IMPORTER OLIGOPSONY POWER IN THE EU: THE CASE OF TANZANIAN CHILLED FILLET EXPORTS

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ABSTRACT

The EU accounts for over 50 percent of all chilled fish fillets exported from Tanzania. Given this large market share, the purpose of this study was to estimate the degree of oligopsony power exercised by EU firms. Price distortion estimates (price markdowns) from 1995 through 2006 were mostly insignificant during the data period. Given that the EU is extensively involved in the export industry and that a number of importers have operations in Tanzania, it is likely that oligopsony power is exercised more so by processors/exporters when purchasing fish from local fishermen and not by EU importers.

INTRODUCTION

The geographic concentration of commodity exports can have negative economic consequences for a developing county. Exports are more vulnerable to fluctuations in a single country or region's import demand and economic conditions, and exports are particularly vulnerable to protectionist policies (McGowan, 1976; Moss and Ravenhill, 1989). Such is the case for chilled fillet exports from Tanzania, where according to the United Nations, EU member states accounted for 64 percent of total chilled fish fillet exports in 2005 (total exports were valued at $68.0 million). As shown in Table 1, the EU has consistently imported a significant share of chilled fillets from Tanzania. From 1997 through 2005, the EU purchased over half of all fillets exported from Tanzania, with the exception of 1997 and 2003. Since 2001, the EU share of Tanzanian fillet exports was 59 percent on average.

Given that the EU is the principal market for chilled fillets from Tanzania, it is not unlikely that importers in the EU exercise buyer market power (oligopsony power). Market power implies that buyers in the EU have the ability to distort prices below their competitive levels resulting in less revenue for Tanzanian exporters. The purpose of this study is to estimate the degree of oligopsony power exercised by EU firms when importing chilled fillets from Tanzania. The methodology used in this study for determining oligopsony power builds on the new empirical industrial organization (NEIO) theory and econometric method for determining oligopoly power introduced by Appelbaum (1982). This was extended to include buyer market power (oligopsony or monopsony power) by Schroeter (1988) and further developed by Azzam and Pagoulatos (1990), Murray (1995), Muth and Wohlgenant (1999). These studies focused on domestic industries where the primary objective was determining market power in input markets. Given that the bulk of international trade consist of intermediate products, the above methods for determining oligopsony power in input markets is used to determine importer market power in the EU market for Tanzanian fillets.

Table 1
Chilled fillet exports for Tanzania and EU market share

	Total Value ($US)	Total Quantity (kg)	EU value share	EU quantity share
1997	$ 11,137,867	4,982,282	0.52	0.47
1998	5,554,433	2,307,169	0.60	0.61
1999	7,042,892	2,766,698	0.81	0.82
2000	37,204,992	19,861,016	0.99	0.98
2001	36,031,864	16,803,296	0.66	0.68
2002	40,604,488	13,478,101	0.67	0.65
2003	67,171,272	22,956,720	0.39	0.37
2004	72,237,277	27,805,619	0.57	0.56
2005	67,986,708	20,541,715	0.65	0.64

Source: United Nations Commodity Trade Statistics

OVERVIEW OF FISH EXPORTING INDUSTRY

The development of the fish exporting industry in Lake Victoria's riparian countries is relatively recent.[1] The industry was first developed in Kenya. Tanzania and Uganda soon followed (Dijkstra, 2001). Prior to the late 1980s, Lake Victoria fisheries provided fish primarily to local populations. In the following decades, over exploitation of fish stocks in developed countries increased dependence on fish stocks in developing countries. As a result, the share of world fish trade for developing countries increased to over 70 percent. During this period, the number of fish processing plants along Lake Victoria significantly increased. Government also played a key role by guaranteeing low interest loans for facility construction and equipment, giving tax and duty exemptions to exporters, and providing R & D funding for improving fish quality. The first processing plant for the export market was set up in Kenya in late 1980. By 2000, 35 factories had been constructed, of which 25 were established after 1990 (Abila, 2000).

