RICE AND POVERTY IN LIBERIA

There has been a substantial literature on the link between rice and other cereal prices and poverty. The key in this literature is often to assess the double impact that a change in the price of rice can have through producers (who benefit from an increase in prices) and consumers (who loose out when the price increases). In Liberia however, at least under the current conditions, the impact of a change in the price of rice is not ambiguous at all. This is because a large share of the rice that is consumed is imported, while the rice that is locally produced is used mostly for auto-consumption rather than for sale on the market. In such circumstances, an increase in the price of rice, whether imported or locally produced, will tend to result in higher poverty in the country as a whole (even if some local producers will gain from this increase), while a reduction in price will lead to a reduction in poverty. Furthermore, because rice represents such a large share of the food consumption of households, any change in its price is likely to have a rather large effect on poverty measures. Using data from the 2007 CWIQ survey, we find that an increase or decrease of 20 percent in the price of rice could lead to an increase or decrease of three to four percentage points in the share of the population in poverty.

1. Introduction

Food security remains a major issue in Liberia. As noted in the Comprehensive Assessment of the Agriculture Sector prepared by Liberia's Ministry of Agriculture (2007), improving rural incomes, food production, food security, safety nets and nutrition remains a key priority for the country. In part because rice production has fallen substantially during the period of conflict, a large majority of the population today is a net buyer of food, with much of food consumption coming from rice imports. There have been numerous accounts in the press over the years related to the price of rice in the country, including on issues regarding the awarding of import licences for rice. The issues related to rice are not new in Liberia. Already in 1980, riots about the price of rice led to a coup.

Any solutions to the country's rice and cereal deficit, and more generally lack of food security, will have to be multiple (see the analysis of the Comprehensive food security and nutrition survey in Republic of Liberia, 2006; see also Ejigu, 2006). High on the agenda is the fact that improved technologies must be used by farmers to increase their yields. To this end, the government and its partners are implementing a variety of programs that aim to provide better and more seeds as well as tools to farmers. As part of the 150-day action plan of the new government that took office in January 2006, one of the actions for economic revitalization consisted in distributing 20.5 million tons of seed rice to farmers, as well as 41,500 tools. In the medium term, substantial progress is expected from improved rice varieties (e.g., NERICA) and the expansion of small-scale mechanization. But for the immediate years to come, rice imports are likely to continue to remain large, with potential fluctuations in the price for consumers of rice likely also to have a major impact on the poor.

In this paper, our objective is not to advocate a particular policy for increasing local rice production (which should help in the medium term for reducing prices paid by consumers), or for reducing the price of imported rice paid by consumers through import and VAT tax reform or through further regulatory reforms (the country has already liberalized rice imports, so that there is not anymore only one firm only that can import rice as used to be the case in the recent past). Instead, our objective is much more limited. It consists in using the 2007 CWIQ survey to make an assessment of the patterns of consumption and production of rice in the country, and to assess the potential impact on poverty of changes in the price of rice using a very simple methodology.

There has been a substantial literature on the link between rice and other cereal prices and poverty. The key in this literature is often to assess the double impact that a change in the price of rice can have through producers (who benefit from an increase in prices) and consumers (who loose out when the price increases). For example, Indonesia is a country that used to import substantial amounts of rice, but where restrictions were progressively placed on imports in order to help local producers, with imports of rice actually banned after 2004. Using a general equilibrium model, Warr (2005) find that the ban on rice imports raised the price of domestically produced rice, and that this led to an increase in poverty by almost one percentage point (on the Indonesia story as well as for a

more general discussion on the experience of governments in Asia to stabilize the price of rice, see Timmer and Dawe, 2007).. Another paper on Indonesia by (Sumarto et al., 2005) using panel data suggests that the practice of subsidizing rice as part of a social safety net led to a reduction in the risk for household to be poor. Papers on Vietnam by Niimi et al. (2004) and Minot and Goletti (1998) suggest that the liberalization of rice exports probably led to a reduction in poverty despite an increase in the price of rice in the country, thanks essentially to increased rice production of rice.

In Liberia however, at least under the current conditions, the impact of a change in the price of rice is not ambiguous at all. This is because a large share of the rice that is consumed is imported, while the rice that is locally produced is used mostly for auto-consumption rather than for sale on the market. In such circumstances, an increase in the price of rice, whether imported or locally produced, will tend to result in higher poverty in the country as a whole (even if some local producers will gain from this increase), while a reduction in price will lead to a reduction in poverty. Furthermore, because rice represents such a large share of the food consumption of households, any change in the price of rice is likely to have a rather large effect on poverty measures.

