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Determinants of Export Pricing at the Firm-Level: Evidence from Egypt

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Abstract

The study explains the export pricing behaviour of Egyptian firms using detailed customs data. Firstly, it finds that more productive firms (as proxied by their importation of intermediate inputs and capital goods) charge higher export prices, which are correlated with higher revenues. This provides evidence of competition in quality, rather than price, amongst firms. Secondly, firms with more destination markets charge a higher price, on average, for their exported products and a wider price range across markets. Thirdly, firms charge higher prices for more distant and richer markets, whereas they charge lower prices for larger and more remote ones, with the effect of significant remoteness being confined to the richer subset of markets. This could be explained by variable mark-ups across destination markets, where higher mark-ups are set for more distant, richer, smaller (less competitive), and more central markets. It could also indicate that higher quality products are sent to more distant markets (Alchian-Allen or selection effects) and richer ones (demand effect). Lastly, firms charge higher prices in markets where there is a larger prevalence of technical measures or in those that impose specific, restrictive measures, reflecting a potentially adverse effect of these measures on a number of exporters, allowing the most successful firms to charge higher mark-ups. Alternatively, this could arise from firms upgrading quality, in compliance with such measures.

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Introduction

The proliferation of firm-level data has given rise to numerous studies into the behaviour of exporting firms. These studies have reached important findings related to the probability of exporting and the characteristics of exporting vs non-exporting firms. More specifically, they documented that the more productive firms have a higher probability of exporting, and that exporters tend to be larger in size, pay larger wages, and are more capital and skill intensive (Bernard et al, 2012). Empirical literature, using firm-level data, emphasising firm heterogeneity - as pioneered by Melitz (2003) – to a large extent has replaced the traditional approach of focusing on product-level trade data.

While most empirical studies examined the export decisions of firms at either the extensive margin (entry into and exit from markets/products) or the intensive margin (volume/value of exports), fewer studies have tackled the export pricing behaviour of firms. Analysing pricing behaviour both across firms and across markets is needed to better understand the price dispersion across firms, as well as the driving forces behind the difference between firm-product prices across destination markets.

The importance of this study lies in the presence of competing models for the behaviour of heterogeneous firms. For example, whilst price competition models predict a negative association between prices set by firms and their earned revenues, quality competition models predict the opposite. Also, models differ in their assumptions for firms' the pricing behaviour of firms across market destinations, where some assume constant mark-ups set by firms across markets, regardless of their characteristics, and others assume variable mark-ups.

Moreover, empirical literature does not always report consistent findings for the determinants of export prices within a firm. Whilst in most studies, the distance and income of the destination country usually exert a positive effect on firm prices (as in Bastos and Silva (2010); Gorg, Halpern, and Murakozy (2017); and Chen and Juvenal (2020)), the size of the market and its overall remoteness have mixed effects (as in Martin (2012); Manova and Zhang (2012) and Rollo (2012)). Similarly, whilst some studies conclude that firms compete on price, as in Anderson et al. (2019), others go head-to-head with their competition over quality, as in Rollo (2012). This renders the analysis country specific.

Given that export pricing studies are particularly scarce for the MENA region, this study empirically examines the determinants of the exporting prices of firms in Egypt by employing their customs data at the destination market and the HS 6-digit product levels. In doing so, it examines whether the behaviour of Egyptian exporting firms corresponds to price or quality competition models and explores how firms adjust their prices according to the characteristics of destination markets, such as distance, size, income, overall remoteness, and tariffs. It additionally studies the impact of technical measures as the most prevalent non-tariff measure, a factor largely ignored in previous empirical studies on the in-firm variation of export prices across destination markets.

The study finds evidence of quality competition amongst exporting firms in Egypt, as reflected in the positive association between firms' export prices and their revenues. Firms with a larger number of destinations markets are found to be more engaged in price discrimination across destinations. Also, firms charge higher prices for more distant, richer, and more technically restrictive markets, whereas they charge lower prices for larger and remote ones. These effects are indicative of variable mark-ups or quality differentiation by firms across destinations.

The study is organised as follows: Section 2 reviews the theoretical and empirical literature on export pricing. Section 3 describes the data and the methodology and offers some descriptive statistics. Section 4 presents the empirical results. Section 5 provides the conclusion.

Literature Review

Theoretical Background

Models tacking firm export prices can be classified according to two main dimensions: whether firms are sorted based on efficiency or quality (i.e. efficiency or quality sorting), and whether they face a constant elasticity of substitution (CES) or a linear demand.

According to efficiency sorting models, there is no quality differentiation across firms; where all firms are assumed to use identical inputs to produce symmetric outputs, but more productive firms have lower marginal costs. On the other hand, quality sorting models allow firms to select the quality of their outputs by choosing the quality of their inputs. We can also refer to the former as "price competition models" and the latter as "quality competition models" (Rollo, 2012).

The assumed demand type facing firms indicates whether firms would optimally charge a constant or a variable mark-up over variable costs across destination markets. Whilst CES demand implies constant mark-ups, a linear demand implies that firms charge mark-ups which vary according to the degree of the competition faced in each market.

Table 1 summarises the predictions of different models regarding export pricing behaviour, both across firms and across destination markets.

