Determinants of Tanzanian Export Prices

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Abstract. This paper uses firm-level data to study the pricing-behavior of Tanzanian exporters. The important question of how exporting firms make pricing decisions has not received significant attention in the trade literature, more focused on factors that determine export flows. The results of this paper show that the free on board (fob) price of Tanzanian exports is differentiated both across exporters - within product-destination pairs - and across markets - within firm-product pairs. Moreover, contrasting with existing evidence, price differentiation across destinations seems to be mainly relevant for homogenous goods. This result could indicate either that goods classified as homogeneous can potentially be differentiated by their intrinsic quality (i.e. coffee), or that firms charge different mark-ups in different markets. Even though further work is needed to confirm what leads price dispersion, allowing for the possibility that food products can be vertically differentiable amplifies the spectrum of existing opportunities for developing countries to exploit product differentiation and market niches. Lastly, this study also discusses the implication of the empirical findings in light of the predictions of price and quality competition models, but finds that the results cannot be explained by a single trade model of quality or price competition.

Keywords: *unit values, heterogeneous firms, quality, pricing, firm level data,*
JEL Classification: F1, C33

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1. Introduction

How do exporting firms make pricing decisions? This important question, which has not received significant attention in the trade literature, has long been overshadowed by the seemingly greater need to understand the factors that determine export flows. Pricing decisions have a direct effect on revenue; as a consequence they should occupy a more crucial place in the trade literature. This is even more important for developing countries. In fact, both domestic and international pricing decisions are difficult, due to the uncertainties associated with dynamic markets and rapid changes in information systems, proliferation of product lines, and advances in technology (Forman and Hunt, 2005). This level of difficulty is amplified further for exporters - which have to compete in the international arena - and in developing countries, where firms often have to count with unreliable infrastructures and less structured services for business counseling, education, and community outreach.

From a policy perspective, it is critical to examine the pricing behavior of exporting firms to understand whether firms are able to position their products competitively in the market. The price of a product is a signal that firms provide to the market about the quality and features of that product. By analyzing price dispersion both across firms and destinations, a clearer understanding emerges about the strategic element of pricing decisions, like whether firms' price strategy is cost-based, demand-based, or competition-based and what factors (at the destination and/or product level) impact exporting firms' behavior. In fact, when firms develop their pricing strategies they have to take into account several factors, both internal and external to the firm. This paper focuses on the latter: it first looks for evidence of pricing-to-markets, and try to establish how destinations' characteristics influence pricing decisions.

More specifically, based on the recent literature on trade and heterogeneous firms, this work explores how Tanzanian exporting firms make pricing decisions, and examines whether the behavior of those firms corresponds to price or quality competition models. In fact, studying pricing behavior allows discriminating among both different trade theories and their respective assumptions. The previous literature indicates a lack of consensus on how firms adjust their prices according to the characteristics of their trade partners. In fact, reviewing the theoretical framework confirms that existing models predict different relationships between unit values (prices) and the gravity variables. For instance, both price and quality competition models with *constant* mark-up predict no correlation between fob export price and both GDP and GDP per capita of the destination, while price and quality competition models with *variable* mark-up predict a negative relationship between price and GDP, and an unclear sign in the relationship between price and GDP per capita. The empirical literature on this subject also presents contrasting findings. There is, however, evidence that adjustments happen and more investigation is needed to better explain the different patterns observed across different countries.

This work contributes to the literature on pricing behavior in an effort to analyze how exporters in small Least Developed Countries (LDCs) – normally considered price takers - behave with respect to pricing decisions. This paper's analysis benefits from a novel, firm-level dataset from Tanzanian exporters[2]. By accessing this disaggregated information, this paper is able to examine diverse aspects of pricing behavior across both firms and destinations. The analysis contained herein benefits from the methodology adopted by Manova and Zhang (2012) and corroborates most of their findings.

Specifically, firms setting a higher export price earn greater revenue and sell lower quantities within a destination for a given product. Moreover, exporters that serve multiple destinations seem to have a higher dispersion of prices across markets, indicating that firms charge different prices if they serve multiple destinations. These results represent preliminary evidence favoring quality competition models. The main difference from Manova and Zhang (2012) relates to the result that homogeneous - rather than differentiated - goods lead price differentiation across destinations. This stands in contrast to the expectations and findings of previous studies. However, most of the studies that work to identify evidence of price differentiation examine middle- to high-income countries and focus mainly on the manufacturing sector. By contrast, Tanzania is a LDC, and the analysis in this paper includes all products, rather than just manufacturing.

In Tanzania, as in most Sub-Saharan African countries, the agriculture sector remains the main source of employment and constitutes one-third of Tanzania's GDP. Tanzania does, however, have a comparative advantage in agricultural goods and, over the years, some donor-driven projects have been successful in developing technologies to add value in agricultural production[3]. For these reasons, the finding that price differentiation relates to homogeneous goods might indicate that the country's comparative advantage in agricultural production is based on differentiation of products by quality attributes. This might suggests that countries with comparative advantage in agricultural goods, such as Tanzania, can still undertake price differentiation among destinations. In fact, even goods classified as homogeneous can potentially be or become differentiated by their intrinsic quality (i.e. coffee). However, quality is not the only explanation to price differentiation: in fact pricing-to-market can also be led by firms charging different mark-ups.

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[2] The dataset was previously used by Freund and Pierola (2011) and by Cadot et al (2011).
[3] Koshuma, K.P. R. and Mmasi, S.M., (Unknown date).

Even though the results in this paper cannot provide a conclusive answer to the question of what is leading price dispersion in multiple-destinations exporters, it opens the way for future research in this area. In fact, even though it is a standard practice to treat agricultural commodities as homogeneous goods, these commodities are perceived by consumers as differentiable in quality, according to production practices, seeds, geographical locations of production, sanitary and phyto-sanitary measures and food safety requirements. For this reason, differences in brand, quality and other aspects of heterogeneity make these products differentiated in international trade[4]. Allowing for the possibility that food products can be vertically differentiable amplify the spectrum of existing opportunities for developing countries to exploit product differentiation and market niches in countries where consumers are willing to pay more for products that satisfy specific quality dimensions.