The primary fish export for Tanzania is Nile perch (*Lates Niloticus*). As noted by Abila (2003), the development of the fish processing sector in Lake Victoria riparian countries was the direct result of the extensive growth in Nile perch demand in developed countries, particularly the EU.[2] Frozen fillets have a more diversified export market because they are less perishable and can be transported by road and then shipped to other countries; chilled fillets on the other hand are shipped primarily by air to the EU. Overall, fillets of exportable quality are too expensive for local markets and the industry is highly dependent on the EU for disappearance (Henson et al., 2000).

In 2005, Tanzania's fillet exports (chilled and frozen) accounted for 61 percent of the total value of all fish exports (whole, fillets, other). Chilled fillets typically command a higher price. Given chilled fillets are more perishable than frozen fillets, exports are primarily for EU markets because of direct flights between the two regions (Dijkstra, 2001; Josupeit, 2005). According to the FAO, the EU imports from 600 to 800 tons of chilled Nile perch fillets per week from Lake Victoria's riparian states. During the EU import ban period (1997-2000), chilled fillet exports reached an annual low of 5,613 tons. Since the ban ended, exports have averaged 33,500 tons annually (2001-2003). The increase in chilled fillet exports is primarily due to improvements in air transportation, and capital and infrastructure investments dedicated to maintaining EU standards (Josupeit, 2005).

The supply chain for exportable fish in Tanzania starts with local fishermen and transport boat operators (numbering too large to influence prices), independent road transporters, processing factories, export agents, and overseas retailers (Keizire, 2004). The potential for noncompetitive pricing occurs at the processor level where the number of processors are relatively small when compared to the number of fishermen. Although fishermen number in the hundreds, there are about 35 processors for all of Lake Victoria, where 17 are located in Uganda, suggesting that the number of processors in Tanzania is less than 20 (Reynolds and Greboval, 1988). There is also potential for noncompetitive practices at the export level where trade is primarily facilitated by a few importing firms in the EU located primarily in the Netherlands, Belgium and France (Keizire, 2004). Given limited data on shoreline prices in Tanzania, this paper ignores the market power that may be exercised by Tanzanian processors and focuses on measuring oligopsony power at the importer/exporter level.

Consequences of the EU dominating fish trade occurred when three successive import bans were imposed on fish from the region. Bans were imposed from February 1997 through June 1998, and March 1999 through January 2000. The first and second bans were due to the Spanish Veterinary Authority detecting salmonella microbes in fish from the region, and the third ban was the result of fisherman using chemicals to slow fish to increase catches (Dijkstra, 2001). Although these bans were primarily imposed due to food safety concerns, protecting domestic industries was also a factor. During the import ban period, much of the capital in the fish exporting industry went unused causing both prices and industry output to decline, resulting in substantial economic decline in both the exporting industry and domestic market (Marriott et al., 2004). Since the last ban ended in 1999/2000, Tanzania has experienced significant growth in fish exports. In the following year, exports grew by 618 percent and have grown by 15.3 percent per year since 2000.

CONCEPTUAL AND ECONOMETRIC MODEL

Past NEIO studies have primarily focused on domestic input markets, where the impact of the consolidation of U.S. processors on farm prices has been the focal point of past research. Farm output in this context is an intermediate input used in production by processors. For an importing firm, the imported good can be viewed as an input in their "production" process. Viewing imported products as intermediate goods is by no means a new concept. For examples, see Burgess (1974), Kohli (1978), Sanyal and Jones (1982), Diewert and Morrison (1989), and Truett and Truett (1998). These studies acknowledged that most goods entering into international trade require further processing before final demand delivery. They further acknowledged that even when a traded product is not physically altered, activities such as handling, insurance, transportation, storing, repackaging, and retailing still occur, resulting in a significant amount of domestic value added.