Table 1: Theoretical Predictions on Firm Export Pricing Behaviour

Export price						
		Across firms in a destination market	**Across destination markets within a firm**			
Nature of firm heterogeneity	Examples of studies	Export revenue	Distance	Market size	Income	Remoteness
Price Competition, CES demand	Melitz (2003)	-	0	0	0	0
Price Competition, linear demand	Melitz and Ottaviano (2008)	-	-	-	+/-	+
Quality Competition, CES demand	Johnson (2007), Baldwin and Harrigan (2011), Kugler and Verhoogen (2011)	+	0	0	0	0
Quality Competition, linear demand	Kneller and Yu (2008), Antoniades (2008)	+	-	-	+/-	+

Source: Manova and Zhang (2012)

Note: The table shows the predicted sign of a correlation between export revenue and the export price across firms in a destination market (third column); and between distance, market size, income, or remoteness and the export price across destinations within a firm (last four columns). 0 is no effect, + is positive effect and – is negative effect.

As Table 1 indicates, the pioneering heterogeneous-firm model of Melitz (2003) is based on the efficiency sorting of firms facing a CES demand. According to this model, more productive firms have lower marginal costs, charge lower prices, sell higher quantities, and earn larger revenues. This gives rise to a negative correlation between free-on-board (FOB) export prices and export revenues across firms selling the same goods in a given destination market in efficiency sorting models.

By contrast, in a quality-augmented model, such as that of Kugler and Verhoogen (2011), more productive firms optimally use more expensive, higher-quality inputs to produce higher-quality goods, thus having higher marginal costs and charging higher prices. This implies the presence of a positive correlation between export prices and export revenues across firms in a given destination market in quality sorting models.

With CES demand, whether in models of efficiency or quality sorting, firms optimally set a constant mark-up over variable cost in each market. Therefore, firms do not vary their prices with destination market characteristics such as distance, size, income, or remoteness. This explains the zero entries in the table. On the other hand, with linear demand (non-constant price elasticity of residual demand), whether in efficiency sorting models, such as Melitz and Ottaviano (2008), or quality sorting ones, such as Kneller and Yu (2008), variable mark-ups are optimally set by firms based on the extent of competition in a market. Specifically, firms would optimally charge lower mark-ups and lower prices for the same product in destination markets with tougher competition i.e. in larger and more distant destinations[2]. Larger markets attract a bigger number of competitors and distant markets are served by relatively more productive firms which set lower prices, resulting in lower mark-ups in these markets. Conversely, firms would charge higher mark-ups and higher prices in more remote (less central) destination markets which are generally characterised by a high aggregate price index. The effect of destination market income on firm export prices is theoretically ambiguous - given that linear demand preferences are non-homothetic (Manova and Zhang, 2012).

Models that examined the effect of tariffs (as an *ad-valorem* trade cost) on FOB export prices across destination markets have reached different results. Some of them predict that tariffs would reduce mark-ups and prices, as in Martin (2010) and Chen and Juvenal (2020). Their predictions are driven by the inclusion of both per unit and *ad-valorem* trade costs in the model that generates an elasticity of demand to the FOB price depending upon trade costs. Specifically, the demand faced by exporters in countries with higher *ad-valorem* costs (tariffs) is more elastic to changes in the FOB price. Therefore, firms are expected to reduce their prices to compensate for the lower demand they face due to higher tariffs[3]. Conversely, tariffs are predicted to increase prices, as in Baldwin and Harrigan (2011). This is based on a pure selection effect which occurs within firms amongst products, driven by the presence of fixed costs paid by multi-product firms for each of their products. Accordingly, only the most competitive high-quality varieties are sold in more challenging (higher tariff) markets, which increase unit values in these markets.

[2] This negative effect of distance on firm export price is challenged in many empirical studies (section 2.2).

[3] Tariffs raise the Cost, Insurance, and Freight (CIF) price which, in turn, lowers foreign demand.

Empirical Literature

A number of studies empirically examined the determinants of firm export pricing across destination markets, a larger share of which explored firm behaviour in developed countries.

Studies of developed country firms include the ones of Bastos and Silva (2010) for Portugal; Martin (2012) for France; Harrigan, Ma, and Shlychkov (2015) for the United States; Gorg, Halpern, and Murakozy (2017) for Hungary; de Lucio et al. (2018) for Spain; Anyfantaki et al. (2019) for Greece; and Statec (2019) for Luxembourg.

Bastos and Silva (2010) used Portuguese cross-sectional firm-level data on exports by product and destination market for 2005. They found that firm-product FOB unit values increase with the distance of the destination country (with an elasticity of 0.05) and tend to be higher for shipments to richer countries. Their study confirms the presence of within-firm variation of unit values across destination markets, where the positive effect of distance suggests that high-quality firms charging higher prices are more able to serve difficult (more distant) markets in line with Baldwin and Harrigan (2011). Similarly, Martin (2012) found a positive relation between firm FOB export prices and destination market distance, using cross-sectional data for French firms in 2003, where doubling of the distance implies a 3.5% increase in the FOB price charged by firms. Moreover, firm prices are found to be more responsive to changes in distance within more differentiated sectors; where firms have more room to adjust their mark-ups or quality across destination market countries. A positive effect of destination market income on prices and an insignificant effect of market size (as measured by the destination market's GDP) are also reached. Using firm-level data for the U.S. in 2002, Harrigan, Ma, and Shlychkov (2015) found that distance exerts a positive effect on firm export prices, though at a higher estimated elasticity of 0.199. They explained their finding in terms of the Alchian–Allen effect (1964) - also called composition effect- as in Hummels and Skiba (2004): in the presence of per-unit transport costs, higher quality goods will be relatively less expensive for larger distances, so demand will shift towards higher priced goods in more distant markets. They also found a statistically significant negative effect of market size on firm export prices, which is consistent with greater price competition in larger markets and is in line with the predictions of Melitz and Ottaviano (2008). Looking across firms, they found that within product–destination market categories, firms that are more productive and skill-intensive charge higher prices. This suggests the existence of quality competition rather than price competition, with productive firms producing higher quality varieties, incurring higher costs, thus charging higher prices.

