EU Nile Perch case. *Journal of Macromarketing, 28*(1), 53–67.

Kebe, M. & Tallec, F. (2006). *Contribution of fisheries to national economies*. Cotonou, Benin: Food and Agriculture Organization–Sustainable Fisheries Livelihood Programme in West Africa, 66pp.

Kelleher, K., Arnasson, R., & Willmann, R. (2008). *The Sunken Billions: the economic justification for fisheries reform*. Washington, DC: World Bank, Agriculture and Rural Development Department – and Food and Agriculture Organization, 80pp.

Kent, G. (1997). Fisheries, food security and the poor. *Food Policy, 22*(5), 393–404.

Kurien, J. (2004). *Fish trade for the people: Toward understanding the relationship between international fish trade and food security*. Report of the Study on the impact of international trade in fishery products on food security, Food and Agriculture Organization of the United Nations and the Royal Norwegian Ministry of Foreign Affairs.

Kurien, J. (2005). *Responsible fish trade and food security*. FAO Fisheries technical paper no. 456, Rome: Food and Agriculture Organization, 102pp.

Lange, G.-M., Hassan, R., & Alfredi, A. (2003). Using environmental accounts to promote sustainable development: Experience in southern Africa. *Natural Resources Forum, 27*(1), 19–31.

Leclair, M. S. (2002). Fighting the tide: Alternative trade organizations in the era of global free trade. *World Development, 30*(6), 948–958.

Madeley, J. (2000). *Hungry for trade: How the poor pay for free trade*. London: Zed Books.

Mehlun, H., Moene, K., & Torvik, R. (2006). Institutions and the resource curse. *The Economic Journal, 116*, 1–20.

Melchior, A. (2001). Global income inequality: Beliefs facts and unresolved issues. *World Economics, 2*(3), 87–108.

Miller, J. W. (2007). *Offshore disturbance: Global fishing trade depletes African waters; poor nations get cash, the rich send trawlers; A dearth of octopus*. July 18, New York: Wall Street Journal.

Mittulah, W. (nd). *Lake Victoria' s nile perch fish cluster: institutions, politics and joint action*. IDS working paper 87. Nairobi, Kenya: Institute for Development Studies, University of Nairobi.

Molony, T., Richey, L. A., & Ponte, S. (2007). 'Darwin's Nightmare': A critical assessment. *Review of African Political Economy, 113*, 598–608.

Mugabe, J., Jansen, E. G., & Ochieng, B. (2000). Foreign cash for local food insecurity? Socio-economic impacts of liberalized trade in Lake Victoria's fisheries. *African Centre for Technology Studies Policy Brief, 1*(1), 4.

Naschold, F. (2004). Growth, redistribution and poverty reduction: LDCs are falling behind. In A. Shorrocks, & R. van der Hoeven (Eds.), *Growth, inequality and poverty: Prospects for pro-poor economic development* (pp. 107–124). Oxford: Oxford University Press.

Neiland, A., & Béné, C. (2004a). *Contribution of fish marketing to livelihoods in the countries of the Lake Chad Basin: Cameroon, Chad, Central African Republic (CAR), Niger and Nigeria*. Final report. UK Department for International Development (DFID) and UN Food and Agriculture Organization: Sustainable Fisheries Livelihoods Programme (SFLP), 23pp.

Neiland, A., & Béné, C. (Eds.) (2004b). *Poverty and small-scale fisheries in West-Africa*. Dordrecht: Kluwer Academic Publishers and the Food and Agricultural Organization.

NY Times. (2008a). Europe's appetite for seafood propels illegal trade. New-York: New-York Times. <http://www.nytimes.com/2008/01/15/world/europe/15fish.html?_r=1&th&emc=th&oref=slogin>.

NY Times (2008b). Europe Takes Africa's Fish, and Boatloads of Migrants Follow. New-York: New-York Times. <http://www.nytimes.com/2008/01/14/world/africa/14fishing.html?_r=1&th&emc=th&oref=slogin>.

O'Rourke, K. (2000). Tariffs and growth in the late 19th century. *Economic Journal, 110*(463), 456–483.

OECD. (2008). Trade Liberalization Programme. <http://www.oecd.org/about/0,3347,en_2649_39863354_1_1_1_1_1,00.html>, last visited 21 March 2008 .