The remainder of the paper is organized as follows: Section 2 reviews the theoretical and empirical framework upon which this work is built. Section 3 reports how Tanzanian trade performed during the 2003-2009 period. Section 4 introduces the data used in this analysis and highlights some preliminary characteristics. Section 5 studies the variation in prices across firms and destinations to investigate whether the Tanzanian data shows evidence of price or quality competition. Section 6 concludes.

2. Literature review

Before starting the empirical analysis, it is useful to classify the main models of trade and heterogeneous firms and review the predictions that are most relevant for this paper. This section will focus on the predicted relationship between firms' fob export prices and: revenue, quantity, GDP, GDP per capita and distance. This brief review draws on Baldwin and Harrigan (2011) and Manova and Zhang (2012). The classification of the reviewed models is summarized in Table 1. Even though it is based on Baldwin and Harrigan (2011), unlike their analysis the fob export price in Table 1 is intended as the unit price of a product at the *firm level*, not the unit price of a particular good *averaged across firms*[5]. For this reason, Table 1 should be compared to the results of the firm-level work in Manova and Zhang (2012).

The workhorse model of heterogeneous firms, Melitz (2003), predicts that only firms with productivity above a certain threshold level can export. In the classification summarized in Table 1 Melitz (2003) is defined as a price competition model (or efficiency sorting model) with constant mark-up: more productive firms face lower marginal costs and charge lower prices. The Melitz model incorporates firm level productivity differences: before deciding to enter an industry, firms draw a productivity level and the marginal production cost associated to it. The model assumes constant elasticity of substitution (CES)

[4] Saker and Surry (2006)

[5] Ito (2011).

demand: all firms charge a constant mark-up over variable cost in every market. As a consequence, the fob price charged by firms is not determined by the characteristics of the destination market. Nevertheless, more productive firms have lower marginal costs, charge lower prices, sell higher quantities and earn higher revenues. As a result, fob prices will differ across firms exporting the same product.

Melitz and Ottaviano (2008) retain the price competition framework of Melitz (2003), but modify the assumption of CES demand by including a linear demand and variable mark-ups. Therefore the fob price depends on the degree of competition present in a destination market: a firm might set different prices across destinations. However, the prediction on the sign of the correlation between fob export prices and destination characteristics remains ambiguous. In Melitz and Ottaviano (2008) market size (GDP) and trade affect the degree of competition, which in turn affects the selection of producers and exporters in that market. Larger, more integrated markets exhibit higher productivity and lower mark-ups.

Berman, Martin and Mayer (2012) build on Melitz and Ottaviano (2008) and develop a model to analyze the heterogeneous reaction of exporters to real exchange rate changes. This paper is close to the class of models where incomplete pass through is generated by introducing additive trade costs (like distribution costs). High additive trade costs lower the relative importance of the producer price as a share of consumer price, so that firms can charge higher mark-ups in destinations with higher additive trade costs (more distant markets, markets with higher distribution costs, etc.). This is also shown in Martin (2012), who explains that a necessary condition for firms to set higher mark-ups or to quality upgrade their product toward more distant countries is the presence of per unit rather than iceberg transport costs.

The quality competition (or quality sorting) models depart from the price competition models by incorporating quality differentiation across firms: more productive firms – apart from being more efficient - will make use of better-quality, more expensive inputs, and might face higher marginal costs and prices. Baldwin and Harrigan (2011) propose a model in which high quality firms are the most competitive and quality increases with firms' heterogeneous cost. They use product-level U.S. trade data to show that export unit values are positively related to distance.

The main difference between price (Melitz 2003) and quality competition (Baldwin and Harrigan 2011) models is that in price competition models price is the only element upon which firms compete and market entry thresholds are defined in terms of a maximum price[6]. In quality competition models, firms' competitiveness is based on the quality-adjusted price and market-entry thresholds are based on quality-adjusted price. As per Baldwin and Ito (2011), "*the lower quality-adjusted prices (unobserved) are*

[6] Ito (2011).

associated with higher unadjusted (observed) prices. In other words, firms only export the most expensive goods to the most distant markets".

In quality competition models with constant mark-up, firms sell at a constant mark-up over marginal cost in all markets, so that fob prices do not vary across destinations. Nevertheless, the most productive (qualitative) firms will use more expensive (quality) inputs and will charge higher prices. As a consequence, quality competition models predict differences in fob prices across firms, but not across destinations.

Lastly, quality competition models with variable mark-ups build on the Melitz and Ottaviano (2008) model, to which quality differentiation is included. Kneller and Yu (2008) are an example of a quality competition model with variable mark-ups: they simply assume that firms with higher marginal costs produce higher quality. Mark-ups are heterogeneous, so that firms that produce higher quality products will charge higher prices both because they use more expensive inputs and because they can charge higher mark-ups. In these models, the fob price charged by a firm will differ across destinations, according to the degree of faced competition.

From this review of the theoretical framework, it is clear that the theoretical models predict different relationships between export prices and gravity variables at the firm level. This finding is also true at the product level (not reported in Table 1): Melitz and Ottaviano (2008) predict a negative relationship between prices and distance, while Baldwin and Harrigan (2011) and Johnson (2007) predict and show the opposite (that prices increase with distance). Regarding the wealth in destinations, the framework developed by Hallak (2006) predicts a positive relation between (aggregate) export prices and the GDP per capita of the trade partner, while Melitz and Ottaviano (2008) predict a negative relationship.

With regard to the empirical literature, Manova and Zhang (2012) is the main reference for this paper. The authors analyze a custom database on Chinese firms and establish stylized facts on the variation in export prices and imported-input prices across firms, products and trade-partner countries. They also compare their findings with the literature and the expected results of the various models of trade and heterogeneous firms. They conclude that there is not a single trade model that can explain all the facts observed in the data and that future work on international trade models should incorporate quality differentiation both across firms and trade partners within firms.