Whilst the previously reviewed studies used cross-sectional data, Gorg, Halpern, and Murakozy (2017) used panel data for Hungarian firm export prices from 1998-2003. They reached the same conclusion, of a positive effect of distance on export price consistent with the Alchian–Allen effect, or with an optimally set higher mark-up by firms covering more distant markets. Their estimated distance elasticity of 0.05 is similar to the ones reported by Bastos and Silva (2010) and Martin (2012), which implies that firms in different European countries behave similarly in their export pricing. Their results also indicate a negative effect of market size on firm prices (competition effect) and a positive effect of destination market income, which could be attributed to a higher demand for quality in richer markets, or from price discrimination by firms, due to the lower price elasticity of higher-income consumers. Additionally, tariffs exhibit a significantly negative effect on firm prices, suggesting the presence of variable mark-ups across destination markets. Similar results for distance, destination market income and destination market size are also found by de Lucio et al. (2019) using panel data for Spanish firm export prices from 2010-2014, suggesting that firms adjust the quality of their products according to destination market characteristics. However, data on Greece exporters from 2003-2015, employed by Anyfantaki et al. (2019), reveals that neither distance nor destination market size has a significant impact on firm pricing. Meanwhile, firms set higher prices in richer and more remote destination markets, which is indicative of variable mark-ups or quality differentiation within firm-product pairs.

Focusing on firm mark-ups and how they vary across destination markets, Statec (2019) estimated an export demand specification using firm-product–country data from Luxembourg from 2000-2011. In line with the predictions of Melitz and Ottaviano (2008) on the effect of market size, he found that mark-ups for products exported to larger-sized destination markets are significantly lower, whereas they are higher for exports to distant countries.

On the other hand, fewer studies were conducted on firms in developing countries. They include those of Manova and Zhang (2012) for China; Rollo (2012) for Tanzania; Anderson et al. (2019) for India; and Chen and Juvenal 2020) for Argentina.

A detailed study on the export pricing of Chinese firms for 2005 was provided by Manova and Zhang (2012). Amongst the key findings is that firms selling a given product charge higher prices in more distant, richer, larger, and less remote countries, where the distance elasticity is nearly 0.01, which is lower than those estimated in studies for European countries and the US. Across firms selling a given product, exporters that charge higher prices earn greater revenues in each destination market, whilst exporters with more destination markets offer a wider range of export prices. Their results indicate that firms vary the quality of their products across destination markets. Following a similar methodology to Manova and Zhang (2012), Rollo (2012) investigated export prices for Tanzanian exporters from 2003-2009 and also found that exporters setting a higher export price earn greater revenue in a given product-destination, whilst those who supply multiple destinations have a higher price dispersion across destination markets. Within firm-product pairs, prices are higher for more distant and richer destination markets. However, differently from Manova and Zhang (2012), destination market size and remoteness do not have significant effects.

In contrast to findings for exporters in other countries, including other developing countries, Anderson et al. (2019) found that Indian firm export prices from 2000–2003 are negatively associated with distance to the destination market and positively associated with remoteness, and that more productive firms charge lower prices. Their results suggest that Indian exporters engage in little quality upgrading in response to improvements in productivity, which they attributed to a higher cost of innovation in India, as compared to China.

A more recent study by Chen and Juvenal (2020) differentiated between the effects of per unit trade costs (distance) and ad valorem costs (tariffs). Their approach differed from previous studies by focussing on firm prices for one single product (wine), employing data for Argentinean firms from 2002-2009. According to their model, firms compensate for the lower demand they face due to higher trade costs by responding differently, based on the type of cost. Specifically, they found that firms raise their mark-ups and prices in more distant markets but lower them in high-tariff countries. This is because demand in more distant markets is less elastic to changes in the FOB price, whilst it is more elastic to changes in the FOB price in higher-tariff countries.

In summary, empirical studies, whether on developed or developing countries, have reached mixed results for the effect of different destination market characteristics on firm export pricing of a given product. Most of them, however, documented a positive effect of distance and destination market income, though with varying estimated elasticities. This suggests either a higher offered quality or a higher mark-up set for more distant and richer destination markets. On the other hand, tariffs usually exhibited a negative effect on prices due to lower mark-ups set by firms exporting to higher-tariff countries. Similarly, studies reached different conclusions when examining whether firms engage in price competition or quality competition. For example, whilst quality competition was evident for Chinese firms, it was lacking for Indian ones. This means that the export pricing behaviour of firms is largely country specific.

Data, Methodology and Descriptive Statistics

Data

The study relies on firm-level customs data for Egypt at the HS 6-digit and destination levels, provided by the General Organisation for Export and Import Control (GOEIC), Ministry of Trade and Industry. Export prices are computed as the ratio of export value to export quantity (i.e. unit values) for a given firm-product-destination-year. Data is subject to a number of cleaning procedures, as explained below.

To focus on persistent export flows, products which represent less than 1 percent of the firm's export revenues over the entire study period, as well as export values below $500, are removed. Also, a firm-product combination that appears only once is dropped. As indicated by Békés and Muraközy (2012), small and temporary exports behave differently from large and permanent ones, so it is best to analyse them separately.