The paper is structured as follows. Section 2 presents basic data on rice production and consumption in Liberia based on two main sources of information: the Comprehensive Assessment of the Agriculture Sector prepared by Liberia's Ministry of Agriculture (2007), and the results from the Comprehensive Food Security and Nutrition Survey (CFSNS) completed from March to April 2006 with data for 5,409 households. Our own analysis of patterns of rice consumption and production using the 2007 CWIQ survey (which is based on a sample of 3,600 households) is provided in Section 3. In section 4, still using data from the 2007 CWIQ survey, we provide simple techniques and simulations first for illustrating the direction of the potential impact on poverty of a balanced budget tax reform involving import rice, and second for assessing in a bit more detail the impact of changes in the price of rice on poverty among producers as well as consumers. A brief conclusion follows.

2. Rice production and consumption in Liberia: A brief review

The Comprehensive Assessment of the Agriculture Sector prepared by Liberia's Ministry of Agriculture (2007) suggests that Liberia's agriculture can be characterized as comprising of three different production systems. First are large plantations which focus on export crops (rubber, palm oil, coffee and cocoa). Most of the production originates from plantations that are privately owned, but there are also a number of smaller state owned plantations operated by the Liberian Palm Products Corporation and the Liberian Cocoa and Coffee Corporation. A second component of Liberia's agriculture sector consists of privately owned commercial farms of medium size which also focus on industrial crops for export and to a lesser extent on livestock for the local market. Finally, the bulk of the population engaged in agriculture belongs to small household farms which rely on traditional production techniques that generated low yields due among others to a lack of inputs, and thereby focus on subsistence production. These household farms are small, with most of them being of around one hectare in size or even less (FAO, 2001; CFSNS, 2006).[1]

In terms of consumption, rice is the main staple food, followed by cassava and other food crops. Production data are scarce, but some estimates are available from the FAO. According to these estimates (table 1), cassava production has better resisted to the conflict than rice production, which has fallen from about 180,000 tons at the start of the conflict to 110,000 tons today, while the population has increased substantially over the same period. By contrast, cassava production appears to have increased from 380,000 tons to 490,000 tons.

Table 1: Rice and Cassava Production; 1990 – 2004

Year	Cassava (fresh and dried)			Rice		
	Area Harvested (1,000ha)	Production (1,000mt)	Yield (mt/ha)	Area Harvested (1,000ha)	Production (1,000mt)	Yield (mt/ha)
1990	55.00	380.00	6.91	175.00	180.00	1.03
1991	42.00	270.00	6.43	110.00	100.00	0.91
1992	40.00	280.00	6.67	120.00	110.00	0.92
1993	40.00	245.00	6.13	60.00	65.00	1.08
1994	29.00	250.00	6.25	45.00	50.00	1.11
1995	32.81	175.00	6.03	50.00	56.20	1.12
1996	43.30	213.26	6.50	75.60	94.45	1.25
1997	47.00	282.20	6.52	135.20	168.40	1.25
1998	55.50	307.00	6.53	161.90	209.40	1.29
1999	67.00	361.30	6.51	153.70	196.30	1.28
2000	72.50	440.50	6.57	143.50	183.40	1.28
2001	72.50	480.00	6.62	130.00	145.00	1.12
2002	75.00	480.00	6.62	120.00	110.00	0.92
2003	75.00	490.00	6.53	120.00	100.00	0.83
2004	75.00	490.00	6.53	120.01	110.00	0.92

Source: Ministry of Agriculture (2007), based on FAOSTAT data.

Two different systems of rice cultivation co-exist in Liberia. Upland rice cultivation is more prevalent, with 63 percent of producing households using this method of cultivation, as compared to 17 percent of households using and swamp rice cultivation methods (the rest, 21 percent of producers, combine both techniques). Upland cultivation is prevalent in River Cess, Grand Kru and Nimba, while swamp rice is found in Lofa County thanks in part to donor funding for agricultural development projects (CFSNS, 2006). Even in swamp or lowland areas, productivity or yields per hectare are often low, and well below that of neighbouring countries, and in the country as a whole, locally produced rice is used mainly for auto-consumption and substistance. Among the constraints tom productivity, households have identified the following: lack of seeds and tools (mentioned by 50% of households), lack of financial capital to purchase agricultural inputs (31 percent), lack of household labour (28 percent), and groundhog (pesticide) attacks as well as bird attacks (each cited by 19 percent of households in the CFSNS survey).

The inability of the country to produce enough rice and other cereals to feed the population has led to massive imports and has been one of the (many) factors that have led to high levels of food insecurity. The FAO (2006) describes food insecurity as a situation under which some people lack access to enough food of good quality to meet their nutrition needs in order to be able to lead an active and healthy life. According to the results of the CFSNS survey, most rural households are suffering from some forms of food insecurity: As described in Ministry of Agriculture (2007: 15):

> "*Nationally 80% of the rural population is either moderately vulnerable (41%), or highly vulnerable to food insecurity (40%), while only 9% of the rural population is food secure, and 11% are food insecure… Chronic malnutrition rates reach 39% for children under five, and only 32 % of households had access to improved water sources, and other basic services were limited… The most food insecure and highly vulnerable groups [are] involved in palm oil producing and selling (64%) followed by hunters and contract labourers (respectively 61% and 58%). The more food secure and moderately vulnerable groups are among the cash and food crop producers (37%), the petty traders and the employees (44% each)*" (see table 2).