An attempt similar to Manova and Zhang (2012) is made by Görg, Halpern and Muraközy (2010), who analyze the relationship between gravity variables and fob export unit values using a Hungarian firm-product-destination dataset. The authors find a positive relationship between export unit values and both distance and GDP per capita (GDPpc) but find a weak negative relationship between unit values and market size – as previously found in Baldwin and Harrigan (2011). Görg et al. explain that this might be evidence for quality differentiation across markets and they find that tariffs do not affect Hungarian firms' fob unit values significantly.

The work of Kugler and Verhoogen (2009) focuses on product-level heterogeneity and investigates the hypothesis that input quality and plant productivity are complementary in generating output quality. They use product-level data for Colombian manufacturing plants to test the cross-sectional predictions of the model. Their findings support the quality-complementarity hypothesis that output prices are positively correlated with plant size within industries, with a stronger effect in industries with more scope for quality differentiation.

In conclusion, this short review of the literature shows that there is weak consensus on how firms adjust their prices according to the characteristics of their trade partners. However, there is evidence that some adjustment happens and that more investigation is needed to explain the different patterns observed in different countries. This work contributes to the literature on pricing behavior in an effort to analyze how exporters in small Least Developed Countries (LDCs) – normally considered price takers - behave with respect to pricing decisions and how firms adjust their prices according to their trade partner's characteristics. This paper's analysis benefits from a novel, firm-level dataset from Tanzanian exporters[7]. By accessing this disaggregated information, this paper is able to examine diverse aspects of pricing behavior across both firms and destinations.

3. Tanzania Trade Performance

Tanzania is considered one of the best performers in Sub-Saharan Africa (SSA) for its economic performance over the last decade[8]. Over the 2003-2009 period the economy grew at an average rate of 6.7 percent, nevertheless GDP per capita performed less brilliantly (on average 3.7 percent over the 2003-2007) due to fast population growth. This indicates that poverty reduction keeps being a concern. The composition of merchandise exports has evolved overtime, characterized by a decrease in the role played by agriculture and food exports versus an increase in the percentage of manufacturing and ores products (as per Figure 1)[9]. The impressive growth of the mining sector has led to a doubling in the contribution of

[7] The dataset was previously used by Freund and Pierola (2011) and by Cadot et al (2011).
[8] Economist Intelligence Unit (2008).
[9] Economist Intelligence Unit (2004).

the sector to GDP from 1.4 percent in 1996 to 2.8 percent in 2005[10]. However the agriculture sector remains the main source of employment and represents one third of GDP.

More specifically, Tanzanian exports have been characterized by a slight decrease in exports concentration at the product level over the 2003-2009 period. Table 2 indicates a decrease in the share represented by Gold exports from 18 to 11 percent in 2003 and 2009 respectively. Nevertheless Gold remains the most important export and overall the top exports in the mining sector represent over 20 percent of total exports in both years. The trend is clearly marked by an increase in the importance of the mining sector (with gold and precious ores as main products) at the expense of agriculture goods, in terms of value of exports.

With regard to trade partners, Tanzanian exports have experienced an increased geographical diversification over the 2003-2009 period, as showed in Table 3. The share of exports to each destination was more evenly distributed in 2009 compared to 2003, when almost one third of exports were concentrated in the EU market. Nevertheless, the top ten exports still represent almost half of total exports; there was just a slight decrease from 44 to 43 percent in 2003 and in 2009 respectively. It is interesting to note that the EU has shifted from being the top destination (in 2003) to second top destination in (2009). Most importantly, China, which was not among the top exporters in 2003, has risen from the fifth place in 2006 to the third place in 2009, moving down Japan from the third to the seventh place in 2003 and 2009, respectively. In general, the rank of Tanzanian trade partners (for both imports and exports) varies considerably from year to year. However, a number of trends are visible. The rise of China as an export market is due to the signature of a special trade agreement in 2007, which guarantees access for Tanzanian goods into China[11]. China has also become the main source of inputs (displacing South Africa) followed by Kenya and India.

Prices play an important role in the Tanzanian economy. The 2007/2008 year was characterized by a considerable increase in food prices for most food crops, due to worldwide decline in food supplies. The Bank of Tanzania reports that production of many traditional crops (except for coffee) increased due to improved weather conditions (compared to the drought in 2006). Moreover, the development in the production of cashew nut was led by the introduction of the Warehouse Receipt Payment System (WRPS): this was aimed at allowing farmers to realize better prices for their products, with a particular focus on cash crops. In 2007/08, world demand and improved quality of traditional export crops pushed their prices upward. More specifically cotton unit price increased in 2007/2008 due to a decline in global

[10] Economist Intelligence Unit (2007).
[11] Economist Intelligence Unit (2007)

supply (caused by a shift of US farmers from cotton acreage to cereals production for bio fuel). The increase in cashew nuts price was also due to a decline in supply in the world market following unfavorable weather conditions in Vietnam and Brazil[12].

4. Data and descriptive statistics

The Tanzanian dataset used for the empirical analysis was obtained as part of the first ever cross-country exporter-level customs transaction database that is being collected under the Export Growth and Dynamics Project by the Trade and International Integration Unit of the World Bank's Research Department (Freund and Pierola, 2011). The novel dataset contains daily information on shipments of Tanzanian exporters between 2003 and 2009. The original source of this dataset is the Tanzania Revenue Authority[13]. Each daily observation contains information on arbitrary[14] firm ID, product information (at HS-6 digits), date, destination (ISO3), for shipment value in US dollars[15] and net weight. In light of merging this dataset with other data, it is very important to ensure that the product codes belong to a single classification[16].

