Markups, Taste and Quality

Oliver Haase[a*], Daniele Curzi[a], Valentina Raimondi[a], Alessandro Olper[a], and Roberto Solazzo[b]

[a]*Department of Environmental Sciences and Policies, University of Milan, Italy*
[b]*CREA-Council for Agricultural Research, Rome, Italy*

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Abstract

This paper documents the heterogeneous effects of varying consumer taste and quality on markups of Italian exporters of food products. After controlling for prices, we extract taste and quality as demand shifters from the residual export variation. Drawing on Italian firm-level customs data, our results suggest that markups rise with distance and fall with tariffs, but higher consumer taste in destination countries and higher-grade products attenuate these impacts on markups. Our results have critical implications for the assessment of the welfare effect of trade liberalization.

Keywords: Trade, taste, quality

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*Corresponding author: oliver.haase@unimi.it
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1 Introduction

Much research documents that demand is heterogeneous due to differences in product quality (e.g. Hallak and Sivadasan, 2013; Roberts et al., 2018; Piveteau and Smagghue, 2019). Only a few exceptions (e.g. Di Comite et al., 2014; Aw-Roberts et al., 2021; Feenstra et al., 2022) so far have interpreted heterogeneity in demand shifters due to differences in other shifters, such as taste. In this article, we empirically explore the effects of taste and quality in conjunction with trade costs on the pricing strategies of Italian food exporters. If a firm faces heterogeneous consumers, it also faces different demand elasticities. The firm would then find it profitable to charge higher prices and higher markups from consumers with relatively lower demand elasticities, due to higher appreciation of quality or simply higher taste (Martin, 2012). This would occur if firms have become more aware of varying consumer tastes due to, for example, greater investments in technologies to monitor consumer sensitivity to product features.

Italian exports of food products, such as Parmigiano cheese and Parma ham, make an ideal case study as they are widely known for their high quality. Many varieties have a longstanding tradition. Some of the recipes date back to the 12th century, and producers are eager to minimize changes in the specification of the product. Hence, quality differences across destination countries should be minor, and hence the heterogeneity of the demand shifter at the country level should be due to taste differences instead of quality differences.

To estimate the impact of consumer heterogeneity on firms' pricing strategy, we employ Italian customs data that covers a large sample of exporters of cheese and processed meat over the period 2013-2019, which allows to conduct panel analyses at the firm-product-destination level. The relation between taste, quality and producer prices is then investigated by estimating a log-log linear specification that regresses f.o.b.(free-on-boards) unit values on taste, quality, and different controls for destination country characteristics. Our proxies for taste and quality are obtained from the estimation of a CES demand as we decompose residual export variation into two components. The first component is an average effect measured as a demand shifter at the firm-product level, while the second component poses a demand shifter that varies also at the destination country level.

Our article relates to the literature that estimates quality using trade data at the firms-destination-product level (e.g. Bernini et al., 2015; Piveteau and Smagghue, 2019). Thereby, quality is estimated by relying on the technique developed by Khandelwal (2010) that infers quality as the share of an exported variety over a country's total import in a given product category not explained by the price. Our article also relates to the literature that examines export price variation across markets using firm-level data. For manufacturing firms, a few studies examine export price variation across markets using firm-level data, including Martin (2012) for France, Bastos and Silva (2010) for Portugal, Görg et al. (2017) for Hungary, Manova and Zhang (2012) for China, and Harrigan et al. (2015) for the U.S..

Much of this literature identifies only the distance effect from the within-firm product variation of prices across destinations. Their finding that firms charge higher prices in more distant markets can be explained by means of two mechanisms. Firms produce different quality versions of their products, and under per unit transport costs, shift the composition of their export products to higher quality and more expensive goods in more distant markets. This is the so called the Alchian–Allen-effect. Second, under per unit transport costs, firms find it more profitable to price discriminate and charge higher prices and higher markups with distance (Martin, 2012). This represents a pricing-to-market effect. In a more recent contribution, Chen and Juvenal (2020) identify a pricing-to-market effect for Argentinian wine exporters depending on distance, tariffs, and quality of their wines. Particularly, they argue that the export price variation is driven by markups as they can control for product quality and firm-product-time fixed effects in their unit value regression. Their empirical findings confirm the theoretical predictions laid out by Martin (2012) that prices and markups increase with distance and decrease with ad valorem tariffs conditional on quality.

The contribution of this article is twofold. First, we retrieve a measure for taste in addition to quality from residual export variation, after controlling for prices. Our data set on Italian food exporters is favorable to account for the reaction of consumer preferences conditional on prices and quality upgrading and therefore eliminate a potential omitted variable bias. Second, we control for taste differences in addition to differences in quality by building on the work of Chen and Juvenal (2020) in capturing the markup variation of Italian food exporters. Where in their analysis quality and taste are treated in much the same way, a major contribution of our approach is to explore the contribution of taste to these patterns and link them to the conceptual framework of Martin (2012). To our knowledge, this is the first study that investigates the impact of taste on export prices for a large sample of companies.

Our findings suggest that taste differences are shifting export prices. Our key findings confirm that higher taste, alongside quality, induce firms to increase their prices and markups on food exports. Our finding on the positive relationship between firms' markup and taste demonstrates that firms indeed exploit lower price sensitivity. With respect to the impact of distance on prices and markups, our results show that firms increase their prices and markups with distance but the magnitude of the effect decreases with taste and quality. For tariffs, firms lower their prices and markups to compensate for lower demand due to higher ad valorem tariffs if export markets exhibit a lower taste for their products. Our analysis also reveals that firms charge higher markups in high-tariff countries without compromising on sales if the appreciation for their products is high which corroborates our finding that price setting moves alongside consumer taste observed by the firm.

The remainder of the article is organized as follows. Section 2 lays out the theoretical framework. Section 3 lays out the empirical strategy for the identification of price elasticities, consumer taste and quality. Section 4 describes the data set and obtains all the parameters from estimating the demand equation. In Section 5, we assess the importance of consumer taste in explaining firms' export revenues relative to quality. Section 6 concludes.