Assume that the EU is comprised of firms that import Nile perch from Tanzania, Uganda, and Kenya and resell domestically. Further assume that Nile perch imports are differentiated by country of origin (Armington, 1969). Using labor, capital, energy and other resources these firms incur the cost of importing such as freight, insurance, transportation and storage. Let the vector of individual imported goods be denoted as **q** ($n\times1$) and the vector of value added and trade facilitating inputs be denoted as **x** ($m\times1$), where n is the number of imported goods, in this case three (Tanzania, Uganda, and Kenya) and m is the number of nonmaterial inputs. The profit maximization problem for a fillet importer is

$$\begin{aligned} &\underset{\mathbf{q}}{\text{Max}}\ \Pi = p\, f(\mathbf{q},\mathbf{x}) - \mathbf{p}_{\mathbf{q}}^{'}\mathbf{q} - \mathbf{w}^{'}\mathbf{x} \\ &\text{subject to: } p_{qi} = g_i(Q_i,\mathbf{z}_i) \text{ for all } i=(1,2,...n) \end{aligned} \tag{1}$$

p is the domestic price, $\mathbf{p_q}$ ($n\times1$) is the vector of import prices and $\mathbf{w}$ ($m\times1$) is the vector nonmaterial factor prices. $p_{qi} = g_i(Q_i,\mathbf{z}_i)$ is the inverse export supply function, where Q_i is the total amount of the product exported and $\mathbf{z}_i$ is a vector of exogenous supply shifters for exporting country i. The first order condition for the imported product from country i is

$$p\frac{\partial f(\cdot)}{\partial q_i} - \frac{\theta_i}{\varepsilon_i}p_{qi} - \sum_{j\neq i} p_{qj}\frac{\partial q_j}{\partial q_i} - p_{qi} = 0\,. \tag{2}$$

$\theta_i = (\partial Q_i/\partial q_i)(q_i/Q_i)$ is the importer's conjectural elasticity and an index of market power, where $\theta_i = 0$ indicates a perfectly competitive import market and $\theta_i = 1$ indicates absolute monopsony power. $\varepsilon_i = (\partial Q_i/\partial p_{qi})(p_{qi}/Q_i)$ is the export supply elasticity. From equation (2), the oligopsony markdown can be measure by the following index

$$\frac{p\dfrac{\partial f(\cdot)}{\partial q_i} - \sum_{j\neq i} p_{qj}\dfrac{\partial q_j}{\partial q_i} - p_{qi}}{p_{qi}} = \frac{\theta_i}{\varepsilon_i} \tag{3}$$

In a competitive import market equation (3) is equal to zero, implying that the marginal import cost or import price is equal the marginal value product.

Data requirements for NEIO studies make estimation difficult. In past studies, industry specific quantities of nonmaterial inputs such as labor, capital and energy were needed in order to estimate market power. This was clearly a problem for this study, where quantity data for labor, capital and energy used to import fish was not readily available. Making use of the enveloped theory, Muth and Wohlgenant (1999) show that the need for nonmaterial input quantities can be circumvented, and nonmaterial input prices, which are easier to obtain are all that are needed. Let Tanzania, Uganda, and Kenya be indexed by 1, 2 and 3 respectively, where p_1 and q_1 represents the price and quantity of fillet imports from Tanzania. The profit function is redefined in terms of optimal nonmaterial inputs as

$$\Pi(p,\mathbf{q},\mathbf{z},\mathbf{w}) = p\,f(\mathbf{q},\mathbf{x}^*) - g_1(Q_1,\mathbf{z}_1)q_1 - g_2(Q_2,\mathbf{z}_2)q_2 - g_3(Q_3,\mathbf{z}_3)q_3 - \mathbf{w}'\mathbf{x}^*. \quad (4)$$

Note that $\mathbf{x}^*$ is the vector of optimal input quantities conditional on the choice of import quantities (**q**). $\mathbf{z} = \{\mathbf{z}_1, \mathbf{z}_2, \mathbf{z}_3\}$. The first order condition with respect to the choice of Tanzanian fillets (q_1) is

$$\frac{\partial \Pi}{\partial q_1} = p\frac{\partial f(\cdot)}{\partial q_1} + \left[p\frac{\partial f(\cdot)}{\partial \mathbf{x}^*} - \mathbf{w}'\right]\frac{\partial \mathbf{x}^*}{\partial q_1} - \theta_1\frac{\partial g_1}{\partial q_1}q_1 - p_1 - p_2\frac{\partial q_2}{\partial q_1} - p_3\frac{\partial q_3}{\partial q_1} = 0. \quad (5)$$