In order to obtain the final dataset used for this analysis, daily transactions are aggregated (summed) by firm-product-destination-year quartets (i.e. exports of coffee by a Tanzanian firm to Germany in 2003). This paper focuses on annual exports for several reasons: first, to avoid dealing with seasonality in both daily and monthly data, and also because most firms do not export a given product to a given market in every day or month (not even in every year); second, the empirical analysis of this paper studies the relationship between firms' export prices and destination characteristics, some of which are available yearly (i.e. GDP). As a consequence, using a daily or monthly dependent variable (price) could generate misleading standard errors. In fact, using price at daily or monthly level would cause an increase in the number of observations (due to the increased frequency of the dependent variable) but would also lead to

[12] Bank of Tanzania Annual Report 2007/8.
[13] Special thanks are also due to Josaphat Paul Kweka for his crucial contribution in the negotiation of the access to the data directly with the authorities from the TRA.
[14] The firm ID is not the official identification number, for confidentiality issues. Also for confidentiality issues, the database did not contain any description or characteristic of the firm and its activities. For this reason it was not possible to identify and/or exclude wholesalers from the results.
[15] The shipment values are converted from local currency to US dollars using average annual exchange rates from IFS-IMF.
[16] The HS revision used in the Tanzanian dataset has not been officially confirmed. For this reason, in this paper the codes of the products in the Tanzanian dataset are compared with the standard product codes by year and classification. More specifically, if a code from the Tanzanian dataset is included only in one of the four HS classifications (1992, 1996, 2002, or 2007), it is categorized under that classification. This procedure indicates that the HS96 is used in 2003-2004 and the HS07 is used in 2008-2009, while for 2005-2007 several classifications are used. As a consequence, the codes related to the years 2005-2007 are classified product by product. Finally, every code is converted to the HS02 classification. Unfortunately, some codes do not belong to any classification. However these are less than 1/50 of all observations, so the associated measurement error related to keeping them can be considered small.

repeated values in the independent variables (which have annual frequency) without necessarily introducing new information[17].

To compare firm level annual shipments with product level annual shipments (reported in Comtrade), the former are aggregated by product, year and destination. This procedure allows observing that the Tanzanian firm level datasets reports from 87 to 100 percent (depending on the year considered) of the exports recorded in Comtrade at the product level. For this reason, it is not necessary to clean or reduce the database.

For the analysis, the firm's price is proxied by the fob unit value of every annual shipment, which is the value of shipment divided by quantity of shipment, at the firm-product-destination level. More specifically, the fob price is calculated as: $\frac{\sum value_{fpdt}}{\sum quantity_{fpdt}}$. This proxy for price has been largely used in previous literature, as actual prices are typically not observed. Since the value of the shipments in the dataset is fob value, it should be seen as the "farm gate" price, not including the costs for shipping, handling, storage, marketing, or the tariff paid in the final destination. Therefore, the analysis is conducted under the assumption that this price should only include the mark-up applied by the firm and its marginal costs[18].

With regard to the firm, value, quantity and prices are the only information available. The dataset is then merged with destination and product specific characteristics such as, annual GDP, GDP per capita (from the Word Development Indicators Database); distance (from CEPII); and the Rauch classification[19] (to classify products as homogeneous and differentiated goods).

Before discussing the econometric analysis, some preliminary statistics are presented. Table 4 shows that the number of firms and products has increased constantly over the 2003-2009 period, while the number of destinations oscillates somewhat, but remains quite stable overtime. Also the average number of products exported per firm is quite stable, while the number of destinations per firm decreases overtime. This last observation might indicate a decline in geographical experimentation and that exporters may limit their trials to a limited number of (maybe more secure) destinations. The number of products and destinations served by firms indicates that firms experiment more with products than with destinations. Also the number of firms per product is quite small, indicating a low degree of competition among firms

[17] Manova and Zhang (2012)

[18] The assumption that marginal costs are constant within a given firm across destinations allows attributing differences in unit value to differences in mark-ups.

[19] http://www.macalester.edu/research/economics/PAGE/HAVEMAN/Trade.Resources/TradeData.html#Rauch

in the same product. The same is not true for competition within a destination, since the average number of firms exporting to a given destination increases overtime.

The dataset of Tanzanian firms includes exports of a wide range of products. For this reason it is useful to look at the variation in export prices. The first row of Table 5 reports some statistics on the price of each firm-product-destination combination by year. The standard deviation of the logarithm of prices is very high (2.4), indicating that – not surprisingly - variation in export prices is considerable. The variation in the price of prices by firm-product pairs across destinations is also high, which can already be a preliminary sign of price differentiation across destinations. Furthermore, prices for a product-destination pair vary considerably across firms, which indicate heterogeneity across firms. This first statistical description of the data predicts that results may be in line with models assuming variable mark-ups, i.e. the variation in prices across firms indicates that firms charge different mark-ups. Table 5 also predicts that results should be in line with quality competition models, because the variation across destinations indicates that firms charge different prices (and maybe sell different qualities) in different destinations.

The products exported are classified according to the Rauch Classification[20] (1999): (1) homogeneous goods are defined as products whose price is set on organized exchanges; (2) differentiated goods are products whose price is not set on organized exchanges and which lack a reference price because of their intrinsic features; (3) while goods not traded on organized exchanges that possess a benchmark price are defined as reference goods[21]. The dummy variable for product differentiation equals one if the product falls into category (2) and zero otherwise. Of the 3542 products exported over the sample period, more than 60 percent are differentiated products (as per column 2 of Table 6). Nevertheless, a look at the number of total shipments indicates that products are almost evenly divided between differentiated and homogeneous goods.

5. Heterogeneity across firms and export destinations

This section studies the variation in prices across firms and across destinations with the aim of investigating if the Tanzanian data shows evidence of quality or price competition. The analysis draws from the study undertaken by Manova and Zhang (2012). As these authors highlight, causal interpretation of coefficients is not always possible. In fact, some of the specifications would likely be affected by reverse causality issues. Moreover both dependent and independent variables in some specification might be correlated with firms' characteristics that cannot be controlled for (a part from including fixed effects).

[20] The Rauch Classification is a measure of horizontal differentiation, not vertical. An example of horizontal differentiation is the ice-cream, which is produced in different tastes, but one is not necessarily better than the other.

[21] Javorcik, B. and Narciso, G. (2008).