Overa, R. (2003). Market development and investment "bottlenecks" in the fisheries of Lake Kariba, Zambia. In E. Jul Larsen, J. Kolding, R. Overa, J. R. Nielsen, & P. van Zwieten (Eds.), *Management, co-management or no management? Major dilemmas in Southern African freshwater fisheries* (pp. 179–232). Food and Agriculture Organization.

Oxfam (2002). *Rigged rules and double standards: Trade, globalisation and the fight against poverty*. Oxford: Oxfam International.

Petersen, E. (2003). The catch in trading fishing access for foreign aid. *Marine Policy, 27*, 219–228.

Ponte, S. (2002). Brewing a bitter cup? Deregulation, quality and the re-organization of coffee marketing in East Africa. *Journal of Agrarian Change, 2*(2), 248–272.

Ponte, S., Raakjaer, J., & Campling, L. (2007). Swimming upstream: market access for African Fish Export in the context of WTO and EU negotiations and regulation. *Development Policy Review, 25*(1), 113–138.

Porter, G. (1999). Euro-African fishing agreements: Subsidizing overfishing in African waters. In S. Burns (Ed.), *Subsidies and depletion of world fisheries: Case studies* (pp. 7–33). Washington, DC: World Wildlife Fund.

Porter, G. (2001). *Fisheries subsidies and overfishing: Towards a structured discussion*. Geneva: United Nations Environmental Programme.

Ravaillon, M. (2004). Competing concepts of inequality in the globalization debate. In S. M. Collins, & C. Graham (Eds.), *Brookings Trade Forum: Globalization, poverty, and inequality* (pp. 1–24). Brookings Institution Press.

Raynolds, L. T., & Murray, D. L. (1998). Yes, we have no bananas: Re-regulating global and regional trade. *International Journal of Sociology of Agriculture and Food, 7*, 7–43.

Reddy, S., & Minoiu, C. (2005). *Has world poverty really fallen during the 1990s?* Mimeo, Princeton University.

Reddy, S., & Pogge, T. (2003). How not to count the poor. available on SSRN. Columbia University, Institute for Social and Economic Research and Policy. <http://ssrn.com/abstract=893159>.

Ross, M. (1999). The political economy of the resource curse. *World Politics, 51*, 297–322.

Ruddle, K. (2008). Reconsidering the contribution of fisheries to society and Millennium Development Goals. In K. Tsukamoto, T. Kawamura, T. Takeuchi, T.D. Beard, & M.J. Kaiser (Eds.), *Fisheries for global welfare and environment, 5th World Fisheries congress* (pp. 399–411).

Sachs, J. D., & Warner, A. M. (2001). The curse of natural resources. *European Economic Review, 45*, 827–838.

Sauper, H. (2004). Darwin nightmare. <http://www.darwinsnightmare.com/>

Schmidt, C.-C. (2003). Globalisation, industry structure, market power and impact of fish trade. Opportunities and challenges for developed (OECD) countries. Paper prepared for the FAO Industry and Expert Consultation on International Trade. Rio de Janeiro, Brazil, 3–5 December 2003.

Sen, A. (1981). *Poverty and famines: An essay on entitlement and deprivation*. Oxford: Clarendon Press.

SFLP. (2002). Fisheries in the livelihoods of the poor in West Africa. Cotonou, Benin: Sustainable Fisheries Livelihoods Programme, Food and Agriculture Organization.

SFLP. (2006). Making fish trade work for development and livelihood in West Africa. New Directions in Fisheries: a series of policy briefs on development issues. Rome: Food and Agriculture Organization.

Sick, D. (1997). Coping with crisis: Costa Rican households and the international coffee market. *Ethnology, 36*(3), 225–275.

Stevens, P. (2003). Resource impact, curse or blessing? *CEPMLP online Journal 13*, article 14.

Stevens, C., Devereux, S., & Kennan, J. (2003). *International trade, livelihoods and food security in developing countries*. IDS working paper 215, Brighton, UK: International Development Institute, University of Sussex.

Sumaila, R. (2008). Wealth-based fisheries management for development. Paper presented at the International Institute of Fisheries Economics and Trade's Conference "Achieving a sustainable future: Managing aquaculture, fishing, trade and development".

Thorpe, A. (2004). Growth and equity: Grounds for inserting the sector is PRSPs and NDPs. In *Mainstreaming fisheries into national development and poverty reduction strategies: Current situation and opportunities*. FAO Fisheries Circular. No. 997. Rome: FAO.

Timmer, C. P. (1997). *How well do the poor connect to the growth process*. CAER II discussion paper no. 17, Cambridge: Harvard Institute of International Development.