If nonmaterial inputs are purchased in perfectly competitive input markets, then the term in brackets is zero and the first order condition is

$$p\frac{\partial f(\cdot)}{\partial q_1} - \theta_1\frac{\partial g_1}{\partial q_1}q_1 - p_2\frac{\partial q_2}{\partial q_1} - p_3\frac{\partial q_3}{\partial q_1} = p_1. \quad (6)$$

Note that regardless to the quantity of nonmaterial inputs the total imported will always be equal to the sum of the imports from each individual source. This implies that

$$\frac{\partial f(\cdot)}{\partial q_1} = \frac{\partial f(\cdot)}{\partial q_1} + \frac{\partial f(\cdot)}{\partial q_2}\frac{\partial q_2}{\partial q_1} + \frac{\partial f(\cdot)}{\partial q_3}\frac{\partial q_3}{\partial q_1} + \frac{\partial f(\cdot)}{\partial \mathbf{x}^*}\frac{\partial \mathbf{x}^*}{\partial q_1} = 1 + \frac{\partial q_2}{\partial q_1} + \frac{\partial q_3}{\partial q_1} \quad (7)$$

Given equation (7), the first order condition is restated as

$$p\left[1 + \frac{\partial q_2}{\partial q_1} + \frac{\partial q_3}{\partial q_1}\right] = p_1\left[1 + \frac{\theta_1}{\varepsilon_1}\right] + p_2\frac{\partial q_2}{\partial q_1} + p_3\frac{\partial q_3}{\partial q_1}. \quad (8)$$

Equation (8) and the ordinary export supply equation for Tanzania $Q_1 = g_1^{-1}(p_1, \mathbf{z}_1)$ make up the system to determine the degree of oligopsony power exercised by Nile Perch importers in the EU.

DATA AND ECONOMETRIC SPECIFICATION

The External Trade Section of the Statistical Office of the European Communities (Eurostat) provided the data used in this study, which was the 6-digit HS commodity classification "fresh and chilled fillets". Imported quantities of chilled fillets for the EU were measured in units of 100 kg, and values were in euros. Import values were on a cost-insurance-freight basis. Monthly data was used to estimate the model. The time period for the data was January 1995 through December 1997 and September 2000 through May 2006. From 1998 to 2000, EU bans restricted imports resulting in many zero observations during this period. Per-unit values were used as proxies for import prices (euros per 100 kg) and were calculated by dividing value by quantity. Given that importers re-exported to other EU countries, per-unit values of EU exports were used as proxies for domestic prices (output price). Price indices for nonmaterial inputs (utilities, energy, labor and capital) were also provided by Eurostat.

Rearranging equation (8), the following econometric specification of the first order condition was used for estimation

$$\left(\frac{p-p_1}{p_1}\right)_t = \alpha_0 + \partial_{21}\left(\frac{p_2-p}{p_1}\right)_t + \partial_{31}\left(\frac{p_3-p}{p_1}\right)_t . \qquad (9)$$

$\alpha_0 = \theta_1/\varepsilon_1$, $\partial_{21} = \partial q_2/\partial q_1$ and $\partial_{31} = \partial q_3/\partial q_1$. ∂_{21} and ∂_{31} are assumed constant for estimation. Note that the left hand side of equation (9) is the relative price margin.

To complete the system a double log form was assumed for the export supply function

$$\ln(Q_1)_t = \beta_0 + \beta_1 \ln(p_1)_t + \beta_2 t + \beta_3(\ln(p_1)_t \times t) + \beta_4 d . \qquad (10)$$

t is a trend term (t = 1, 2, 3… for 1995, 1996, 1997,…) and $\varepsilon_1 = \beta_1 + \beta_3 t$. The inclusion of the trend term was to account for changes in non-price determinants of export supply overtime. The dummy variable d was included to account for the impact of industry investments and other changes during the import ban period that increased the export potential of the industry. Given that these investments had a lasting effect on the industry, d was equal to 1 for all years prior to the ban and 0 after the ban.