Importantly, even cash and/or food crop producers are considered likely to be food insecure (indeed, this group of households is considered as likely as many other groups to be food insecure in table 2), suggesting that food production for auto-consumption often still does not enable many households to meet their food needs.

Table 1 Vulnerability, Incomes and Livelihood Profile in Liberia, 2006

Livelihood Profile*	% moderately vulnerable and food secure	% highly vulnerable and food insecure	% of income derived from food crop production	% of income derived from cash crop production
Cash and food crop producers	63	37	62	22
Petty traders	56	44	5	0
Employees	55	44	4	0
Food crop farmers	53	49	74	0
Charcoal producers	53	47	8	0
Rubber tapers	53	47	5	0
Fisher folks	52	48	8	0
Palm oil and food crop producers	52	48	26	5
Skilled labourers	49	51	7	0
Contract labourers	42	58	5	0
Hunters	40	61	8	0
Palm oil producer/ seller	36	64	0	0

Source: CFSNS (2006).

3. Rice production and consumption in the 2007 CWIQ survey

In the rest of this section, the 2007 CWIQ survey is used to estimate rice production and consumption, and separate consumption into locally produced rice and imported rice. Table 3 provides summary data on rice consumption and production for auto-consumption, as well as a comparison with a number of other food items commonly consumed in Liberia. The total value of food consumption for the items listed in table 2 accounts for 87 percent of the total food consumption of households (these items were used for estimating a food poverty line in Liberia using the cost of basic needs method, as discussed in Backiny-Yetna et al., 2007). The following comments are worth pointing out:

- Rice is by far the largest food consumption item, accounting for more than a third of the value of total food consumption. The value of imported rice is estimated at Liberian $6.5 billion (about $100 million at the current exchange rate of Liberian $62 per US$), while that of locally produced rice is estimated at Liberian $ 4.7 billion (this includes the imputed value of locally produced rice for auto-consumption). In total, rice thus accounts for Liberian $10.2 billion in total consumption, a figure that can be compared to the total food consumption in table 2 estimated at Liberian $30.2 billion.

- The total value of rice imports in 2007 is estimated in the survey at about US$ 100 million. This is probably an overestimation of true imports, which is not surprising given that the 2007 CWIQ survey tends to overestimate consumption (Backiny-Yetna et al., 2007). At the same time, the order of magnitude of the estimation of imports is not completely off, since according to the latest staff report of the International Monetary Fund (2007), imports of rice were estimated at US$57 million in 2006 (the exchange rate between 2006 and 2007 has not changed dramatically), and it is quite possible that not all rice imports are reported in the government's official statistics.

- The total production of local rice is estimated at approximately 103,000 tons, which may be on the low side, but is also of an appropriate order of magnitude given that according to table

1, production was estimated at 11,000 tons in 2004, and production has probably not increased dramatically since then.

- Locally produced rice is used mostly for auto-consumption, since only slightly more than one fourth of the locally producer rice is actually purchased. This finding echoes similar results obtained from the 2006 Comprehensive Food Security and Nutrition Survey.

- The share of rice consumption in terms of the total estimated caloric intake per adult equivalents of households, at 50 percent, is even larger than the share of rice in total consumption, at about a third. This underscores even more the fundamental role played by rice, including through imports, in the issue of food security in the country.