UN Secretariat. (2004). World population prospects: The 2004 revision and world urbanization prospects. Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat. <http://esa.un.org/unpp>.

UNDP (2005). *Sub-Saharan Africa- the human costs of the 2015 'business-as-usual' scenario*. Washington, DC: United Nation Development Programme. <http://hdr.undp.org/docs/events/Berlin/Background_paper.pdf>.

UNDP. (2007). Human development Index reports (2002–2007). <http://hdr.undp.org/en/reports/> Last accessed: 8 July 2007.

UNEP. (2002). *Integrated assessment of trade liberalization and trade related policies: A case-study on the fisheries sector in Senegal*. Geneva: United Nations Environment Programme.

Valdimarsson, G. (2003). International fish trade. Presentation given at the expert consultation on international fish trade and food security. Rome: Food and Agriculture Organization. Casablanca Morocco 27–30 January 2003.

Valdimarsson, G., & James, D. (2001). World Fisheries – Utilisation of catches. *Ocean and Coastal Management, 44*, 619–633.

Wade, R. (2004). Is globalization reducing poverty and inequality?. *World Development, 32*(4), 567–589.

WHAT. (2000). Governance for a sustainable future. London: World Humanity Action Trust.<http://www.what.org.uk>.

Wheeler, D. (1984). Source of stagnation in sub-Saharan Africa. *World Development, 12*(1), 1–23.

Wilson, J. R., & Boncoeur, J. (2008). Microeconomic efficiencies and macroeconomic inefficiencies: On sustainable fisheries policies in very poor countries. *Oxford Development Studies, 36*(4), 339–460.

Wolf, M. (2004). *Why globalization works*. New Haven: Yale University Press.

World Bank. (2004). *Saving Fish and Fishers: Towards sustainable and equitable governance of the global fishing sector*. Report no. 29090-GLB, Washington, DC: World Bank, Agriculture and rural development Department, 93pp.

World Bank. (2007). World Development Indicators database. Washington, DC: World Bank. <http://www.worldbank.org>.

WorldFish Center. (2005). *Fish and food security in Africa*. Policy Brief, Penang, Malaysia: WorldFish Center, 12pp.

(*See Overleaf*)

ANNEX 1

Determinants of **per capita GDP** (OLS regressions)—Details of the initial specification testing and diagnostic checking[a]. Amongst the adequate models, model7 displays the highest Adj $\boldsymbol{R}^2$.

Independent variables	Dependent variable = Log of **per capita GDP**									
	Transf	Model1	Model2	Model3	Model4	Model5	Model6	Model7	Model8	Model9
Industry, value added	log	$.912^{*}$	0.447	0.252	0.737	1.1^{*}	1.07^{***}	1.05^{***}	$.99^{***}$	$.901^{***}$
Education expenditure	log	1.02^{**}	$.54^{*}$	$.614^{*}$	0.428	0.475	$.409^{**}$	$.415^{**}$	$.285^{*}$	$.327^{**}$
Internet users	$\sqrt[3]{}$	1.31^{*}	1.06	0.703	0.625	0.871	$.94^{*}$	$.916^{*}$	1.09^{**}	1.2^{***}
Political stability	ranking nber	0.006	$.013^{*}$	$.012^{*}$	0.002	0.006	$.006^{*}$	$.007^{*}$	0.005	
Trade policy	ranking nber	0.008	−0.002	0.001	−0.001	0.004	0.006	0.006		
Trade outcomes	%	0.001	0.002	0.001	−0.001	0.000	−0.001			
Poverty gap	log	$.314^{*}$	0.146	−0.047	−0.053	0.037				
Trade facilitation	ranking nber	0.000	−0.001	−0.001	−0.001					
Accountability	ranking nber	−0.003	−0.010	−0.012						
External environment	ranking nber	−0.000	−0.003	$-.006^{*}$						
Net Foreign Investment	log	$-.552^{**}$	$-.288^{*}$							
Health expenditure	log	$-.524^{*}$								
Intercept		−1.51	1.18	3.67^{*}	2.46	−0.037	0.050	0.080	1.00^{*}	1.29^{*}
Statistics summary										
N		18	19	20	20	22	28	28	38	41
R^2		0.988	0.95	0.917	0.814	0.802	0.882	0.881	0.853	0.84
Adj R^2		0.95	0.872	0.825	0.679	0.702	0.848	0.854	0.836	0.827
Root MSE		0.168	0.26	0.3	0.406	0.463	0.399	0.391	0.429	0.435
F (k, $N-k-1$)		25.6	12.12	9.95	6.02	8.08	26.15	32.66	47.99	64.98
Prob > F		0.003	0.001	0.001	0.004	0.001	0.000	0.000	0.000	0.000
Breusch−Pagan heteroskedasticity test H_0: homoskedasticity										
$\chi^2(k-1)$		0.58	1.87	2.07	0.68	0.15	1.38	1.34	0.13	0.38
Prob > χ^2		0.44	0.171	0.150	0.41	0.70	0.240	0.247	0.722	0.5375