According to Appelbaum (1982), the conjectural elasticity θ_1 need not be constant but a function of the exogenous variables. Preliminary test indicated that the following functional form best fit the data

$$\theta_1 = \theta_{10} + \theta_{11} w_L + \theta_{12}\, tm + \theta_{13}\, d . \qquad (11)$$

w_L is the price labor; tm is a monthly trend term (tm = 1, 2, 3… for January, February, March,…, December); d is as previously defined.

EMPIRICAL RESULTS

Equations (9) and (10) were estimated jointly, where equation (11) was substituted for α_0 in equation (9).[3] Estimation was accomplished using the LSQ procedure in TSP (version 5.0), which uses the multivariate Gauss-Newton method (Hall and Cummins, 2005). Likelihood ratio (LR) test were used to determined the presence of AR(1) in the system (Green et al., 1978). LR test failed to reject the null hypothesis of no AR(1) at any reasonable significance level.

Maximum likelihood estimates of the export supply equation are presented in Table 2. The R^2 for the export supply equation was 0.79, and the export supply elasticity estimates was positive (1.42) as expected and significant at the 0.01 level. Given that *d* was equal to 1 prior to the ban and 0 after, the negative estimate (-0.32) reflects the fact that imports were significantly higher after the import ban period.

Estimates of the first order condition are presented in Table 3. Results indicate that the price of labor had a negative impact on the EU/Tanzania relative price margin (-0.0055). The positive significance of the monthly trend term indicated that the price margin increased throughout the year. The negative significance of ∂_{21} (-1.85) indicated that an increase in Ugandan prices relative to the EU price $(p_2 - p)$ had a negative impact on the EU/Tanzania relative price margin. The direct opposite was the case for Kenyan where an increase in Kenyan prices relative to the EU price $(p_3 - p)$ had a positive effect on the EU/Tanzania relative price margin. These opposite effects are due to the way importers view imports from each country. Muhammad (2007) found that imports from Uganda and Tanzania were strong substitutes for each another in the EU market. In fact, estimates showed that Ugandan and Tanzanian fillets were one-to-one substitutes (the cross-price elasticities between products equaled one). Given that $\partial_{21} = \partial q_2 / \partial q_1$, if Tanzanian and

Table 2
Maximum Likelihood Estimates for Export Supply Equation
Dependent Variable = 1n $\ln(Q_1)$

Variable	Parameter	Estimate
	β_0	-12.333 (2.792)***
$\ln(p_1)$	β_1	7.693 (1.380)***
t	β_2	5.341 (0.862)***
$\ln(p_1) \times t$	β_3	-0.945 (0.155)***
d	β_4	0.323 (0.131)**
$R^2 = .79$		

Supply Elasticity Estimate
ε =1.432***

Ugandan fillets are substitutes then this term should be negative because imports from each country would be inversely related. Kenyan's exports were so small that EU imports from Kenya and Tanzania were for the most part price-independent. Also, given the high level of tourism in Kenya, Kenya has at times imported a significant amount of Nile perch from Tanzania.

Estimates of oligopsony distortions from 1995 through 1997, and 2000 through 2006 are presented in Table 4. Although the EU imported a significant percentage of chilled fillets from Tanzania, results suggests that prices were not significantly distorted below competitive levels. Oligopsony power was significantly negative from 1995 to 1997, suggesting that import prices were significantly higher than competitive levels during the pre-ban period. This suggests that Tanzanian exporters may have exercised oligopoly power (seller market power) when exporting to the EU. This may be due to Tanzania being one of the top suppliers of Nile perch to the EU. For the post-ban period (2000-2006), all distortion estimates are insignificant. Note that the EU was extensively involved in the recovery of the fish exporting industries during the import ban period. The EU built laboratories, provided