The first specification - Equation (1) - examines the relationship between the log of price set by firm *f* exporting product *p* to a destination *d* in year *t* and the revenue (value) associated to that transaction:

$$(1) \qquad \log(price_{fpdt}) = \alpha + \beta * \log(revenue_{fpdt}) + \delta_{pd} + \gamma_t + \varepsilon_{pd}$$

The regression controls for time related un-observables by including year fixed effects. Product-destination pair fixed effects are also included to control for un-observed product and destination characteristics (i.e. transportation costs, bilateral tariffs and other) which are invariant across firms. It is not possible to give a causal interpretation to these coefficients, because firm's price and revenue are both affected by un-observed firm's characteristics and are the outcome of the profit maximization of the firm. Nevertheless, the β coefficient in (1) indicates how price and revenue are correlated and indicates whether there is evidence of price or quality competition, with fixed or variable mark-ups.

The results in Table 7 indicate that firms setting a higher export price earn greater revenue within a destination for a given product. Conversely, firms that sell higher quantities of a certain product to a specific destination charge lower prices. The interaction between revenue and differentiated products[22] is positive and significant, which indicates that revenue and export prices are more strongly correlated for differentiated goods compared to homogeneous goods. Lastly, the interaction between revenue and GDPpc is positive and significant for export prices: the elasticity of price with respect to sales is larger for richer destinations compared to poor markets. These findings are robust to other levels of clustering[23].

These results indicate that there is empirical evidence in favor of quality competition, both assuming fixed and variable mark-up. In fact, the quality competition models predict a positive relationship between revenue and price. This can be associated with more successful firms (proxied by sales) selling higher quality goods - as in fixed mark-up models - or to better quality firms having larger variable costs or charging higher mark-ups - as in variable mark-up models. In any case, price competition models like Melitz (2003) or Melitz-Ottaviano (2008) cannot explain how the Tanzanian exporters' prices in a given market (destination and product) vary across firms. In fact, they would expect a negative relationship between price and revenue (more productive firms charge lower prices).

Secondly, in order to examine the relationship between the number of destinations served and price charged, equation (2) examines the correlation between the price dispersion across destinations served by

[22] The dummy variable equals one if the product is differentiated and zero otherwise.

[23] Notice that the sample size decreases when interaction terms are included. This decrease results from the unavailability of product (Rauch classification) and destination characteristics (GDPpc) for every observation.

a firm *f* selling product *p* in time *t* and the number of destinations served with the same product across firms:

$$(2) \qquad sd_{fpt}(\log price_{fpdt}) = \alpha + \beta * \log(nr\ destinations_{fpt}) + \delta_p + \gamma_t + \varepsilon_{fp}$$

This is an interesting way of posing the question, because it shows whether exporters that serve multiple destinations charge different prices or the same price for all destinations. Product and year fixed effects are included in the specification to control for good specific and year specific un-observables. The errors are clustered at the conservative firm-product level. Interestingly, as shown in Table 8, exporters that supply multiple destinations seem to have a higher price's dispersion across destinations, indicating that firms charge different prices if they serve multiple destinations. However, when the regression is specific to homogeneous goods, the relationship between the number of destinations served and price's dispersion holds positive, while for differentiated goods it no longer holds. The exact opposite relationship was found by Manova and Zhang (2012). Intuitively, it is common to think that price dispersion is associated more with differentiated rather than with homogeneous goods, if it relates to quality differentiation.

A look at the average number of destinations by firm-product pair (see Figure 2) shows that for differentiated goods (left figure) most firm-product pairs are exported to only one destination. The same relationship holds for homogeneous goods (right figure), but to a lesser extent. In fact, over 60 percent of firm-product pairs are exported to only one destination for differentiated goods, while the percentage for homogeneous goods goes down to 45 percent. This might be a first statistical explanation to the difference in results from Manova and Zhang (2012).

A part from statistical considerations, a way of interpreting the result linked to homogeneous goods is that the quality argument does not have to be disregarded only because it does not apply to differentiated goods. In fact, a country that exports mainly agriculture products, like Tanzania, with a limited capacity of production, might still be able to improve the quality and efficiency of its agriculture production. The case of coffee (reported in column (5) of Table 8) is interesting because under the Rauch classification this product would be classified as homogeneous. Nevertheless, Tanzanian firms have received donor assistance to improve the production and perceived quality of coffee.

A document from TecnoServe[24] argues that the country has the climate and altitude to produce specialty Arabica coffee (a type of quality that can be sold at premium world market prices). Before 2004, the country farmers used to sell their high quality but poorly processed coffee on the blended coffee market

[24] http://www.value-chains.org/dyn/bds/docs/519/Technoserve%20Tanzania%20Coffee%20Summary%20Case.pdf

through a state-run auction: a system that did not reward quality. When the country started to receive assistance by several donors, a policy reform allowed a lowering of the farm-gate taxation and permitted producers to sell their product directly to foreign buyers. These reforms, together with technical assistance to the farmers, allowed a change in the sector from 2004 onwards such that the price of coffee is no longer determined exclusively on organized exchanges.

The case of coffee shows that the result in Table 8 could indicate that Tanzanian firms might charge different prices even in homogeneous products, like coffee. In fact when the regression is restricted to Coffee and Tea (HS2 code 9), the result is positive (even though weakly significant). This preliminary result might highlight that countries with a comparative advantage in agricultural goods might still be able to improve the competitiveness of their products and increase the quality and value associated to them, even if they are classified as homogeneous goods. In fact, the 2009 Tanzania National Competitiveness Assessment reported that tea and coffee were two of Tanzania's most competitive exports in the 2003-2007 period.

An alternative explanation to the result that price differentiation is only significant for homogenous goods is that firms charge different mark-ups in different markets, rather than firms selling different qualities in different markets. A way to differentiate between "quality led" and "mark-up led" pricing-to-market would be to use an index of vertical differentiation, like the one built by Khandelwal (2010). The problem with this and other indices of vertical differentiation is that they do not include the products defined as homogenous by Rauch. As a consequence, further research is needed in order to establish whether price dispersion across destinations in homogenous goods is led by quality differences or different mark-ups.