Table 3: Structure of food consumption and role of rice in Liberia, 2007

	Monetary value (millions of L$)			Share in total Consumption (% of L$)			Quantity (Tons)			Daily Calories (kcal) per eq adult		
	Purchase	Autocons., Gifts and Food aids	Total	Purchase	Autocons. Gifts and Food aids	Total	Purchase	Autocons., Gifts and Food aids	Total	Purchase	Autocons., Gifts and Food aids	Total
Imported rice	6492.9	0.0	6492.9	30.0	0.0	21.5	144898.2	0.0	144898.2	694.0	0.0	694.0
Local rice	1256.3	3478.6	4734.9	5.8	40.7	15.7	27267.1	75500.7	102767.8	130.6	361.6	492.2
Maize/corn	51.8	80.6	132.4	0.2	0.9	0.4	1737.5	2707.1	4444.6	8.2	12.8	21.1
Cassava flour (fufu, gari, etc)	137.6	123.8	261.4	0.6	1.4	0.9	6211.7	5589.7	11801.4	28.0	25.2	53.3
Gari	151.1	0.0	151.1	0.7	0.0	0.5	3663.7	0.0	3663.7	16.5	0.0	16.5
Bread	304.2	32.1	336.3	1.4	0.4	1.1	3543.0	373.9	3916.9	11.6	1.2	12.9
Chicken	625.6	261.1	886.6	2.9	3.1	2.9	4028.3	1681.0	5709.4	7.4	3.1	10.5
Game and insects (porcupine, gazelle)	158.5	163.3	321.8	0.7	1.9	1.1	370.0	536.4	906.4	1.3	1.9	3.2
Fresh or frozen fish	2549.5	640.7	3190.2	11.8	7.5	10.6	21992.1	5526.4	27518.5	18.6	4.7	23.2
Smoked fish (dried or salted)	614.3	161.3	775.6	2.8	1.9	2.6	2047.1	537.4	2584.5	10.1	2.7	12.8
Fresh milk	175.9	0.0	175.9	0.8	0.0	0.6	1087.1	0.0	1087.1	1.1	0.0	1.1
Eggs	131.4	42.7	174.1	0.6	0.5	0.6	591.9	192.5	784.4	1.1	0.4	1.4
Palm oil	1234.7	484.4	1719.1	5.7	5.7	5.7	14809.1	5810.4	20619.5	155.9	61.2	217.1
Banana, plantain	235.8	252.5	488.4	1.1	3.0	1.6	8323.8	8914.4	17238.3	14.8	15.9	30.7
Coconuts	97.4	50.5	147.9	0.5	0.6	0.5	3257.8	1687.9	4945.7	16.7	8.6	25.3
Palm nut	286.6	217.2	503.8	1.3	2.5	1.7	19097.2	14472.0	33569.2	100.8	76.4	177.2
Cassava leaves	91.5	112.4	204.0	0.4	1.3	0.7	7265.9	8924.8	16190.6	8.7	10.7	19.4
Bitter Balls	244.3	134.9	379.1	1.1	1.6	1.3	6898.4	3808.6	10707.0	2.9	1.6	4.5
Okra	103.1	69.2	172.3	0.5	0.8	0.6	1233.6	828.0	2061.6	0.6	0.4	1.0
Green Pepper	569.6	334.4	904.0	2.6	3.9	3.0	3443.7	2021.5	5465.2	1.6	1.0	2.6
Hot or sweet pepper (fresh or dry)	263.9	0.0	263.9	1.2	0.0	0.9	447.2	0.0	447.2	0.3	0.0	0.3
Onions	471.0	30.2	501.2	2.2	0.4	1.7	3375.7	216.1	3591.8	1.8	0.1	1.9
Dried beans	232.4	0.0	232.4	1.1	0.0	0.8	3143.4	0.0	3143.4	13.9	0.0	13.9
Cassava roots	362.8	580.8	943.7	1.7	6.8	3.1	28923.1	46299.2	75222.3	56.9	91.0	147.9
Sugar	249.8	0.0	249.8	1.2	0.0	0.8	3305.5	0.0	3305.5	17.4	0.0	17.4
Bouillon cubes (maggi, jumbo, etc)	754.2	0.0	754.2	3.5	0.0	2.5	1966.6	0.0	1966.6	8.6	0.0	8.6
Salt	310.4	0.0	310.4	1.4	0.0	1.0	8206.1	0.0	8206.1	36.5	0.0	36.5
Soft/carbonated drinks (coke,fanta,etc)	212.3	26.8	239.0	1.0	0.3	0.8	1552.0	195.8	1747.8	0.9	0.1	1.0
Total Basket	18369.0	7277.5	25646.5	85.0	85.2	85.0	332686.8	185823.8	518510.6	1367.0	680.5	2047.5
Total Others food expenditures	3247.7	1265.9	4513.6	15.0	14.8	15.0	49982.7	27531.8	77514.5	205.4	100.8	306.2
Total food	**21616.7**	**8543.4**	**30160.1**	**100.0**	**100.0**	**100.0**	**382669.6**	**213355.6**	**596025.1**	**1572.3**	**781.3**	**2353.7**

Source: Authors' estimation using 2007 CWIQ survey.

Table 4 provides additional data on rice consumption as estimated in monetary terms using the CWIQ 2007 survey. As expected, locally produced rice is consumed mostly by households in rural areas, and the capital of Monrovia is the area that is the most dependent on imported rice. At the same time, an overwhelming majority of households outside of the capital also consume imported rice, so that for most households, local production is apparently not large enough to meet their own needs.

There are also interesting differences in terms of the value of consumption according to the level of well-being of households, as measured by their level of total monetary consumption per equivalent adult. For imported rice, the consumption pattern is similar for all households except those located in the bottom quintile of the distribution of consumption, as these households consume only about half of what other households consume. For imported rice, there is a more traditional pattern according to which the richer a household is, the higher the expenditure of that household is as well. Still, while richer households tend to consume much more imported rice than poorer households, the consumption of imported rice among the poor is far from being negligible, so that changes in the price for consumers of imported rice can be expected to have a major impact on the measures of poverty obtained for the population as a whole, the issue to which we turn in the next section.