2 Theoretical framework

Our hypothesis is straightforward: Higher taste for a product increases consumers' willingness to pay for that product which induces firms to charge higher prices and higher markups. The theoretical framework for our research question is laid out by Martin (2012) in a monopolistic competition model with additive transport costs.[1] As in Hummels and Skiba (2004), the consumer price of a good depends on its producer price, p_{ivj}^{fob}, as well as on additive and multiplicative trade costs, $t \geq 0$ and $\tau \geq 1$, respectively:

$$p_{ivj}^{cif}(\tau_{vjt}, T_j, c_{ivj}(\eta_{ivj})) = \tau_{vj} p_{ivj}^{fob}(\tau_{vjt}, T_j, c_{ivj}(\eta_{ivj})) + T_j, \tag{1}$$

where p_{ivj}^{cif} is the cost, insurance, and freight (c.i.f.) price faced by the consumer. Marginal cost of firm-product i destined for country j increase with taste or quality. Catering to the taste of the richer consumers within a country or producing higher quality versions — for example those where they use more durable packaging — leads to higher marginal costs of their products in remote destinations (Martin, 2012).

Exporting firms face the inverse CES demand in each destination country (Krugman, 1980; Melitz, 2003):

$$p_{ivj}^{cif} = \kappa_{vj} q_{ivj}^{-\frac{1}{\sigma}} \eta_{ivj}^{\frac{\sigma-1}{\sigma}}, \tag{2}$$

where κ_{vj} characterize overall expenditure share and price index for good v in destination country j exogenous to firm i. A higher appeal η_{ivj}, either due to higher quality or taste, implies an upward shift in the demand faced by the firm.

Exporters maximize profits subject to the CES demand in (2) in each destination country. The first order condition yields:

$$p_{ivj}^{cif} = \frac{\sigma}{\sigma-1}(T_j) + \frac{\sigma}{\sigma-1}\tau_{vj} c_{ivj}(\eta_{ivj}) \tag{3}$$

[1]The introduction of additive transport costs is crucial to generate a demand elasticity that increases with distance, and falls with higher tariffs.

$$p_{ivj}^{fob} = \frac{1}{\sigma - 1}\left(\frac{T_j}{\tau_{vj}}\right) + \frac{\sigma}{\sigma - 1} c_{ivj}(\eta_{ivj}) \tag{4}$$

and the corresponding markup (Melitz and Ottaviano, 2008):

$$\mu_{ivj}^{fob} = p_{ivj}^{fob} - c_{ivj}(\eta_{ivj}) = \left(\frac{1}{\sigma - 1}\left(\frac{T_j}{\tau_{vj}}\right) + \frac{\sigma}{\sigma - 1} c_{ivj}(\eta_{ivj})\right), \tag{5}$$

where taste and quality are introduced in this framework through the marginal cost channel: Under monopolistic competition in the CES model, catering to the taste of consumers within a country or producing higher quality versions leads to higher marginal costs which induces the firm to charger higher prices and higher markups which can be inferred by looking at (5) and (6). Furthermore, f.o.b. prices and markups depend positively on the per unit part (T_j) of transport costs and negatively on the ad valorem part. If trade costs are ad valorem only (i.e. $T_j = 0$) the model indicates that f.o.b. prices and markups do not depend on trade costs at all. With per unit transport costs (i.e. $T_j > 0$) f.o.b. prices and markups depend positively on per unit costs T_j, and negatively on ad valorem costs τ_{vj}. With per unit transport costs only (i.e. $\tau_{vj} = 1$) f.o.b. prices and markups are increasing with transport costs. Hence, the elasticities of the f.o.b. price and markup with respect to distance T_j obtained from (4) and (5) are:

$$\epsilon_T^{fob} = \frac{1}{\left(1 + \frac{\sigma c_{ivj}(\eta_{ivj})}{T_j/\tau_{vj}}\right)} > 0, \tag{6}$$

$$\epsilon_T^{\mu} = \frac{1}{\left(1 + \frac{c_{ivj}(\eta_{ivj})}{T_j/\tau_{vj}}\right)} > 0. \tag{7}$$

The elasticities of the f.o.b. price and markup with respect to ad valorem tariff τ_{vj} are:

$$\epsilon_\tau^{fob} = \frac{-1}{\left(1 + \frac{\sigma c_{ivj}(\eta_{ivj})}{T_j/\tau_{vj}}\right)} < 0, \tag{8}$$

$$\epsilon_\tau^{\mu} = \frac{-1}{\left(1 + \frac{c_{ivj}(\eta_{ivj})}{T_j/\tau_{vj}}\right)} < 0. \tag{9}$$

Accordingly, demand faced by exporters in more distant markets should be less elastic to changes in the f.o.b. price. That is why exporters find it profitable to raise prices. However, the elasticities in (6) and (7) show that exporters raise their prices less for products of higher appeal. With respect to tariffs, demand faced by exporters in countries with higher tariffs is more elastic to changes in the f.o.b. price. To compensate for the lower demand due to higher tariffs, firms tend to reduce their prices, but they reduce them less for exports of higher appeal as can be inferred from the elasticities in (8) and (9).

3 Estimating strategy

In this section we present the strategy introduced by Feenstra et al. (2022) to estimate taste alongside quality of exports for the firm-destination-product triplet, employing customs data. We identify both from a CES demand system in which taste and quality operate as two separate utility shifters. We derive a country-specific demand shifter for each 8-digit firm-product which we associate with taste for the product in each country. In this manner, we segment consumers according to the countries in which they reside. Quality is reflected by the mean export variation across firm-products unexplained by prices assuming that food producers serve the same product specification to any destination country, and that consumers across destinations are on average capable to recognise the quality of each firm-product. We assume that differentiation in taste is a variable shock at the destination level that exceeds the mean export variation associated with quality. Therefore we say that commonly perceived quality is a part of taste. To illustrate this for the set of differentiated varieties of cheese, suppose that demand faced in France by a producer of Parmigiano-Reggiano to be different from the demand faced by the same producer in Germany. After controlling for prices and assuming an equal quality catered to both destinations higher sales of Parmigiano-Reggiano in Germany should then be attributed to differences in taste.