Thirdly, Equation (3) takes into account how prices are linked to the characteristics of trade partners, namely: GDP, GDPpc, bilateral distance, and the remoteness index. This is calculated as $remoteness_d = \sum GDP_o * dist_{od}$ for year 2009. Nevertheless, results do not change drastically if the remoteness index is calculated for every year (the reason being that the index does not change much overtime). The specification includes firm-product and year fixed effects, and the errors are clustered at the firm-product level.

$$(3) \quad \log price_{fpdt} = \alpha + \beta * \log GDP_{dt} + \gamma * \log GDPpc_{dt} + \lambda * \log dist_d + \\ + \mu * \log remote_d + \delta_{fp} + \gamma_t + \varepsilon_{fp}$$

Tanzania's trade partners vary considerably in terms of wealth, market size and distance. The results in Table 9 show some differences compared to the findings of Manova and Zhang (2012). The most important difference is that GDP is not significant: Tanzanian firms do not systematically differentiate prices for the same product based on the size of the trade partner, and if they did, smaller markets would be served with higher prices (as in Baldwin and Harrigan (2011)). Nevertheless, wealth of and distance from partners, measured respectively as GDPpc and distance, are significant and positive in all columns, indicating that Tanzanian firms sell the same product at higher prices in richer and further destinations. Remoteness is not significant.

A possible explanation for the not significance of market size (GDP) is that Tanzanian firms might not have the ability to differentiate prices according to the size of partners because of limited production capacity. Theoretically, there is no consistency between the results in Table 9 and only one specific model: not significant GDP and remoteness could be consistent with both price and quality competition models, under the assumption of fixed mark-ups. Nevertheless fixed mark-ups could not explain why GDPpc and distance are positively correlated with price. The positive relationship between price and distance is consistent with Baldwin and Harrigan (2011): high quality/price goods are the most competitive; hence they can overcome distance-related trade costs, so that the average price of goods in further destinations tends to be higher. An alternative explanation is related to firms charging higher mark-ups, as in Berman et al (2012): when additive trade costs are high (which is the case when distance is high) a large share of the final consumer price does not depend on the export price, so the elasticity of the exporter's demand to a change in export price decreases with distance, allowing firms to charge higher mark-ups.

The positive relationship between GDPpc and price can also be explained by quality competition arguments, but only assuming variable mark-ups: since the regression includes firm-product fixed effects, it is implicit that a firm is exporting the same product to every destination, so variation in price associated to wealthier countries (and consumers) could be linked to different quality variants of the same product (or simply to strategic pricing). Wealthier countries are either served with the higher quality variation of the same product, or are charged higher mark-ups.

The positive relationship between market-share and prices control for the possibility that results are driven by firm's market power, but this is not the case, since the coefficient of GDPpc does not change drastically when this variable is included. Market share here is calculated as the share of the value of a firm's export of product p in destination d at time t over total exports of Tanzanian firms of product p to destination d in time t. So it represents the market share of the specific firm. The positive relationship is intuitive (firms with a higher market power can charge higher mark-ups), even though this measure does not provide a clear picture of the competition faced at the world level, but only at the domestic level.

Column (5) incorporates an additional covariate: the number of firm-product pairs exporting to each destination. Even though this variable is imperfect, it is a proxy for the degree of Tanzanian competition in each destination. The reason for including this variable is to explain that destinations where other Tanzanian exporters and products are already established might allow firms to charge higher prices because the destination already knows and likes the Tanzanian product. Moreover the "network effect" would allow firms to have better information about prices charged in the destination by other firms and be more confident in proposing their product as a good product (so charging higher prices). This is consistent with findings in the work of Cadot et al. (2011)[25]. An interesting result from Table 9 is that, when the number of firm-product pairs exporting to a destination is included, market share becomes not significant, while remoteness becomes significant and positive: a result which would be in line with both price and quality competition, under the assumption of variable mark-ups.

Lastly, when the sample is divided between differentiated and homogeneous goods (in columns (6) and (7)), price across destinations is differentiated by (some) country characteristics only for the latter group. In fact, for differentiated goods the gravity variables are not related to prices (in line with both quality and price competition models with constant mark-up), while in the case of homogeneous goods both wealth and distance are positively related to price (partially in line with both quality and price competition models with variable mark-up). This might strengthen the argument that price differentiation in Tanzania is mainly applicable to homogeneous - rather than differentiated - goods.

[25] They find that exporters of similar products to the same destination exert a positive externality on each other: a higher number of firms are related to a higher rate of survival, so there is no evidence that firms crowd each other out through price competition.

6. Concluding remarks

The analysis presented in this paper builds on the existing literature of heterogeneous firms. The primary objective of this paper is to observe how Tanzanian firms make their pricing decisions and to assess whether their behavior corresponds with price or quality competition models. The analysis undertaken draws from Manova and Zhang (2012), and the results corroborate most of these authors' findings. Specifically, firms setting a higher export price earn higher revenue and sell lower quantities within a destination for a given product: which is preliminary evidence favoring quality competition models. Moreover, exporters that supply multiple destinations seem to have higher price dispersion across importers, indicating that firms charge different prices if they serve multiple destinations. However, when the sample is reduced to homogeneous goods, the relationship between the number of destinations served and price's dispersion holds positive, while for differentiated goods it no longer holds. The exact opposite was true in Manova and Zhang (2012).

As a matter of fact, it is common to think that price dispersion is associated more with differentiated - rather than homogeneous - goods, because it relates to quality differentiation. Nevertheless, the quality argument does not have to be disregarded because it does not apply to differentiated goods. In fact, a country that exports mainly agricultural products, like Tanzania, might still be able to improve the quality and efficiency of its production. The case of TecnoServe – in Section 5 – explains that an agricultural good, such as coffee, is classified as homogeneous (according to the Rauch classification) even though its market is segmented and firms adapt its quality to different markets. Unfortunately the existing indices of vertical differentiation (which could help to establish whether price dispersion is really related to quality differentiation) are not built for "homogeneous" goods.