Table 4: Rice consumption in Liberia for different household groups, 2007

	% HH consuming rice			Average consumption For all HH			Average consumption for households with positive consumption		
	Locally produced rice	Imported rice	Total	Locally produced rice	Imported Rice	Total	Locally produced rice	Imported Rice	Total
Residence area									
Rural	80.0%	79.2%	99.2%	13201.2	10484.8	23686.0	13312.5	10573.1	23885.6
Urban	17.1%	97.3%	98.6%	1566.6	18633.0	20199.6	1589.6	18906.9	20496.6
Region									
Greater Monrovia	7.2%	98.2%	98.4%	227.6	19585.0	19812.5	231.3	19905.7	20137.0
North Central	87.9%	71.6%	99.0%	15216.9	9118.9	24335.8	15371.0	9211.3	24582.3
North Western	69.8%	90.9%	99.7%	9516.9	9824.7	19341.6	9545.1	9853.9	19399.0
South Central	46.3%	90.6%	98.6%	5796.7	15287.3	21084.1	5877.9	15501.4	21379.3
South Eastern A	83.8%	83.0%	99.4%	16150.2	10553.5	26703.6	16240.5	10612.5	26853.0
South Eastern B	75.6%	91.9%	99.9%	10910.1	15587.9	26498.0	10919.4	15601.2	26520.7
Quintile									
Q1 (poorest)	63.4%	71.8%	96.5%	5431.4	6166.7	11598.2	5631.1	6393.5	12024.7
Q2	70.0%	83.0%	99.3%	9520.0	10483.4	20003.3	9582.7	10552.4	20135.1
Q3	62.5%	85.7%	99.6%	10149.5	12912.5	23062.0	10187.9	12961.4	23149.2
Q4	58.5%	87.6%	99.7%	10400.1	14361.1	24761.2	10431.3	14404.2	24835.5
Q5 (richest)	50.7%	92.3%	99.3%	11104.2	18502.0	29606.2	11178.2	18625.3	29803.5
Total	60.1%	84.9%	99.0%	9524.0	13060.1	22584.1	9623.1	13195.9	22819.0

Source: Authors' estimation using 2007 CWIQ survey.

4. Simulating the impact on poverty of changes in the price of rice

There are two simple so-called partial equilibrium ways to discuss the potential impact of a change in the price of rice on poverty. A first way is rounded in the theory of balanced budget marginal tax reforms, and we illustrate this approach below not to actually advocate for such a reform in Liberia (more information and a more in-depth analysis would be needed before doing so), but to present the idea and technique, because this gives some additional background on the issues, especially in terms of the comparison of the consumption patterns for rice as opposed to other food items. The second approach is to actually simulate the impact of non-marginal absolute or proportionate changes in the price of rice on poverty among both rice consumers and rice producers. The results from this second approach are probably simpler to interpret for the non-specialist reader and thereby for potential reference in Liberia's Poverty Reduction Strategy, and although we are making some simplifying assumptions in implementing the approach, the orders of magnitude of the impact on poverty that are presented are likely to be correct.

4.1. Marginal tax and subsidy reforms

Figure 1 provides consumption dominance curves of the second order for imported rice and selected other food consumption items. As demonstrated by Makdissi and Wodon (2002; see also Duclos, Makdissi and Wodon, forthcoming), these curves are useful to assess the impact of so-called balanced budget marginal tax reforms on poverty. The idea is to test whether increasing a tax or subsidy for one type of goods, while reducing a tax or subsidy for another type of goods in such a way that the overall tax receipts or subsidy expenditures remain the same, will lead to a reduction or an increase in a wide range of poverty measures. If one consumption dominance curve is above another, then it is good for poverty reduction to reduce a tax (or increase a subsidy) on the good with the curve that is above the other, while increasing a tax (or reducing a subsidy) for the good that corresponds to the curve that is located below the first curve.

When using consumption dominance curves of the second order, we are in practice considering the impact of taxes or subsidies on poverty measures like the poverty gap, which takes into account not only the share of the poor in the population, but also the distance separating the poor from the poverty line or "depth" of poverty (when computing the poverty gap, the non-poor are included in the estimation, but they are given a zero distance separating them from the poverty line since they are not below that line). More simply, the consumption dominance curves of order two actually represent the cumulative share of the total consumption of a good that is made by the poor. The horizontal axis represents the level of consumption per equivalent adult normalized by the poverty line, so that a value of one corresponds to the poverty line actually used in the country. In Figure 1 for example, at a value of one on the horizontal axis (which means that we are looking at the consumption share of all the poor taken together), the value of the horizontal axis for total food consumption is about 45 percent. This means that the poor as a whole, which represent 63.8 percent of the population (see Backiny-Yetna et al., 2007) consume about 45 percent of the total food consumed in the country.