Although export data is available for the period 2005-2016, we begin the analysis from 2009; since at that time data became more consistent, in terms of the reported quantity unit for each HS 6-digit product[4]. However, some products (constituting about 12% of total exports) still have more than one unit, so are excluded from the analysis. Also, mineral products (HS 25-27)

[4] To be able to compare product-level export quantities and hence, prices, whether across or within firms, each product should be associated with a single quantity unit. For the period 2005-2016, the share of HS 6-digit products with a single reported quantity unit is about 58% of the total number of products, whereas this share rises significantly to about 92% when the analysis is restricted to the period 2009-2016.

are commonly disregarded, since they are subject to large and sudden fluctuations in their international prices.

Since data may be subject to some errors in reporting and in order to deal with outliers, we follow Crucini, Telmer, and Zachariadis (2005) and drop observations for which the unit value is five times higher or lower than the median unit value set by a firm-product on its different markets[5]. A similar trimming procedure was also adopted by Méjean and Schwellnus (2009) and Martin (2012).

Gravity-type variables representing destination characteristics are obtained as follows: GDP and GDP per capita, PPP (constant 2011 $) are from the World Bank's World Development Indicators. Bilateral distances from Egypt are from Centre d'Études Prospectives et d'Informations Internationales (CEPII). Remoteness of destination d is measured as a weighted average of a country's bilateral distance to all other countries in the world, using countries' GDP as weights: $remoteness_d = \sum_o GDP_o \, . distance_{od}$, where GDP_o is the GDP of origin country o, $distance_{od}$ is the distance between o and d, and the summation is over all countries in the world o. Tariffs are effectively applied rates per HS 6-digit product and destination market country, as obtained from TRAINS.

Methodology

First, to investigate the behaviour of export prices across firms, we estimate the following equation:

$$\log(price_{fpdt}) = \alpha + \beta \log(revenue_{fpdt}) + \delta_{pdt} + \epsilon_{fpdt} \quad (1)$$

Where f denotes firm, p product, d destination, t year and δ_{pdt} is fixed effects at the product-destination-year level, which allow for factors such as transportation costs, tariffs, and demand conditions that affect firms in a given product-destination-year. Errors are clustered by firm-year.

The sign of β reflects the direction of the correlation between export prices and revenues across firms within a product-destination-year. As noted by Manova and Zhang (2012), β here does not have a causal interpretation because firm prices and revenues are both affected by unobserved firm characteristics and are the joint outcome of firm profit maximisation. Nevertheless, it provides evidence on whether firms engage in price or quality competition.

Equation (1) is also augmented to examine the effect of firms' importation of intermediate inputs or capital goods from abroad on their export prices[6].

[5] This leads to a dropping of 2624 observations (less than 1% of total observations).

[6] The dataset for importing firms in Egypt is also provided by the General Organisation for Export and Import Control (GOEIC), Ministry of Trade and Industry. It is merged with the one for exporting firms through the Trader ID.

Second, to investigate the relationship between firm export prices and the number of export destination markets, we estimate the following two equations:

$$\log(price_{fpt}) = \alpha + \beta \log(number\ of\ destinations_{fpt}) + \delta_{pt} + \epsilon_{fpt} \quad (2)$$

$$sd_{fpt} \log(price_{fpdt}) = \alpha + \beta \log(number\ of\ destinations_{fpt}) + \delta_{pt} + \epsilon_{fpt} \quad (3)$$

where equation (2) examines the correlation between the number of destination markets at the firm-product-year level and firm f's average export price for product p at time t, whilst equation (3) examines its correlation with the firm's price dispersion, measured as the standard deviation of log export prices across destination markets within a firm-product-year. δ_{pt} is product-year fixed effects. Errors are clustered by firm-year.

Third, to investigate the behaviour of export prices within firms across destination markets, we estimate the following equation:

$$\log(price_{fpdt}) = \alpha + \beta \log(distance_d) + \gamma \log(GDP_{dt}) + \lambda \log(GDPpc_{dt}) + \mu \log(remoteness_{dt}) + \theta \log(tariff_{pdt}) + \delta_{fpt} + \epsilon_{fpdt} \quad (4)$$[7]

δ_{fpt} is firm-product-year fixed effects. This allows the coefficients to capture the variation in export prices across destination markets for a given firm-product-year. Errors are clustered by destination-year[8].

Equation (4) can also be augmented to examine the effect of the presence of restrictive technical regulations in a destination-product-year (as indicated by TBTs specific trade concerns) on firm export prices. Technical measures are considered as the most frequently used form of non-tariff measures (NTMs), where they affect about 30% of products and trade values. Their large incidence reflects, in part, a response of governments to legitimate concerns such as human health, food safety, and environmental protection (UNCTAD, 2013). Meanwhile, their effect on within firm-product prices across destination markets was not examined in previous studies.

In all regressions, we examine how effects change based on the degree of differentiation of a product, where Rauch (1999) classification is used to indicate whether a good is homogeneous or differentiated[9]. More differentiated industries are expected to be more subject to quality variation or mark-up adjustment by exporting firms.

Intermediate inputs and capital goods are identified using BEC classification, where they correspond with the following BEC categories: 41, 521, 111, 121, 21, 22, 31, 322, 42 and 53. Corresponding HS product codes are determined through the HS-BEC concordance table, available through World Integrated Trade Solution (WITS).