Table 3
Maximum likelihood estimates for first order condition

Dependent Variable = $\left(\dfrac{p - p_1}{p_1}\right)$

Variable	Parameter	Estimate
	θ_{10}/ε	-0.0205 (0.122)
w_L	θ_{11}/ε	-0.0055 (0.002) **
t	θ_{12}/ε	0.0647 (0.024) ***
d	θ_{13}/ε	0.1431 (0.070) ***
$\left(\dfrac{p_2 - p}{p_1}\right)$	∂_{21}	-1.8504 (0.042)***
$\left(\dfrac{p_3 - p}{p_1}\right)$	∂_{31}	0.4882 (0.058)***
$R^2 = .54$		

Standard errors are in parentheses.
***, ** indicate significance of 0.01 and 0.05 respectively.

funds, and encouraged UN support to ensure that exports were up to EU food safety specifications (Zaramba, 2002). Also, some EU firms have operations in Lake Victoria (Keizire, 2004). Import and re-export data for Belgium (a major importer of Nile Perch from Uganda) indicated that chilled Nile perch import prices and re-export prices were virtually identical, suggesting that Belgium firms claimed zero profits in the EU, allowing all profits to be claimed by the foreign subsidiary. This is likely the case for operations in Tanzania, although this could not be confirmed. Lastly, if distortion estimates from 1995 to 1997 are an indication of oligopoly power for Tanzanian exporters, then one could argue that the import bans did improve the competitive position of importers since distortion estimates after the ban were insignificant; however, this interpretation of results should be taken with some caution.

Table 4

Oligopsony distortion estimates (θ/ε): 1995-1997, 2000-2006

Year	Estimate
1995	-0.519 (0.144)***
1996	-0.472 (0.136)***
1997	-0.410 (0.128)***
2000	-0.204 (0.162)
2001	-0.126 (0.168)
2002	-0.067 (0.183)
2003	-0.008 (0.200)
2004	0.050 (0.218)
2005	0.120 (0.235)
2006	0.172 (0.256)

Standard errors are in parenthesis.
*** indicates significance of 0.01.

SUMMARY AND CONCLUSIONS

Given that the EU is the principal market for chilled fillets from Tanzania, it is not unlikely that importers in the EU exercise buyer market power (oligopsony power). Additionally, EU import bans from 1998 through 2000 may have increased market power for importers. To satisfy EU standards exporters incurred increased production costs making fillets that qualified for EU markets too expensive for local markets. This study estimated the degree of oligopsony power exercised by EU firms when importing chilled fillets from Tanzania. The methodology used in this study for determining oligopsony power builds on the new empirical industrial organization (NEIO) theory and econometric method for determining oligopoly power introduced by Appelbaum (1982).

Oligopsony price distortions were estimated from 1995 through 1997, and 2000 through 2006. Price distortions for imported fillets from Tanzania were for the most part insignificant during the data period which indicated that import prices were not significantly distorted below competitive levels. Given results, the question arises, if the EU dominates fish trade with Tanzania, why are prices not significantly distorted? Given that the EU is extensively involved in the export industry and that a number of importers have operations in the Lake Victoria region, it is likely that oligopsony power is exercised more so by processors/exporters when purchasing fish from local fishermen and not between EU importers and African exporters, where a number of these "African" exporters are actually European firms.

ENDNOTES

1. Lake Victoria is shared between three countries: Tanzania (which possesses 49 percent), Uganda (45 percent) and Kenya (6 percent) (Bokea and Ikiara, 2000).
2. EU imports of Nile perch are primarily from the Lake Victoria region.
3. The first order condition equation used for estimation was

$$\left(\frac{p-p_1}{p_1}\right)_t = \frac{\theta_{10}}{\varepsilon_1} + \frac{\theta_{11}}{\varepsilon_1} w_{Lt} + \frac{\theta_{12}}{\varepsilon_1} tm_t + \frac{\theta_{13}}{\varepsilon_1} d_t + \partial_{21}\left(\frac{p_2-p}{p_1}\right)_t + \partial_{31}\left(\frac{p_3-p}{p_1}\right)_t + u_t$$

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