In terms of comparing different goods and curves in Figure 1, chicken and smoked fish have the lowest curves. This means that the shares of chicken and smoked fish consumed by the poor are lower for any poverty line we chose than the shares of the other items presented in the Figure. Thus, if this were feasible, it would be better to tax more chicken and smoked fish and tax less other goods. We are of course not suggesting here that this should be done – it would be very difficult in practice to tax chicken or smoked fish, as these goods are locally produced and informally sold and purchased, and thereby typically not subject to taxes. But we want to highlight the properties of the curve representing imported rice, in comparisons with other curves.

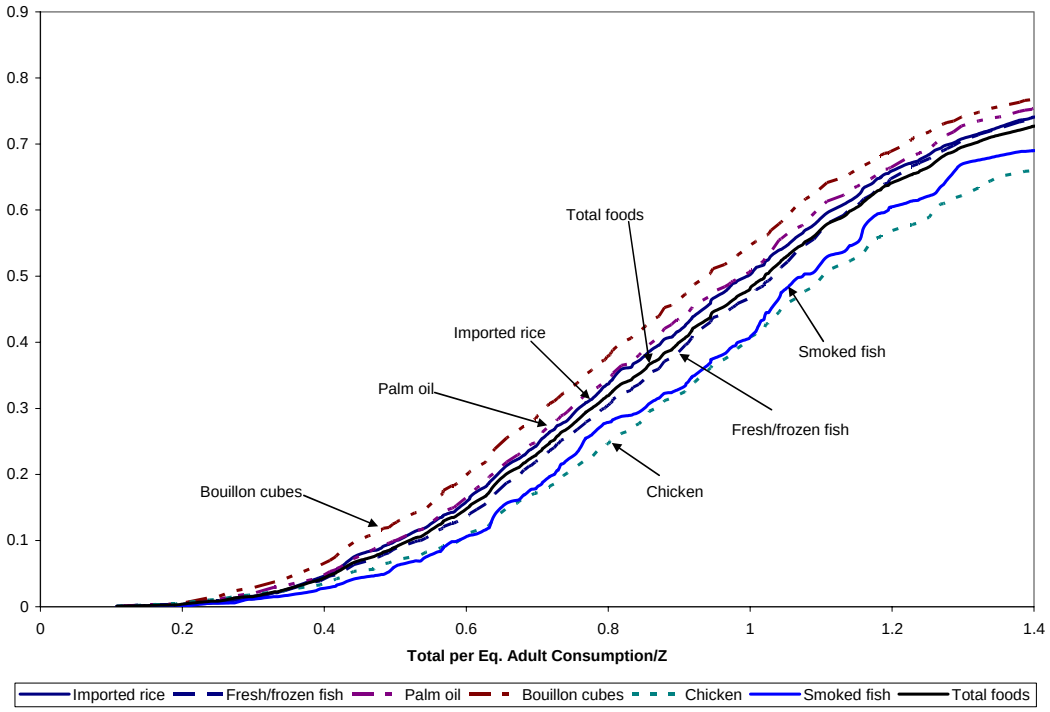
Imported rice has a consumption dominance curve that is located above the curve for overall food consumption. This means that despite the fact that imported rice is consumed more by better off households than by very poor households (as was already evident from table 4), it is still a good that could tentatively be targeted for a reduction in taxes, such as import taxes which

are currently levied on this commodity. Indeed, many other food items will be even more consumed by the non-poor than by the poor than imported rice, and in addition, most non-food items, some of which are clearly imported and thereby subject to tax, would probably have consumption dominance curves far below that obtained for food consumption as a whole.

Independently of taxation, the consumption dominance curves can also be used to argue that other measures that would help reduce the price of imported rice would be beneficial for poverty reduction, and that imported rice, due not only to its consumption pattern but also to the sheer importance of the commodity in total food consumption, should indeed be a prime candidate for efforts to reduce consumer prices (the issue is less pressing for local rice, not only because consumption of local rice is lower than for imported rice, but also because most of the local rice is actually self-consumed, so that prices pay a less important role there).

In Liberia, it has long been argued that liberalizing the imports of rice could lead to more competition (there was until recently a quasi monopoly for such imports), and that this competition could lead to a reduction in the prices ultimately paid by consumers. The data presented in Figure 1, and more generally in this paper, certainly suggest that a reduction in prices, if it were to be obtained thanks to more competition, would have a potentially large impact on poverty. In the next section, we estimate exactly how large this poverty impact may be.

Figure 1: Cumulative CD Curve for selected food items- Order 2, Liberia 2007



Source: Authors' estimation using 2007 CWIQ survey.