7 Remoteness variable is not strongly correlated with other explanatory variables. The correlation coefficient between distance and remoteness equals 0.3. Generally, correlations among explanatory variables are of no concern, the highest of which is between real GDP and real GDP per capita (r=0.46).

8 In all equations, robust standard errors or alternative clustering can be employed. Obtained empirical results are not qualitatively affected by the clustering procedure.

9 Rauch classification can be accessed through: https://econweb.ucsd.edu/~jrauch/rauch_classification.html

Descriptive Statistics

After data cleansing and dropping outliers, as explained in section 3.1, data from 2009-2016 consists of 286,416 observations at the firm-product-destination-year level. Table 2 provides some summary statistics (averages) for the number of exporting firms, firm export value, number of destination markets, and number of products for Egypt over the study period.

Table 2: Summary Statistics for Exporting Firms in Egypt, 2009-2016

Average number of firmms per year	5155.88
Average export value per firm-year (in million USD)	3.08
Average number of destination markets per year	179
Average number of destination markets per firm-year	4.38
Average number of products (HS 6-digit) per year	1522.25
Average number of products (HS 6-digit) per firm-year	2.52

Source: Own calculations

As Table 2 indicates, from 2009-2016, there is an average of 5155.88 firms exporting 1522.25 HS6 products to 179 destination markets, at an average value of 3.08 million USD per firm-year. On average, each firm exports 2.52 HS6 products to 4.38 destination markets.

To deconstruct the variance for log firm export prices, product means should be first removed, so that price variation becomes comparable across products measured in different quantity units (Harrigan, Ma, and Shlychkov, 2015). In doing so, we find that the standard deviation of log export prices within product-year is 0.84. The difference between log prices at the 90th and 10th percentiles of the distribution is 1.67, which means that the prices at the 90th percentile are a factor of 5 higher than prices at the 10th percentile (e^1.67=5). Instead, on removing firm-product means from log export prices, so that only variation across destination markets within firm-product-year is examined, we find that the standard deviation is 0.43. The difference between log prices at the 90th and 10th percentiles of the distribution is 0.68, which means that the prices at the 90th percentile are a factor of 2 higher than prices at the 10th percentile (e^0.68=2). These statistics imply that a larger variation in product-level prices occurs due to variation in prices set by different firms for a product (i.e. variation between firms), rather than variation in prices set by a given firm-product across destination markets (i.e. variation within firms). However, there is still much within firm-product price variation across destination markets (a 90th-10th percentile price ratio of 2).

To obtain initial evidence on destination market characteristics that potentially affect firm-product export prices, country fixed effects are first estimated. This is done by regressing log firm prices on both country fixed effects and firm-product-year fixed effects. A large country fixed effect means that a firm - on average - charges a higher price to this country than to other export destinations. Next, these country fixed effects are regressed on log distance or on log distance and log GDP per capita. The results indicate a positive relationship between estimated fixed effects and distance (correlation=0.59), where distance alone explains a considerable 34% of country fixed effects, and distance together with GDP per capita explains 47%[10]. This means that distance (followed by destination market income) stands as a main destination determinant of firm-product export prices.

Empirical Results

We begin by examining the determinants of export prices across firms within a given product-destination-year. Table 3 indicates a positive and significant correlation between a firm's export price and its revenues within a product-destination-year. This means that firms setting a higher export price earn greater revenues within a destination market for a given product, providing evidence for the existence between firms of quality competition, rather than mere price competition. This means that more productive firms produce more expensive, higher-quality products and, therefore, enjoy better export performance in terms of higher earned revenues[11]. In column 2, the interaction between revenue and good differentiability (measured by a dummy that equals to one if the good is differentiated and zero if it is homogeneous, according to Rauch classification) is positive and significant. Therefore, the positive relation between price and revenue becomes stronger for goods with a greater scope of differentiation/ quality upgrading, providing further evidence of quality selection by firms. These results are in line with those of Manova and Zhang (2012) and Rollo (2012). The interaction between revenue and the destination country's income (measured by its real GDP per capita) is, however, insignificant (column 3). Column 4 further examines the effect of a firm's importing status on its export price. The former is captured by a dummy that equals one if the exporting firm is importing intermediate inputs or capital goods from abroad[12]. The positively significant coefficient of importing status indicates that firms which import intermediate or capital goods tend to charge higher export prices, which can be attributed to the higher productivity of these firms and the greater quality of their products,

[10] Adding destination market GDP and remoteness - both show a negative effect on prices - increases R^2 to 0.53.

[11] Price competition (efficiency sorting) models, such as Melitz (2003) or Melitz and Ottaviano (2008), would conversely expect a negative correlation between price and revenue, where more productive firms (with lower marginal costs) charge lower prices to sell more units and earn higher revenues (Refer to Table 1).

as compared to the non-importers[13]. This result again confirms quality competition between firms; where more productive firms optimally use more expensive, higher-quality imported inputs to produce higher-quality goods, thus they incur higher marginal costs and charge higher export prices.