3.1 Consumer Demand

Consider that all consumers can be segmented by their countries of origin. Any j country comprises a set of consumers endowed with identical CES preferences. We start with the quantity demand in destination j for good v produced by the exporting firm i:

$$q_{ivj} = \kappa_{vj}\, \eta_{ivj}^{\sigma_g - 1}\, p_{ivj}^{-\sigma_g}, \tag{10}$$

with the consumer price, p_{ivj}, that is linked to the f.o.b. (Free on board) price; η_{ivj} is the demand shifter which contains intrinsic and extrinsic characteristics that make the firm-product, iv, given its price more appealing to consumers. Besides that, σ_g is the own price elasticity of demand in product category g. The consumer price p^*_{ivj} is unobserved, but linked to the f.o.b price because we assume that prices are a function of iceberg type trade costs $\tau \geq 1$, $p^*_{ivj} = \frac{\tau_{vj} p^{fob}_{ivj}}{e_j}$, and the f.o.b. price p^{fob}_{ivj} normalized by the nominal exchange rate, e_j.

Inserting the consumer price into Equation (10) and taking logs yields:

$$log\, q_{ivj} = \kappa_{vj} + (\sigma_g - 1) log\, \eta_{ivj} - \sigma_g\, log\, \tilde{p}_{ivj} \tag{11}$$

$$\text{with} \quad \kappa_{vj} = log E_{vj} + (\sigma_g - 1)\, log P_j + log \tau_{vj} - log\, e_j$$

and the demand shifter of a firm can be decomposed into firm-product-specific component, η_{iv}, that is associated with commonly perceived quality, and a firm-product-market-specific component, η_{ivj}, that refers to the taste of consumers in country j for firm-product iv, such that:[2]

$$\eta_{ivj} \equiv \eta_{iv} \tilde{\eta}_{ivj} \tag{12}$$

The estimation performed in this paper identifies both taste and quality as specific parts from the demand shifter, $(\sigma_g - 1) ln\, \eta_{ivj}$, as we discuss further below. We take Equation (11) to the data. The variables that are observable to the econometrician are $ln\, q_{ivj}$ and $\tilde{p}_{ivj,t}$ while σ_g, κ_{vj} and η_{ivj} have to be estimated. The presence of taste and quality in the demand shifter also may cause endogeneity of prices, which we discuss briefly in the next subsection.

3.2 Demand estimation

We adapt the specification (11) to our firm panel data set resulting in the estimation equation:

$$ln\, q_{ivj,t} = \kappa_{vj,t} - \sigma_g\, ln\, \tilde{p}_{ivj,t} + \gamma_{i,t} + \gamma_{j,t} + \epsilon_{ivj,t}, \tag{13}$$

where the product-destination fixed effect, $\kappa_{vj,t}$, absorbs all destination specific effects which are common to all exporters serving the same destination market in year t. We include firm-year fixed effects, γ_{it} to control for productivity, size, wages etc. at the firm level. We also include destination-year fixed effects, $\gamma_{j,t}$ to control for any destination specific characteristics at a given year affecting all exports. The inclusion of the fixed effects, $\gamma_{i,t}$,$\gamma_{j,t}$ and $\kappa_{vj,t}$, purges any firm-product-destination-time-specific heterogeneity from the error term, and we thereby force the identification to exploit firm-product and destina-

[2]The notion that geography manifests consumer heterogeneity in taste can also be inferred from the empirical literature, for instance, Coşar et al. (2018) for the car market, Jäkel (2019) for the chocolate market, and Atkin (2013) for food products.

tion country variations in quantities of a particular HS8 product exported by the firm.[3]

One can infer from (13) that the demand shifter of a firm, $(\sigma_g - 1) ln\, \eta_{ivj,t} = \epsilon_{ivj,t}$, is a demand shock that accounts for export variation of a firm–product across destination countries. Differentiation between products is then the combination of a constant parameter of substitution and a variable shock at the firm–product level both contained in the error term.

Arguably an important econometric problem for the estimation of the demand function is posed by the f.o.b price being most likely correlated with quality and taste. If a demand shock caused by a shift in consumer preferences induces firms to raise prices we would expect the OLS estimator for σ_g to be biased toward 0. To deal with endogeneity we follow Hausman (1996) and exploit price information on a firm-product in other foreign markets as our instrument since we expect the price in other markets to be strongly correlated with the price charged in destination j while not directly affecting demand in market j. In addition, we also consider the price information about other varieties exported by the same firm by using unit values at the HS6-digit level to instrument for the unit value at the HS8-digit level. We do so to ensure that the instrument is valid given that unobserved product quality is most likely correlated across markets. At the same time, our instrument maintains correlation with the endogenous price due to similar input use in the production of different types of cheese (or ham).[4]

In particular, we instrument $\tilde{p}_{ivj}$ with the log of the weighted average f.o.b. price of firm- varieties at the HS6-digit level served to other markets (Irarrazabal et al., 2015):

$$\tilde{p}_{ivj,t} = \frac{1}{(S_{iv} - 1)} \sum_{k \in J^{-}_{ivj}} p_{ivk,t}, \tag{14}$$

where S_{iv} depicts the number of export destinations by firm-product iv and J^{-}_{ivj} is the set of destinations served by firm-product iv, except destination j.