4.2. Non-marginal changes in the price of rice

In this section, we provide estimates of the impact of changes in the price of rice (whether imported or locally produced) on the headcount index of poverty, which is simply a measure of the share of the population in poverty (i.e., with a level of consumption per equivalent adult below the poverty line; for an introduction to the concepts and techniques of poverty measurement, see Coudouel et al., 2002). We carry the simulations in a very simple way. First, for rice producers, we measure the additional income or the loss in income obtained from the sale of rice by households due to an increase or reduction in the price of rice. We assume that this difference in income translates into an equivalent difference in the consumption per equivalent adult of households used to measure poverty. We then recomputed the poverty measures keeping the poverty line intact. For consumers, we do essentially the same: we estimate the increase or decrease in the cost of rice following a change in price, taking into account the quantities actually consumed by each household. In the case of a reduction in price, we then add to the consumption aggregate the reduction in the total cost of rice for the household, since this reduction in cost means that the household can actually consume other goods (this is thus as if the household consumption had increased.) In the case of an increase in the price of rice, we substract from the consumption aggregate the value of this increase, since the household will have to give up other consumption goods in order to be able to purchase the rice it needs. For either an increase or a decrease in the price of rice, we then compute again poverty with the adjusted consumption level.

This procedure is admittedly a very rough approach, but it has the merit of being simple. The approach may slightly overestimate the impact on poverty of changes, because we do not take into account the price elasticity of rice consumption, but this price elasticity is likely to be very low in any case, due to the fact that rice is so dominant in the diet of the population. In addition. Also, the approach does not take into account any ripple effects of changes in the price of rice on other parts of the economy. More sophisticated methods could be used to measure the "general equilibrium" effect of a change in the price of rice, but such simulations require a much larger number of assumptions which are the subject of debate. The estimations given here thus provide "first round" likely poverty effects from lower or higher rice prices paid to producing households or paid by consuming households, assuming that households don't change their consumption patterns for rice after the change in price.

Key results from the simulations are provided in tables 5 and 6. The headcount index of poverty is the share of the population with a level of consumption per equivalent adult below the poverty line. The poverty gap takes in addition into account the distance separating the poor from the poverty line (while giving a zero distance to the non-poor). The squared poverty gap takes in addition into account the square of that distance (and thus inequality among the poor).

Table 5: Impact of a change in consumer or producer prices for rice on poverty, Liberia 2007

	-30%	-25%	-20%	-15%	-10%	-5%	No change	+5%	+10%	+15%	+20%	+25%	+30%
	Impact of changes in consumer prices only (no impact on producer prices)												
Consumption per eq. adult (L$)	25371.5	25101.1	24830.8	24560.4	24290.0	24019.7	**23749.3**	23479.0	23208.6	22938.3	22667.9	22397.6	22127.2
Average per eq. adult change in L$	1622.1	1351.8	1081.4	811.1	540.7	270.4	-	-270.4	-540.7	-811.1	-1081.4	-1351.8	-1622.1
Poverty, population as a whole													
Headcount index of poverty	58.4	59.3	60.4	61.0	62.1	62.8	**63.8**	64.6	66.1	67.1	68.0	69.0	69.9
Poverty gap	21.3	21.8	22.3	22.8	23.3	23.9	**24.4**	25.0	25.6	26.2	26.8	27.5	28.1
Squared poverty gap	10.8	11.1	11.4	11.7	12.0	12.3	**12.7**	13.0	13.4	13.8	14.2	14.6	15.0
Poverty, rice consumers													
Headcount index of poverty	58.2	59.1	60.2	60.8	61.9	62.7	**63.6**	64.4	65.9	66.9	67.9	68.9	69.8
Poverty gap	20.9	21.4	21.9	22.5	23.0	23.5	**24.1**	24.7	25.3	25.9	26.5	27.2	27.8
Squared poverty gap	10.5	10.8	11.1	11.4	11.7	12.0	**12.4**	12.7	13.1	13.5	13.9	14.3	14.7
	Impact of changes in producer prices only (no impact on consumer prices)												
Consumption per eq. adult (L$)	23702.4	23710.2	23718.0	23725.8	23733.7	23741.5	**23749.3**	23757.2	23765.0	23772.8	23780.7	23788.5	23796.3
Average per eq. adult change in L$	-47.0	-39.2	-31.3	-23.5	-15.7	-7.8	-	7.8	15.7	23.5	31.3	39.2	47.0
Poverty, population as a whole													
Headcount index of poverty	64.0	63.9	63.9	63.9	63.9	63.8	**63.8**	63.7	63.7	63.5	63.4	63.4	63.4
Poverty gap	24.5	24.5	24.5	24.5	24.5	24.4	**24.4**	24.4	24.4	24.4	24.3	24.3	24.3
Squared poverty gap	12.8	12.7	12.7	12.7	12.7	12.7	**12.7**	12.7	12.6	12.6	12.6	12.6	12.6
Poverty, rice producers													
Headcount index of poverty	70.3	70.1	70.0	69.9	69.9	69.3	**69.3**	68.8	68.6	67.5	67.1	67.1	66.8
Poverty gap	26.7	26.6	26.4	26.3	26.2	26.1	**26.0**	25.9	25.8	25.7	25.6	25.5	25.4
Squared poverty gap	13.9	13.8	13.7	13.6	13.5	13.5	**13.4**	13.3	13.2	13.2	13.1	13.0	12.9

Source: Authors' estimation using 2007 CWIQ survey.