Even though further work is needed to establish whether price dispersion is led by quality differentiation or firms charging different mark-ups, it is interesting to find that even in an LDC like Tanzania multiple-destinations exporters are doing pricing to market. This is an important issue that should be researched in future work. In fact, even though it is a standard practice to treat agricultural commodities as homogeneous goods, these commodities are perceived by consumers as differentiable in quality. Allowing for the possibility that food products can be vertically differentiable amplify the spectrum of existing opportunities for developing countries to exploit product differentiation and market niches in countries where consumers are willing to pay more for products that satisfy specific quality dimensions.

Lastly, this study indicates that Tanzanian firms do not systematically differentiate prices for the same product based on the size of the trade partner. Nevertheless, Tanzanian exporters sell the same product at higher prices in richer and more distant destinations. These results cannot be explained by a single trade model of quality or price competition. This inconsistency call for future work on international trade models so as to incorporate quality differentiation both across firms and across trade partners within firms. Moreover, the inclusion of the number of firm-product pairs exporting to each destination - a proxy for the degree of Tanzanian competition in each destination- indicates that firms charge higher prices in destinations where more Tanzanian exporters and products are established. This "network effect" is significant, and consistent with findings in the work of Cadot et al. (2011).

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APPENDIX I: FIGURES

Figure 1: Trade Growth 2001-2008

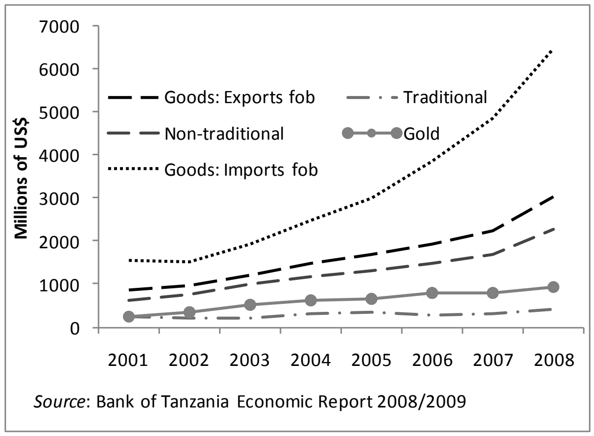
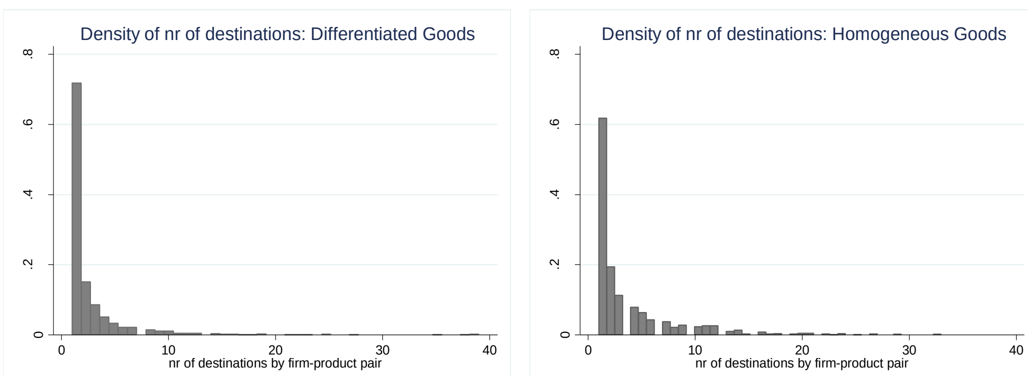


Figure 2: Number of destinations by firm-product: DIFF (left) versus HOM (right) Goods



APPENDIX II: TABLES

Table 1: Summary of model prediction

	fob export price							
	Across firms in a destination		Across destinations within a firm					
	Export Revenue	Export Quantity	Export Revenue	Export Quantity	GDP	GDP per capita	Distance	Remoteness
Price Competition, constant mark-up	-	-	0	0	0	0	0	0
Price Competition, variable mark-up	-	-	+/-	-	-	+/-	-	+
Quality Competition, constant mark-up	+	-	0	0	0	0	0	0
Quality Competition, variable mark-up	+	-	+/-	-	-	+/-	-	+
Results M&Z for China	+	-	+	-	+	+	+	-
Results Rollo for Tanzania	+	-	+	-	0/-	+	+	0/+

Source: Baldwin and Harrigan (2011) and Manova and Zhang (2012)
Note: Each entry reports the effect of an increase in export revenue, export quantity, GDP, etc on the fob export price, both across firms in a destination (firs two columns) and across destinations within a firm (last six columns).

Table 2: Top Exports (2003-2009)

2003				2009			
710812	Gold Non-monetary	EU25	17.5	710812	Gold Non-monetary	Switzerland	11.3
30410	Fresh or chilled Fish fillets/meat	EU25	3.0	261690	Precious-metal ores	China	8.6
261690	Precious-metal ores	Japan	2.7	710813	Gold semi-manufactured	South Africa	2.8
90111	Coffee, not roasted	EU25	2.2	90111	Coffee, not roasted	EU25	1.9
30420	Frozen Fish fillets	EU25	1.9	240120	Tobacco	EU25	1.6
80131	Cashew nuts	India	1.8	520100	Cotton, not carded or combed	India	1.5
520100	Cotton, not carded or combed	India	1.8	80131	Cashew nuts	India	1.2
710813	Gold semi-manufactured	EU25	1.8	90240	Other black tea (fermented)	Kenya	1.1
240120	Tobacco	EU25	1.5	120740	Sesamum seeds	China	1.1
710239	Diamonds Non-industrial	EU25	1.1	30420	Frozen Fish fillets	EU25	1.0
			35.2				32.1

Note: numbers in column represent percentage of TZA exports of product to world over total TZA exports to world, while the country represents the main export destination for that product.
Source: Comtrade data (Gross Exports HS1996) extracted from WITS.