3.3 Demand Estimation Results

In this section, we describe the results obtained from the estimation of specification (13) that uses the Hausman-instrument and two fixed effects for the two product categories. We restricted our sample to export flows to similar countries (i.e. other OECD members) to account for taste. Otherwise zero trade values may be spuriously interpreted as distaste in case prohibitively low levels of income mask true consumer preferences for Italian cheese. In other words, we exclude cases in which the firm-product-destination variation is possibly driven by differences in income in importing countries. Further, extreme values of sales be-

[3]We abstain from introducing firm-product fixed effects in the empirical specification (13) since differences across products within firms may be attributed to differences in quality. Likewise, we drop firm-destination-year fixed effect as this would capture firms' overall market shares which may be associated with taste.

[4]Note the fact that cheese producers do not engage in the production of ham, and vice versa.

low the 1st percentile or above the 99th percentile with respect to every product-destination are dropped from the sample.

In Table (1), we report two types of estimates for both product categories. First, we estimate the elasticity of substitution using OLS (columns 1 and 2) to obtain a benchmark to which to compare our parameters estimated with 2SLS. Second, we present the results of the 2SLS estimation performed separately again for both product categories: column 3 reports the estimated coefficient, column 4 the standard deviation of the parameter and column 5 the Kleibergen-Paap F-statistic from the first stage describing the strength of the instrument. For cheese, the estimate obtained from OLS displays that the presence of endogeneity between demand and supply shocks is driving the elasticity towards zero. In comparison, the estimated elasticity in the IV specification is larger in magnitude. This confirms that the Hausman-instrument adequately picks up common cost shocks. For processed meat, the IV estimate is lower in magnitude which may suggest that endogeneity does not pose at least an issue for this industry. Although, the first stage regressions of the 2SLS are both strong as illustrated by the large F-statistic. As a consequence, the IV estimates display small variances which indicates that the values of our estimates of the price elasticity are plausible for both industries. We use the estimates of the price elasticities obtained from the 2SLS to construct our taste and quality measures.

Table 1: Estimates of demand elasticities

	OLS		IV			
Product categories	σ	Std. Dev.	σ	Std. Dev.	F-stat.	N
Cheese	-0.989***	0.033	-1.474***	0.163	280.19	101,612
Processed meat	-0.879***	0.038	-0.851***	0.180	70.63	31,653
Market-year FE	Yes		Yes			
Firm-country-year FE	Yes		Yes			

Notes: Estimates in columns "OLS" and "IV" are obtained by estimating Equation(13) separately for each industry, respectively by OLS and 2SLS. Estimates in column "IV" are obtained by estimating a single first stage and a second stage where the price-elasticity is allowed to vary across industries. Firm-destination-time fixed effects are included in all regressions. IV specifications uses the f.o.b. price at the HS-6 digits level quoted on neighboring markets as instrument. Column F-stat reports the value of the Kleibergen-Paap F-statistic. ***,**,* denote significance at 1%, 5% and 10% respectively. Intercepts included but not reported.

3.4 Measuring Taste & Quality

Once we obtained consistent estimates for the price elasticity of demand for the two product categories (i.e. cheese and ham), the estimator of the demand shifter containing both quality and taste is obtained through the prediction of the error term:

$$(\hat{\sigma}_g - 1) ln \hat{\eta}_{ivj,t} = \hat{\epsilon}_{ivj,t}. \tag{15}$$

The firm-product and time-invariant quality measured as the consumers' mean valuation across all destination countries, is obtained by taking the average of the residual as:[5]

$$(\hat{\sigma}_g - 1) ln \hat{\eta}_{iv} = \frac{1}{JT} \sum_j \sum_t \hat{\epsilon}_{ivj,t} \tag{16}$$

And, one may see from the definition (12) in logs that:

$$ln \eta_{ivj,t} \equiv ln \eta_{iv} + ln \tilde{\eta}_{ivj,t}. \tag{17}$$

We can obtain a measure of taste after rearranging (17), by using the estimates from (15) & (16) :

$$ln \hat{\tilde{\eta}}_{ivj,t} = ln \hat{\eta}_{ivj,t} - ln \hat{\eta}_{iv}. \tag{18}$$

Thus, differences in taste between countries become interpretable as the country-specific deviation from the mean valuation (i.e. quality) of a firm-product. [6]

4 Data & Descriptive Statistics

4.1 Customs Data

The data set covers all Italian cheese producers for the period 2013-2019 which originate from customs declarations. This database provides export values and quantities by product defined at the HS-8 digit level and destination for each firm. We calculate f.o.b. unit values as a proxy for export prices by dividing export values by quantities. Tables (2) and (3) summarize our trade data by year, and displays that the number of exporters increased between 2013 and 2017. All types of cheese were exported by 1,149 firms in 2013, while the number of firms increased to 1,353 firms in 2017. Table (3) shows a similar trend for the processed meat sector. The comparison between the two tables also reveals that export competition in the Italian cheese sector is more pronounced. The mean number of destinations and types of cheese exported per firm remain largely stable over the study period.

[5]This assumption on quality is somehow similar to the one used in Khandelwal (2010). However, Khandelwal (2010) uses US import data, such that quality reflects the valuation for a firm-product that is common across consumers in the US.

[6]Note that the taste component absorbs the entire firm-product-destination country variation of the demand shifter.

Table 2: Statistics for Cheese

Year	Observations	Firms	Types of cheese	Types of cheese per firm	Destinations per product
2013	15,230	1,149	44	13.0	34.9
2014	13,032	1,084	37	11.2	35.2
2015	17,886	1,276	43	14.1	35.6
2016	18,994	1,319	43	14.0	35.8
2017	19,483	1,353	43	14.1	36.0
2018	17,178	990	43	16.0	35.9
2019	17,720	1,032	43	15.6	36.2

Notes: For each year in the sample, the table reports the number of observations, exporters, products, types of cheese, and destinations.

Table 3: Statistics for Processed Meat

Year	Observations	Firms	Types of ham	Types of ham per firm	Destinations per product
2013	5,287	676	5	3.0	36.3
2014	5,618	691	5	2.9	35.3
2015	6,004	723	5	3.0	35.9
2016	6,443	774	5	3.1	35.6
2017	6,551	780	5	3.0	35.8
2018	5,276	508	5	3.2	37.1
2019	5,525	566	5	3.2	37.5

Notes: For each year in the sample, the table reports the number of observations, exporters, products, types of ham, and destinations.