$^{*}p < 0.1$; $^{**}p < 0.01$; $^{***}p < 0.001$. *Notes*: a—Underscored independent variables are those expected to display negative estimated correlations with the dependent variable (based on their original definition).

ANNEX 2

Determinants of mortality rate, monthly income and malnutrition (OLS estimates). Details of the initial specification testing and diagnostic checking. Models Mortality4, Income4 and Nutrition4 were considered adequate.

Dependent variables		Mortality rate				Monthly income			
Independent variables	Transf	Mortality1	Mortality2	Mortality3	Mortality4	Income1	Income2	Income3	Income4
GDP	log	2.17	10.4	−13.78*	−12.8*	9.6	42.1**	41.2**	41.6***
Poverty gap	%	4.8	0.79	2.44	3.16*	1.02			
Poverty gap2	^2	−0.106	−0.009	−0.043	−.056*	−0.059			
Net Foreign Investment	log	−3.42	−10.947	−15.31*	−16.0*	−0.27			
Trade outcomes	%	0.152	0.038	0.037	0.117	0.067	−0.014		
Accountability	ranking nber	−0.519	−0.098	0.014		−0.069	0.333	0.2	0.2
External environment	ranking nber	0.062				−0.025	0.204	.225*	.227*
Health expenditures	log	1.9				22.1*	0.083	0.494	
Trade facilitation	ranking nber	0.105	0.281			−0.45	−0.205		
Intercept		16.5	74.32	84.9*	65.2	−33.4	−195*	−211***	−212***
N		19	22	24	26	19	22	24	24
R^2		0.586	0.538	0.513	0.602	0.895	0.771	0.728	0.728
Adj R^2		0.172	0.308	0.342	0.502	0.791	0.68	0.671	0.687
Root MSE		21.6	22.488	21.25	20.3	17.99	21.3	21.8	21.2
F (k, $N-k-1$)		1.41	2.33	2.99	6.04	8.57	8.43	12.7	17.8
Prob > F		0.307	0.0838	0.035	0.002	0.002	<0.001	0.000	0.000
Breusch–Pagan heteroskedasticity test H_0: homoskedasticity									
$\chi^2(k-1)$		0.82	0.51	0.19	0.42	1.00	0.00	10.85	9.31
Prob > χ^2		0.364	0.477	0.666	0.516	0.31	0.995	0.028	0.025

Dependent variables		Malnutrition rate			
Explanatory variables	Transf	Nutrition1	Nutrition2	Nutrition3	Nutrition4
GDP	log	−1.7	−4.2*	−4.52*	−4.18*
Poverty gap	%	−0.945			
Poverty gap2	^2	0.027			
Net Foreign Investment	log	−3.95	−1.55	−1.82	−1.63
Trade outcomes	%	−0.044	−0.012		
Accountability	ranking nber	0.139	0.011	0.016	
Extern environment	ranking nber	−0.027	−.0582*	−.059*	−.052*
Health expenditures	log	−14*	−8.25**	−8.03**	−7.98**
Trade facilitation	ranking nber	0.162	.087*	.088*	.089*
Intercept		64*	73.8***	72.3***	70.7***
N		18	22	22	23
R^2		0.843	0.793	0.789	0.804
Adj R^2		0.666	0.69	0.705	0.746
Root MSE		4.97	4.9	4.78	4.56
F (k, $N-k-1$)		4.77	7.68	9.36	14
Prob > F		0.019	<0.001	<0.001	<0.001
Breusch–Pagan heteroskedasticity test H_0: homoskedasticity					
$\chi^2(k-1)$		0.00	0.04	0.08	0.08
Prob > χ^2		0.983	0.843	0.774	0.774

*$p < 0.1$; **$p < 0.01$; ***$p < 0.001$.