Table 3: Variation of Export Prices across Firms Within Product-Destination-Year

	(1)	(2)	(3)	(4)
	Ln Export Price per firm-product-destination-year (Variation across firms within product-destination-year)			
Ln revenue $_{fpdt}$	0.0894***	0.0627***	0.0688***	0.0561***
	(0.00204)	(0.00198)	(0.0179)	(0.00199)
Ln revenue $_{fpdt}$ * differentiated good		0.0532***		0.0536***
		(0.00371)		(0.00369)
Ln revenue $_{fpdt}$ * Ln real GDP per capita			0.00211	
			(0.00175)	
Importer of intermediate/capital goods				0.146***
				(0.00939)
Observations	215,397	209,088	209,341	209,088
R-squared	0.855	0.857	0.855	0.858
Product-Destination-Year Fixed Effects	Yes	Yes	Yes	Yes
Estimation Method	OLS	OLS	OLS	OLS

Robust standard errors in parentheses, clustered by firm-year
*** p<0.01, ** p<0.05, * p<0.1

Next, we examine the effect of the number of export destinations on firm-product-year average export price (Table 4) and on price dispersion across destination markets (Table 5). Table 4 indicates that firms which serve more export destinations charge a higher average export price. This effect is more pronounced for products with a potential for quality differentiation (column 2). Moreover, Table 5 indicates that firms serving more export destinations have higher price dispersion across destination markets, i.e. they offer a wider range of prices. However, the dispersion effect of the higher number of destination markets does not seem to vary significantly based on the type of goods being exported (homogeneous/ differentiated, column 2). This result differs from those of Manova and Zhang (2012) who found higher price dispersion for differentiated goods in China and Rollo (2012), who conversely found a higher dispersion for homogeneous goods in Tanzania.

[13] The positive link between firm productivity and its importation of intermediate inputs is established in previous studies, as in Gopinath and Neiman (2014).

Table 4: Number of Export Destinations and Average Firm-Product-Year Export Price

	(1)	(2)
	Ln Average Export Price per firm-product-year	
Ln num. of destination markets $_{fpt}$	0.133***	0.104***
	(0.00493)	(0.00497)
Ln num. of destination markets $_{fpt}$* differentiated goods		0.0415***
		(0.00900)
Observations	283,534	273,671
R-squared	0.834	0.838
Product-Year Fixed Effects	Yes	Yes
Estimation Method	OLS	OLS

Robust standard errors in parentheses, clustered by firm-year
*** p<0.01, ** p<0.05, * p<0.1

Table 5: Number of Export Destinations and Firm-Product-Year Price Dispersion across Destinations

	(1)	(2)
	St. Dev. of ln Export Prices across destination markets within a firm-product-year	
Ln num. of destination markets $_{fpt}$	0.0180***	0.0217***
	(0.00280)	(0.00362)
Ln num. of destination markets $_{fpt}$* differentiated goods		-0.00750
		(0.00553)
Observations	231,905	223,836
R-squared	0.419	0.417
Product-Year Fixed Effects	Yes	Yes
Estimation Method	OLS	OLS

Robust standard errors in parentheses, clustered by firm-year
*** p<0.01, ** p<0.05, * p<0.1

We then turn to export pricing within - rather than across - firms. Table 6 presents the effect of different destination market characteristics on firm export prices. Column 1 shows the results for the full dataset. It indicates that a firm exporting a certain product charges a higher price to more distant destination markets. The estimated distance elasticity is 0.05, which is similar to the ones reported in studies on European firms by Bastos and Silva (2010) Martin

(2012) and Gorg, Halpern, and Murakozy (2017). Destination income (measured by real GDP per capita) also exerts a positively significant effect on a firm-product export price. These results are consistent with the preliminary analysis conducted in section 3.3. They can partly be explained by variable mark-ups set by firm-product across destination markets, where higher mark-ups are set in more distant and richer markets. Also, the quality differentiation channel is a relevant explanation for the pricing behaviour of Egyptian firms. The positive effect of both distance and destination market income on export prices is indeed higher for differentiated than homogeneous goods (columns 4 and 5). In more differentiated industries, firms have more room to adjust the quality of their products, so they tend to supply higher-priced, higher-quality versions to more distant destinations (in line with the Alchian-Allen effect and within-firm selection of product quality across destination markets) and to richer locations where the demand for quality is typically higher.

On the other hand, Egyptian firms charge lower prices for their products in larger and more remote destination markets. As theoretically predicted by Melitz and Ottaviano (2008), larger-sized destination markets enjoy greater competition between firms, forcing them to charge lower mark-ups and lower prices. This competition effect is consistent with the empirical findings of Harrigan, Ma, and Shlychkov (2015), Gorg, Halpern, and Murakozy (2017), de Lucio et al. (2019) and Statec (2019). As for the overall remoteness of the destination market, whilst it is theoretically predicted to increase a firm's export price (Table 1), its effect is mixed in empirical studies: negative in Manova and Zhang (2012), and positive in Anyfantaki et al. (2019) and Anderson et al. (2019). Our result is in line with that of Manova and Zhang (2012), where remoteness has a significantly negative effect on firm export prices (i.e. higher prices are charged to less remote/ more central destination markets). This effect ceases to be significant, however, when the sample is restricted to poor destination markets (those with less than the median value of real GDP per capita, column 7).

In almost all specifications, tariffs do not exert a significant effect on firm export prices. The exception is in column 5, which indicates that firms charge higher prices for their homogeneous goods destined for higher-tariff countries. This result mainly concerns non-manufactured goods with little scope for quality differentiation, leaving the variable mark-up behaviour of firms across destination markets as a potential explanation.

It is worth noting that when firm country-product-specific market share[14] is added as a covariate to allow for firm market power (column 2), the effects of different destination market characteristics did not differ much. Results also remain qualitatively similar when the analysis is confined to manufactured goods[15] (column 3). Comparing rich and poor destination market sub-samples reveals that the positive effect of distance and the negative effect of market size on export prices are both higher for rich destination markets (those with above median real GDP per capita, columns 6 and 7).