4.2 Macroeconomic Data

Additive trade costs approximated by bilateral distances (in kilometers) are obtained from the Centre d'Etudes Prospectives et d'Informations Internationales (CEPII). Ad valorem trade costs approximated by bilateral tariffs for cheese (HS 406) and processed meat (HS 160), at annual frequency, are obtained from the United Nations Conference on Trade and Development TRAINS database. We use the effectively applied weighted average tariff rates expressed in percentage terms. Annual PPP GDPs (in constant 2010 US dollars) are from the Organisation for Economic Co-operation and Development (OECD) database.

5 Unit Values, Taste & Quality

To explore how firms choose their pricing strategy in conjunction with taste and quality of their exports we regress the f.o.b unit values in logs as our dependent variable on taste, quality and their interactions with trade costs as in the following equation:

$$log\,UV_{ivj,t} = \beta_1 \, log\,Dist_j + \beta_2 \, log\,Tar_{vj,t} + \beta_3 \, Taste_{ivj,t} + \beta_4 \, log\,Dist_j \times Quality_{iv} \quad (19)$$
$$+ \beta_5 \, log\,Dist_j \times Taste_{ivj,t} + \beta_6 \, log\,Tar_{vj,t} \times Quality_{iv} + \beta_7 \, log\,Tar_{vj,t} \times Taste_{ivj,t}$$
$$+ \beta_8 \, log\,z_{j,t} + D_{iv,t} + \epsilon_{ivj,t},$$

where $UV_{ivj,t}$ is the free-on-board unit value computed at the firm-product-destination level for a given year. The quality of variety denoted by $Quality_{iv}$, and the taste for that variety in destination country j in year t, denoted by $Taste_{ivj,t}$ are our estimated indices. The distance, $Dist_j$, between Italy and country j, and the annual tariff $_{vj,t}$ imposed by country j on cheese and ham imports from Italy in year t are both interacted with quality and taste.

The inclusion of firm-product-time fixed effects, $D_{iv,t}$, absorbs the direct effect of quality from the regression and captures marginal costs that are invariant across destinations. This forces the identification to exploit the variation in unit values across destinations for a given firm-product-year triplet and thereby renders the variation in unit values to markups (Chen and Juvenal, 2020).[7] We further control for market-specific characteristics by including destination-year fixed effects $D_{j,t}$.

We expect the direct effect of distance to be positive, i.e. $\beta_1 > 0$, and the direct effect of tariff to be negative, i.e. $\beta_2 < 0$. The model further predicts that the impact of distance on unit values depends on the quality of the product such that the distance effect falls with quality and taste.[8] The interactions of $logdist$ with $taste$ and $quality$ capture these effects. Therefore, the prediction is that $\beta_1 + (\beta_4 \times quality_{iv}) + (\beta_5 \times taste_{ivj,t}) > 0$, with $\beta_4 < 0$ and $\beta_5 < 0$, implying that firms raise their prices less for higher quality goods as well as for goods which are highly preferred among consumers in destination countries.

We further argue that observed unit values obtained from customs data should respond positively to higher consumer taste (i.e. $\beta_3 > 0$), assuming that firms charge higher prices for goods for which demand is relatively inelastic to f.o.b. price increases. For the same reason, the coefficient on the interaction between tariff and taste should be positive (i.e. $\beta_7 > 0$) because firms reduce prices to compensate for lower demand due to higher tariffs in the first place, but they do less so for products for which the demand is relatively inelastic. In the same vein, we should observe the same countering price effect from higher quality, while we shall let the data speak if the compensating effect is stronger for taste than for quality, or vice versa. Thus, we should observe $\beta_2 + (\beta_6 \times quality_{iv}) + (\beta_7 \times taste_{ivj,t}) > 0$, with $\beta_6 > 0$ and $\beta_7 > 0$.

[7]As for the direct effects we predict that higher quality of a product is associated with a higher markups, if consumers across countries commonly rank different varieties of the same good (Bresnahan, 1987). The mapping between prices and quality should become apparent as we also control for horizontal attributes of products.

[8]Note that Chen and Juvenal (2020) confound quality with taste.

Lastly, we also control for destination-specific characteristics z_{jt}, namely the log of annual GDP and GDP per capita. Unit values should be on average higher in countries with higher GDP per capita due to stronger preference for quality in wealthier countries (Bastos and Silva, 2010; Görg et al., 2017; Hummels and Skiba, 2004; Manova and Zhang, 2012; Martin, 2012). In contrast, unit values should be lower in countries with higher GDP as larger countries give rise to stronger competition Görg et al. (2017); Harrigan et al. (2015); Martin (2012).

In Table 4, we display the results from the unit value regression. Column 1 reports the baseline regression for the homogeneous model for which we drop all four interaction terms and replace the firm-product-time fixed effects by the firm-time dummies. The coefficients are, except for tariffs, statistically significant and have the predicted signs. Distance positively affects unit values. As expected, we find a positive direct effect of taste on unit values which is significant across destinations. We also find a significantly positive correlation for quality but the coefficient is far below one (i.e. 0.174), which indicates that prices represent an imperfect proxy for quality. All regressions include destination-year fixed effects such that the relation is identified within the export market.

The results from the heterogeneous model including all interaction terms are reported in column (2) & (3). The inclusion of the firm-product-time fixed effect absorbs now the direct effect of quality and forces the identification to exploit the variation in export volumes across destinations for a given firm-product-year triplet. Again, prices are higher in more distant countries for a given taste and quality, and lower in markets with higher tariffs. We infer that firms may choose to sell higher quality versions — for example those where they use more durable packaging — of their products in remote destinations and thus charge higher markups. The direct taste effect remains significant and positive also after including the importer-year fixed effects.