Table 6: Impact of a change of both producer and consumer prices of rice on poverty, Liberia 2007

	Percentage changes in prices												
	-30%	**-25%**	**-20%**	**-15%**	**-10%**	**-5%**	**No change**	**+5%**	**+10%**	**+15%**	**+20%**	**+25%**	**+30%**
Consumption per eq. adult (L$)	25324.5	25062.0	24799.4	24536.9	24274.4	24011.9	**23749.3**	23486.8	23224.3	22961.8	22699.2	22436.7	22174.2
Average per eq. adult change in L$	1575.1	1312.6	1050.1	787.6	525.0	262.5	-	-262.5	-525.0	-787.6	-1050.1	-1312.6	-1575.1
Poverty, population as a whole													
Headcount index of poverty	58.8	59.4	60.5	61.1	62.2	62.9	**63.8**	64.6	66.0	67.0	67.7	68.9	69.8
Poverty gap	21.4	21.9	22.4	22.9	23.4	23.9	**24.4**	25.0	25.5	26.1	26.7	27.3	28.0
Squared poverty gap	10.9	11.2	11.4	11.7	12.0	12.3	**12.7**	13.0	13.4	13.7	14.1	14.5	14.9
Poverty, rice producers													
Headcount index of poverty	62.7	63.1	64.0	64.4	66.1	67.1	**69.3**	70.3	72.0	74.7	76.1	78.5	79.3
Poverty gap	22.9	23.3	23.8	24.3	24.9	25.4	**26.0**	26.6	27.2	27.9	28.6	29.3	30.1
Squared poverty gap	11.6	11.9	12.2	12.5	12.8	13.1	**13.4**	13.7	14.1	14.5	14.8	15.3	15.7
Poverty, rice consumers													
Headcount index of poverty	58.6	59.2	60.2	60.9	62.0	62.7	**63.6**	64.4	65.8	66.8	67.6	68.8	69.7
Poverty gap	21.0	21.5	22.0	22.5	23.0	23.6	**24.1**	24.7	25.2	25.8	26.4	27.1	27.7
Squared poverty gap	10.6	10.8	11.1	11.4	11.7	12.0	**12.4**	12.7	13.0	13.4	13.8	14.2	14.6

Source: Authors' estimation using 2007 CWIQ survey.

Consider first table 5, which is based only on data on the consumption of rice. At the time of the survey, the share of the population in poverty was 63.8 percent. If the price of rice could be reduced by 20 percent, and if we look only at the impact on the consumer side, poverty would fall to 60.4 percent. If the price of rice were to increase by 20 percent, poverty would increase to 68.0 percent. If we look at the producer prices, the impacts is much lower, since only locally produced rice that is actually sold must be taken into account for the simulations (for rice auto-consumed, changes in producer prices do not affect household welfare of producers). If the price of rice is reduced by 20 percent, and if we look only at the impact on the producer side, poverty would increase only to 63.9 percent, while if the price of rice for producers were to increase by 20 percent, poverty would decrease to 63.4 percent in the overall population.

The total impact of changes in the price of rice on poverty is obtained by taking both consumers and producers into account, and the results are given in table 6. If the price of rice is reduced by 20 percent, poverty is reduced in the population as a whole to 60.5 percent, while if the price of rice increases by 20 percent, poverty would increase to 67.7 percent. These are relatively large effects for a single commodity, and they underscore why the population's feelings about the price of rice run high in Liberia.

5. Conclusion

When assessing the potential impact of a change in the price of cereals on poverty, it is important to consider both the impact on producers (who tend to benefit from an increase in prices) and consumers (who tend to loose out when the price increases). If producers tend to be poor and if consumers live in urban areas and are better off, an increase in the price of rice, despite its impact on the cost of food, may very well be poverty reducing. In Liberia however, the impact of a change in the price of rice is not ambiguous at all. A majority of the rice consumed is imported, and a majority of the rice that is locally produced is used by farmers for their auto-consumption. Therefore, any increase (decrease) in the price of rice, whether imported or locally produced, will clearly result in an increase (decrease) in poverty, and this impact is likely to be large given the important share of food consumption allocated to rice in the country.

Using data from the 2007 CWIQ survey implemented by Liberia's Institute of Statistics, we find that a change in the price of rice of 20 percent could lead to an increase or decrease of three to four percentage points in the share of the population in poverty, which is indeed large for a single commodity. The magnitude of the impact on poverty of changes in the price of rice suggests that the issue of what can be done to help reduce the price of rice for consumers would warrant a thorough discussion under the preparation of the country's Poverty Reduction Strategy.

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In fact, 53.6% of rice farms were between 0.2ha – 1.19ha with a further one-quarter of rice farms from 1.2ha – 1.69ha. For cassava, 70% of farms are of less than 0.69ha (CFSNS, 2006).