[9] Market share is measured as the value of a firm's export of product p in destination d at year t over total exports of Egyptian firms of product p to destination d in year t.

[15] Manufactured goods correspond to HS chapters 16, 19-23, 28-40, 42-49, and 53-98 (Asprilla et al., 2019).

Table 6: Variation of Export Prices within Firm-Product-Year across Destination Markets

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
			Ln Export Price per firm-product-destination-year (Variation across destination markets within firm-product-year)				
			Manufactured Good	Differentiated Good	Homogeneous Good	Rich Destination Market	Poor Destination Market
Ln distance	0.0542***	0.0459***	0.0584***	0.0606***	0.0420***	0.0680***	0.0475***
	(0.00335)	(0.00335)	(0.00424)	(0.00519)	(0.00393)	(0.00479)	(0.00476)
Ln real GDP	-0.0106***	-0.00705***	-0.0152***	-0.0144***	-0.00646***	-0.0141***	-0.00769***
	(0.00153)	(0.00153)	(0.00234)	(0.00262)	(0.00147)	(0.00181)	(0.00219)
Ln real GDP per capita	0.0225***	0.0226***	0.0307***	0.0337***	0.00672**	0.0245**	0.0233***
	(0.00290)	(0.00282)	(0.00370)	(0.00417)	(0.00317)	(0.00959)	(0.00492)
Ln remoteness	-0.0770***	-0.0688***	-0.0645***	-0.0617**	-0.0643***	-0.103***	-0.00854
	(0.0164)	(0.0158)	(0.0204)	(0.0239)	(0.0167)	(0.0250)	(0.0231)
Ln tariff	0.0389	0.0126	-0.00792	-0.0244	0.0598**	0.0468	0.0363
	(0.0243)	(0.0238)	(0.0367)	(0.0437)	(0.0251)	(0.0510)	(0.0269)
Market share		0.0887***					
		(0.00614)					
Observations	181,388	181,388	104,763	88,450	87,656	86,896	74,755
R-squared	0.934	0.934	0.940	0.942	0.896	0.947	0.933
Firm-Product-Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Estimation Method	OLS	OLS	OLS	OLS	OLS	OLS	OLS

Robust standard errors in parentheses, clustered by destination-year
*** p<0.01, ** p<0.05, * p<0.1

As a robustness check, within firm-product regressions are conducted using alternative definitions of explanatory variables. Market size is proxied using population size, instead of real GDP. Also, a measure that captures the direct implication of destination market remoteness on its prevailing prices is introduced: the mean import unit value per destination county-product-year[16]. Results are shown in Table 7. The main previous findings are confirmed. First, firms charge higher export prices for more distant and richer destination markets. Second, as the degree of competition strengthens in a destination market, firms charge lower prices. This is evident from the negative effect of destination market size - proxied by population - as well as the positive effect of a higher mean import price in the destination country (an indication of minimal competition) on firm export prices across destination markets. A 10% higher destination market price leads to about a 0.4% higher firm export price (columns 4 and 6). Third, tariffs still have an insignificant effect.

Table 7: Variation of Export Prices within Firm-Product-Year across Destination Markets: Robustness Check, using Alternative Explanatory Variables

	(1)	(2)	(3)	(4)	(5)	(6)
	Ln Export Price per firm-product-destination-year Variation across destination markets within firm-product-year					
Ln distance	0.0405*** (0.00242)					0.0396*** (0.00253)
Ln population		-0.00391*** (0.00151)				-0.00865*** (0.00156)
Ln real GDP per capita			0.0170*** (0.00255)			0.0111*** (0.00265)
Ln mean unit value $_{pdt}$				0.0381*** (0.00341)		0.0354*** (0.00387)
Ln tariff					0.0109 (0.0222)	0.0215 (0.0247)
Observations	231,782	230,957	223,144	169,812	186,687	144,896
R-squared	0.932	0.932	0.933	0.936	0.933	0.937
Firm-Product-Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Estimation Method	OLS	OLS	OLS	OLS	OLS	OLS

Robust standard errors in parentheses, clustered by destination-year
*** p<0.01, ** p<0.05, * p<0.1

Finally, the regression can be augmented to include the effect of technical measures on firm export prices. As NTM data is not available for all destination

[16] Data on trade unit values (in US dollars per ton) is available through Centre d'Études Prospectives et d'Informations Internationales (CEPII), with 182 reporters, 253 partners, and more than 5,000 product categories (HS 6-digit) per year for the period 2000-2017.

countries[17], the number of observations becomes much lower. Table 8 shows the effect of the number of technical measures[18] imposed on a given product by a destination market country on firm export prices across destination markets. Results indicate that a firm charges a higher export price for destination markets imposing a higher number of technical regulations on a given product. This effect is higher for manufactured goods, as they are more subject to technical measures (column 2). To obtain a more accurate view for their effect, we focus on a subset of technical measures considered to be the most restrictive, i.e. those raised as specific trade concerns (STCs) at the WTO Technical Barriers to Trade (TBT) committee[19]. Technical measures are then defined using a dummy variable, which equals one if there is an ongoing TBT STC raised against the importing country on a given product at year t-1[20]. Results in Table 9 again indicate that firms charge higher prices for destination markets with restrictive technical measures, as measured by TBT STCs, especially for manufactured goods (column 2). The positive effect of TBTs on firm export prices can be explained in terms of their effect on the number of firms which serve a destination market country imposing such measures. It is well established that TBTs mainly represent a fixed trade cost, which negatively affects the number of exporting firms by crowding out small firms unable to meet stringent measures (as in Fontagné and Orefice (2018) for French firms, Fugazza, Olarreaga and Ugarte (2018) for Peruvian firms, and Kamal and Zaki (2018) for Egyptian firms). The TBT-induced decrease in the number of firms (i.e. the effect on the extensive trade margin) raises the market power of surviving firms, which enables them to set higher mark-ups and, hence, higher prices in TBT-imposing destination markets. An alternative explanation is based on quality upgrading by firms or selection effects, where only high-quality varieties are sold in TBT-imposing markets, thus increasing prices in these markets.