The estimated coefficients on the interactions of distance with taste and quality are negative and precisely estimated which supports the prediction that the positive impact of distance on markups declines with taste and quality implying that firms tend to raise their prices less for higher quality goods or for goods which are highly preferred among consumers in destination countries. However, the heterogeneous effects of distance are statistically distinguishable only if we include importer-year fixed effects as in column 3. For the interactions with distance we can therefore no longer assume that the effect of each predictor on the outcome is independent of the other predictor in the model.

The estimated coefficients on the interactions of ad-valorem tariffs with taste and quality are both positive, precisely estimated, and statistically distiguishable implying that firms reduce their prices, but less for produces of higher grade and higher customer appeal. Moreover, the inclusion of destination-time fixed effects in column 3 increases the precision of the estimate of the interaction effect between tariffs and quality.

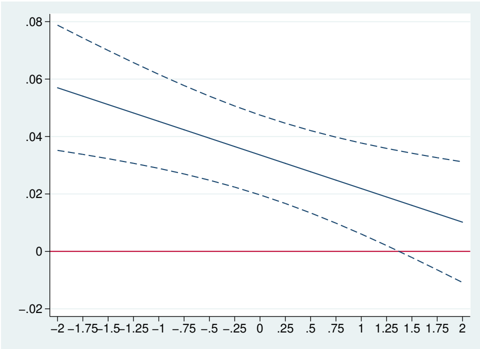
Thus, price setting moves alongside firms' quality choice and consumer preference observed by the firms. We infer that higher taste implies a lack of price sensitivity which induces firms to increase their markups.

Table 4: The Effects of Taste and Quality on Markups

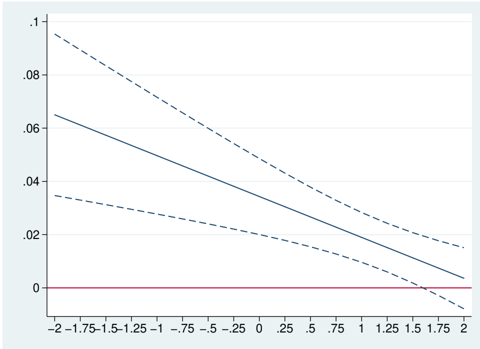
	(1)	(2)	(3)
log Distance$_j$	0.015***	0.031***	
	(0.005)	(0.007)	
log Tariffs$_{vjt}$	−0.006	−0.004	0.052***
	(0.005)	(0.006)	(0.010)
Taste$_{ivjt}$	0.025***	0.015***	0.012***
	(0.003)	(0.003)	(0.003)
Quality$_{iv}$	0.171***		
	(0.005)		
log GDP$_{jt}$	0.006	0.002	
	(0.004)	(0.004)	
log (GDP/cap)$_{jt}$	0.029***	0.025***	
	(0.003)	(0.004)	
log Distance$_j$ × Quality$_{iv}$		−0.015***	−0.013***
		(0.005)	(0.004)
log Distance$_j$ × Taste$_{ivjt}$		−0.009**	−0.001
		(0.004)	(0.004)
log Tariffs$_{vjt}$ × Quality$_{iv}$		0.003	0.006**
		(0.004)	(0.003)
log Tariffs$_{vjt}$ × Taste$_{ivjt}$		0.017***	0.009***
		(0.003)	(0.003)
Observations	138,994	119,709	119,709
R-squared	0.486	0.712	0.715
Firm-year fixed effects	*Yes*	*No*	*No*
Firm-product-year fixed effects	*No*	*Yes*	*Yes*
Importer-year fixed effects	*No*	*No*	*Yes*

Notes: The dependent variable is the log f.o.b. unit value calculated at the HS-8 digit product level. All regressions are performed using ordinary least squares estimation. Robust standard errors clustered at the destination-time dimension indicated between parentheses. ***, **, * denote significance at 1%, 5% and 10% respectively. Intercepts included but not reported.

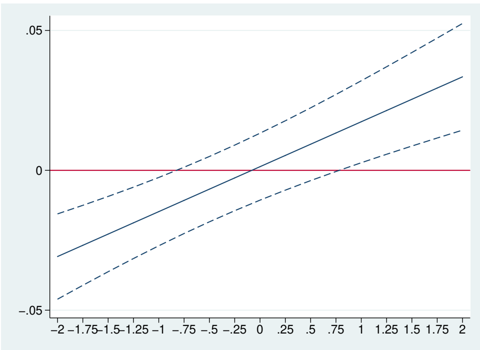
Based on the estimates of column (3), Panels (a) and (b) of Figure (1) plot the distance elasticities between the 5th and 95th percentile of taste and quality levels and their confidence intervals. At the mean value of taste, the distance elasticity is equal to 0.033. It is equal to 0.054 at the 5th percentile of the distribution of taste, and falls to 0.016 at the 95th percentile. Panels (c) and (d) of Figure (1) plot the tariff elasticities between the 5th and 95th percentile of taste and quality and their confidence intervals. The tariff elasticity is equal to 0.001, and statistically insignificant at the mean value of taste, while it is statistically insignificant all along the distribution of our quality measure. The elasticity increases from -0.026 at the 5th percentile of the distribution of taste to 0.025 at the 95th percentile. For taste levels above the 80th percentile the tariff elasticity becomes positive and statistically significant. This means that the dampening effect of taste overcompensates the effects from higher ad valorem tariffs such that firms even raise their markups in countries that impose higher tariffs.