Table 3: TOP Destinations (2003-2009)

2003		2006		2009	
EU25 (UK)	28.4	EU25 (Germany)	10.7	Switzerland	10.1
EAC 5 countries (Kenya)	4.1	Switzerland	9.7	EU25 (Netherlands)	8.3
Japan	3.9	South Africa	7.4	China	6.7
India	3.2	EAC 5 countries (Kenya)	5.2	EAC 5 countries (Kenya)	4.8
South Africa	1.6	China	4.0	South Africa	3.2
Zambia	0.8	Japan	2.2	India	3.2
United Arab Emirates	0.7	India	1.7	Japan	3.1
Singapore	0.6	Congo, Dem. Rep.	1.6	United Arab Emirates	1.6
Switzerland	0.6	United Arab Emirates	1.3	Congo, Dem. Rep.	1.5
Congo, Dem. Rep.	0.5	Zambia	0.8	United States	0.8
	44.4		44.7		43.3

Note: numbers in column represent percentage of exports to partner over total exports to world.

Source: Comtrade data (Gross Exports HS1996) extracted from WITS.

Table 4: Descriptive statistics

Years	Firms	Products	Destinations	Products by firm		Destinations by firm		Firms by product		Firms by destination	
				mean	median	mean	median	mean	median	mean	Median
2003	887	1358	137	4.1	2	3.4	2	2.7	1	22.1	5
2004	1005	1444	132	4.1	2	3.1	2	2.9	1	23.8	5
2005	1238	1556	133	3.7	2	2.9	1	2.9	1	26.6	6
2006	1359	1680	135	3.6	1	2.5	1	2.9	1	25.0	7
2007	1542	1880	136	3.6	1	2.5	1	3.0	2	27.8	7
2008	1723	1917	137	3.9	2	2.3	1	3.5	2	29.0	5
2009	1817	2000	139	3.9	2	2.3	1	3.6	2	29.6	7

Note: This is similar to the description in Cadot et al (2011), with the difference that here all available years are included.

Table 5: Variation in export prices

Variable	Nr of Obs	Mean	Std.Dev.	Min	Max
log(price)	55148	0.7	2.4	-17.7	13.8
sd(price) across destinations within firm-product pairs	7276	0.8	0.9	0.0	8.4
sd(price) across firms within product-destination pairs	8147	0.9	1.0	0.0	9.2

Table 6: Types of products exported

	Unique products		All observations	
Product	Frequency	Percent	Frequency	Percent
Homogeneous	1315	37.13	22966	44.96
Differentiated	2227	62.87	28117	55.04
Total	3542	100	51083	100

Table 7

Dependent variable: log(export price) by firm product destination year

Variation Across Firms

Within product-destination

VARIABLES	(1)	(2)	(3)	(4)
log(revenue by fpd)	0.219***		0.153***	0.150***
	(0.000)		(0.000)	(0.000)
log(quantity by fpd)		-0.273***		
		(0.000)		
log(revenue by fpd)*Diff			0.079***	
			(0.000)	
log(revenue by fpd)*log(GDPpc)				0.010**
				(0.025)
Constant	-1.243***	2.631***	-1.268***	-1.274***
	(0.000)	(0.000)	(0.000)	(0.000)
Product-Destination FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Observations	54047	54047	50325	53092
R-squared	0.762	0.779	0.777	0.760
p-d cluster	18764	18764	18001	18221

Robust p-values in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 8

Dependent variable: sd(log(price)) across destinations within a firm product pair

Variation Across Firms

Within product

VARIABLES	(1)	(2)	(3)	(4)	(5)
	ALL	ALL	HOM	DIFF	Coffee &Tea
log(nr dest by fp)	0.116***	0.079***	0.066***	0.025	0.143*
	(0.000)	(0.002)	(0.009)	(0.427)	(0.095)
log(nr dest by fp)*Diff		-0.064*			
		(0.097)			
Constant	0.637***	0.622***	0.500***	0.753***	0.323
	(0.000)	(0.000)	(0.000)	(0.000)	(0.135)
Product FE	Y	Y	Y	Y	f_p
Year FE	Y	Y	Y	Y	Y
Observations	7139	6532	3264	3268	319
R-squared	0.367	0.287	0.301	0.263	0.643
f-p cluster	3775	3474	1661	1826	120

Robust p-values in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 9

Dependent variable: log(price) by firm product destination year

Variation Across Destinations

Within firm-product pairs

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)
						DIFF	HOM
log(GDP)	-0.009	-0.012	0.001	-0.002	-0.015	0.003	-0.022
	(0.289)	(0.191)	(0.896)	(0.836)	(0.154)	(0.863)	(0.125)
log(GDPpc)	0.045***	0.038***	0.041***	0.034***	0.039***	0.005	0.050***
	(0.002)	(0.001)	(0.005)	(0.006)	(0.001)	(0.815)	(0.000)
log(distance)	0.081***	0.078**	0.064**	0.061*	0.093***	0.042	0.170***
	(0.009)	(0.012)	(0.042)	(0.053)	(0.004)	(0.348)	(0.000)
log(remoteness)		-0.151		-0.159	0.030**	-0.124	-0.069
		(0.147)		(0.116)	(0.020)	(0.246)	(0.307)
market share			0.194***	0.196***	-0.160	0.253***	0.173***
			(0.000)	(0.000)	(0.115)	(0.000)	(0.000)
log(nr of f-p per dest)					0.219***	0.019	0.033*
					(0.000)	(0.336)	(0.068)
Constant	-0.248	5.988	-0.446**	6.130	5.995	4.999	1.115
	(0.291)	(0.177)	(0.048)	(0.155)	(0.160)	(0.255)	(0.691)
Firm-Product FE	Y	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y	Y
Observations	53084	53084	53084	53084	53084	27373	22091
R-squared	0.854	0.854	0.855	0.855	0.855	0.869	0.869
p cluster	3675	3675	3675	3675	3675	2335	1445

Robust p-values in parentheses

*** p<0.01, ** p<0.05, * p<0.1