[17] NTMs data at product-destination level are obtained from UNCTAD TRAINS: https://trains.unctad.org/Forms/Analysis.aspx

[18] Count measures are simple rough indicators for the prevalence of NTMs per destination-product. The larger number of technical measures could be a sign of regulatory complexity in issuing countries, possibly impacting firm pricing behaviour, where exporting firms to these countries should know about more regulations -including conformity assessment measures - and comply with them (higher information and compliance costs).

[19] Data on TBT STCs are defined at the HS 4 digit-level and are obtained from the WTO: https://www.wto.org/english/res_e/publications_e/wtr12_dataset_e.htm. They are only available up until 2010, which further lessens the number of observations.

[20] A TBT concern on a given HS 4-digit product is assumed to affect all related HS 6-digit products. Also, a concern is considered resolved (no longer ongoing) if it is not re-raised by any country for two or more years (WTO report, 2012). It enters the regression as one year lagged to account for the time between raising a concern at the WTO and the actual implementation of the measure, which takes around 8 months (Fontagné et al., 2015).

Table 8: Number of Technical Measures and within Firm-Product Export Prices across Destinations

	(1)	(2)
	Ln Export Price per firm-product-destination-year (Variation across destination markets within firm-product-year)	
		Manufactured Good
Ln distance	0.0401***	0.0422***
	(0.00520)	(0.00710)
Ln real GDP	-0.00826***	-0.0165***
	(0.00225)	(0.00344)
Ln real GDP per capita	0.0133***	0.0248***
	(0.00468)	(0.00768)
Ln remoteness	-0.0680***	-0.106***
	(0.0242)	(0.0341)
Ln tariff	-0.0209	0.0105
	(0.0427)	(0.0663)
Ln num. of technical measures	0.00764**	0.0120**
	(0.00344)	(0.00567)
Observations	68,835	35,184
R-squared	0.945	0.952
Firm-Product-Year Fixed Effects	Yes	Yes
Estimation Method	OLS	OLS

Robust standard errors in parentheses, clustered by destination-year
*** p<0.01, ** p<0.05, * p<0.1

Table 9: TBT STCs and Within Firm-Product Export Prices across Destination Markets

	(1)	(2)
	Ln Export Price per firm-product-destination-year Variation across destination markets within firm-product-year	
		Manufactured Good
Ln distance	0.0438***	0.0496***
	(0.00534)	(0.00751)
Ln real GDP	-0.00861***	-0.0112***
	(0.00254)	(0.00434)
Ln real GDP per capita	0.0231***	0.0275***
	(0.00500)	(0.00638)
Ln remoteness	-0.0939***	-0.0520
	(0.0268)	(0.0357)
Ln tariff	0.0662	0.0201
	(0.0425)	(0.0633)
TBT STC $_{t-1}$	0.0425**	0.0701***
	(0.0169)	(0.0229)

Observations	62,092	36,517
R-squared	0.933	0.941
Firm-Product-Year Fixed Effects	Yes	Yes
Estimation Method	OLS	OLS

Robust standard errors in parentheses, clustered by destination-year
*** p<0.01, ** p<0.05, * p<0.1

Conclusion

Using disaggregated export data at the firm-HS 6-digit product-destination country-year level, this paper studies how Egyptian firms make their export pricing decisions.

Analysing export prices across firms reveals that firms which set a higher export price within a given product-destination country earn higher revenues, especially for differentiated products. Also, more productive firms (as proxied by being an importer of intermediate inputs or capital goods) charge higher prices. This supports the existence of quality, rather than price, competition between Egyptian firms. Additionally, firms serving a larger number of destination markets charge a higher average product price and offer a wider range of prices across their destination markets, which could signal a greater ability of multi-destination firms to exercise price discrimination across markets.

Regarding export prices within firms across destination markets, it is found that firms charge higher export prices in more distant and richer destination markets, which could be driven by higher set mark-ups or improved quality versions of products supplied to these locations. Conversely, lower prices are charged to larger (more competitive) and remote (less central) destination markets. In general, these destination market characteristic effects on firm export prices are more pronounced for differentiated goods and for the richer set of destination markets. The effect of tariffs is positively significant only for homogeneous non-manufactured goods, signifying a higher mark-up set by firms exporting this type of goods to higher tariff countries.

The study contributes to the literature by further examining the effect of technical measures as the most frequently used form of NTMs on firm-product export prices across destination markets. Firms are found to increase prices for their exported products - especially manufactured products - to destination markets with a higher number of technical measures and to those imposing restrictive measures raised as specific trade concerns at the WTO. This can be attributed to the adverse effect of TBTs on the number of exporting firms and the associated increase in market power of surviving firms, which enables them to set higher mark-ups and higher prices. It can also result from quality upgrading of firms exporting to TBT-imposing destinations.

Finally, the study's empirical findings support heterogeneous-firm models that feature quality competition amongst firms and the setting of variable mark-ups across destination markets.

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