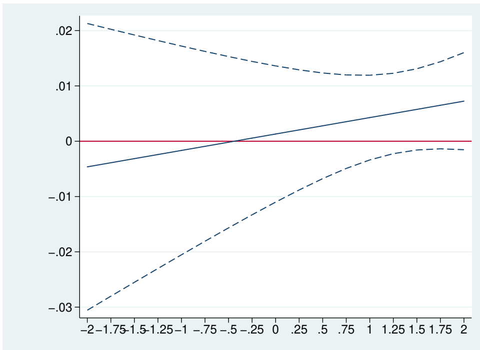
(a) Distance elasticity w/r to taste



(b) Distance elasticity w/r to quality



(c) Tariff elasticity w/r to taste



(d) Tariff elasticity w/r to quality

Figure 1: Bilateral distance and tariff elasticities by taste and quality level based on estimates in column 2 of Table 4. Panel (a) and (b) show both marginal distance effects, (c) and (d) refer to marginal tariff effects.

5.1 Effects on Export Volumes

We also explore whether our measures deliver consistent estimates of trade elasticities with respect to distance and tariffs depending on the degree of vertical and horizontal product differentiation. We should expect reciprocal results as taste and quality should lower the trade cost effects associated with higher tariffs and distance. To identify the effect of tastes and quality on international trade flows we replace the dependent variable by firm-level export volumes to run a gravity-like estimation. We perform within OLS estimations by including firm-product-time fixed effects $D_{iv,t}$ to control for unobserved time-varying characteristics of the firm products which forces the identification to utilise the variation in exported volumes across the destinations for a given firm-product-year triplet. And next, we structurally control for market-specific characteristics $D_{j,t}$ in destination country j which absorbs the direct effects of distance from the regression.

We first identify the homogeneous effects of bilateral distance and tariffs, as we estimate Equation (5) without the four interaction terms with quality and taste. For this specification, we again replace the firm-product-time fixed effects by firm-time dummy variables to control for time-varying characteristics of the exporters such as size and productivity so that we identify the variation in exports volumes across products and destinations for a given exporter at a given time.

Columns (1) of Table (5) reports OLS estimates. The results for the homogeneous trade cost effects in the first column show that export volumes fall with distance and tariffs. Taste and quality impact trade volumes significantly and positively meaning that exports are higher for high-quality and preferential types of produces. The effects are statistically significant and distinct from each other.

We now investigate the heterogeneous effects of bilateral distance and tariffs on the intensive margin of exports differentiated by quality and taste. The results for the heterogeneous effects are reported in column (2) & (3). The inclusion of the firm-product-time dummy absorbs the direct effect of quality, and the direct taste effect remains significant and positive throughout both specifications.

For products of higher taste and higher quality, we observe a dampening effect over longer distances such that the estimate for the coefficient on the interaction is positive and significant. The magnitude of the negative distance effect falls with taste and quality, however, the interaction coefficients are again statistically equal. The magnitude of the tariffs elasticity increases with both demand shifters (column 2 & 3) as f.o.b. prices fall less for products of higher appeal and higher quality. These heterogeneities across taste and quality levels remain robust to including destination-time fixed effects, which increases the precision of the estimate on the interaction between tariffs and taste (column 3).

Exports fall with distance and tariffs through c.i.f. price increases but also indirectly through the f.o.b. price. Higher-grade produces are shipped over longer distances (Alchian and Allen, 1964; Hummels and Skiba, 2004). As empirically shown in the previous section, the f.o.b. price rises less for higher quality goods, and therefore exports fall less compared to lower quality exports. Tariffs increase the c.i.f. price directly but also reduce it by lowering the f.o.b. price. As the f.o.b. price falls less for higher quality goods, their exports fall more than lower quality exports.

While the distance increases the c.i.f. price directly and indirectly via the f.o.b. price. Due to the Alchian-Allen effect the f.o.b prices rises less for higher quality goods, therefore their exports fall less compared to lower quality goods. Quantities also fall with tariffs, especially for higher quality exports.

Table 5: The Effects of Taste and Quality on Export Volumes

	(1)	(2)	(3)
log Distance$_j$	−0.005***	−0.009***	
	(0.001)	(0.002)	
log Tariffs$_{vj,t}$	0.002**	0.001	−0.010***
	(0.001)	(0.001)	(0.002)
Taste$_{ivj,t}$	0.676***	0.683***	0.684***
	(0.001)	(0.001)	(0.001)
Quality$_{iv}$	0.662***		
	(0.001)		
log GDP$_{j,t}$	−0.002	0.001	
	(0.001)	(0.001)	
log (GDP/cap)$_{j,t}$	−0.011***	−0.010***	
	(0.001)	(0.001)	
log Distance$_j$ × Quality$_{iv}$		0.003**	0.003**
		(0.001)	(0.001)
log Distance$_j$ × Taste$_{ivj,t}$		0.002**	0.000
		(0.001)	(0.001)
log Tariffs$_{vj,t}$ × Quality$_{iv}$		−0.001	−0.002**
		(0.001)	(0.001)
log Tariffs$_{vj,t}$ × Taste$_{ivj,t}$		−0.005***	−0.002***
		(0.001)	(0.001)
Observations	135,723	116,301	116,301
R-squared	0.959	0.979	0.979
Firm-year fixed effects	*Yes*	*No*	*No*
Firm-product-year fixed effects	*No*	*Yes*	*Yes*
Destination-year fixed effects	*No*	*No*	*Yes*

Notes: The dependent variable is the log export quantity at the HS-8 digit product level. All regressions are performed using ordinary least squares estimation. Robust standard errors clustered at the destination-time dimension indicated between parentheses. ***, **, * denote significance at 1%, 5% and 10% respectively. Intercepts included but not reported.

Our identification strategy controls for some endogeneity concerns due to a potential omitted variable bias. However, international trade and globalization change the relative prices of food products in the importing country which may alter consumption patterns of persons who have not had substantial exposure to some food produce. If taste for newly introduced food produce is acquired in reaction to a sudden growth in imports of a product from a particular exporting firm, then endogeneity due to reverse causality could bias our estimates. In this case, reverse causality may cause our OLS estimation to produce an upwardly biased estimate of the population parameter and therefore to overstate the effect of taste. The optimal solution to address this form of endogeneity is to estimate instrumental variable regression. Because our variable of interest is time-varying across destination countries we instrument our measure of taste with the time-invariant measure used in Aw-Roberts et al. (2021) and Kohler and Wunderlich (2021) which is based on the similarity between national dishes between any two countries.[9] The choice of this instrument stems from that argument that tastes may also be persistent as the evolution is primarily determined by past consumption of particular food items which are locally available (Aizenman and Brooks, 2008; Atkin, 2013). Our main findings are confirmed and the estimated effects are smaller in economic magnitude. This gives further weight to our estimated measure of the time-varying taste underlining the notion that consumer taste in importing countries evolves more dynamically.

Table 6: Instrumental variable regressions

	(1)	(2)	(3)
Taste_{ivjt}	0.626***	0.652***	0.652***
	(0.011)	(0.008)	(0.013)
log Distance_j	−0.005***	−0.006***	−0.099***
	(0.002)	(0.001)	(0.030)
log Tariffs_{vjt}	0.006***	0.004***	0.013***
	(0.001)	(0.001)	(0.003)
Quality_{iv}	0.674***		
	(0.002)		
log GDP_{jt}	0.012***	0.009***	−0.0001***
	(0.003)	(0.002)	(0.005)
log $(\text{GDP/cap})_{jt}$	−0.002	−0.004***	0.010*
	(0.002)	(0.002)	(0.006)
log $\text{Distance}_j \times \text{Taste}_{ivjt}$			0.340***
			(0.112)
log $\text{Tariffs}_{vjt} \times \text{Taste}_{ivjt}$			−0.126***
			(0.036)
log $\text{Distance}_j \times \text{Quality}_{iv}$			0.070***
			(0.022)
log $\text{Tariffs}_{vjt} \times \text{Quality}_{iv}$			−0.018***
			(0.005)
Observations	133,153	114,299	114,299
Centered R-squared	0.93	0.9561	0.833
Firm-year fixed effects	*Yes*	*No*	*No*
Firm-product-year fixed effects	*No*	*Yes*	*Yes*

Notes: The dependent variable is the log export quantity at the HS-8 digit product level. All regressions are performed using ordinary least squares estimation. Robust standard errors clustered at the destination-time dimension indicated between parentheses. ***, **, * denote significance at 1%, 5% and 10% respectively. Intercepts included but not reported.

[9] We show results for the time-invariant taste measure in Table A.1 in the appendix.

6 Concluding remarks

This paper investigates the link between taste and markups for the case of the food processing sector in Italy, based on a data set of all Italian exporters of cheese and processed meat over the period from 2013 to 2019. Our analysis is particularly important to understand the pricing strategy of exporters across international markets. Because our findings demonstrate that the variation in export prices across markets is driven by differences in taste conditional on quality, we therefore infer that firms' pricing strategy has direct implications for consumer welfare as higher taste implies a lack of price sensitivity which induces firms to charge higher markups.

We estimate taste alongside quality from the residual export variation of Italian firms. While quality marks the vertical component, consumer taste constitutes the demand shifter that is specific to each export market. We use these measures to explain the variability of export prices charged for each firm-product at a given point in time. We identify the markup variation by following the empirical approach laid out by Chen and Juvenal (2020) as we control for quality and firm-product-time-specific effects in our regressions.

Our finding on the positive relationship between firms' markup and country-level taste demonstrates that firms indeed exploit price insensitivity. With respect to the impact of distance on markups, our analysis reveals that firms increase their markups with distance but the magnitude of the effect decreases with taste and quality. Both have the same amount of influence on the distance elasticity. For higher tariffs, however, firms lower their markups to compensate for lower demand if export markets exhibit a lower taste for their products. Our analysis also reveals that firms may charge higher markups in high-tariff countries without compromising on sales if the appreciation for their products is high. That shows that price setting moves alongside consumer taste observed by the firm.

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Table A.1: Trade cost effects with time-invariant taste measure

	(1)	(2)	(3)
log Distance_j	−0.029**	−0.030**	−0.025
	(0.011)	(0.013)	(0.018)
log Tariffs_{vjt}	0.025***	0.030***	0.057***
	(0.006)	(0.006)	(0.008)
Food Similarity_j	−0.041***	−0.047***	0.056***
	(0.006)	(0.008)	(0.008)
Quality_{iv}	0.684***		
	(0.008)		
log GDP_{jt}	0.199***	0.204***	0.234***
	(0.011)	(0.011)	(0.013)
log $(\text{GDP/cap})_{jt}$	0.092***	0.104***	0.093***
	(0.010)	(0.011)	(0.013)
log Distance_j × Quality_{iv}			0.008
			(0.015)
log Tariffs_{vjt} × Quality_{iv}			−0.024***
			(0.009)
log Distance_j × Food Similarity_j			0.042**
			(0.008)
log Tariffs_{vjt} × Food Similarity_j			−0.000
			(0.003)
Observations	133,153	114,299	114,299
R-squared	0.539	0.546	0.565
Firm-year fixed effects	*Yes*	*No*	*No*
Firm-product-year fixed effects	*No*	*Yes*	*Yes*

Notes: The dependent variable is the log export quantity at the HS-8 digit product level. All regressions are performed using ordinary least squares estimation. Robust standard errors clustered at the destination-time dimension indicated between parentheses. ***, **, * denote significance at 1%, 5% and 10% respectively. Intercepts included but not reported.

Table A.2: The Markup Effects of Taste and Quality of Cheese

	(1)	(2)	(3)
log Distance$_j$	0.017***	0.035***	
	(0.004)	(0.005)	
log Tariffs$_{vjt}$	−0.012***	−0.013***	0.072**
	(0.003)	(0.004)	(0.032)
Taste$_{ivjt}$	0.012***	−0.000	−0.001
	(0.003)	(0.003)	(0.004)
Quality$_{iv}$	0.127***		
	(0.005)		
log GDP$_{jt}$	0.013***	0.008**	
	(0.004)	(0.004)	
log (GDP/cap)$_{jt}$	0.027***	0.023***	
	(0.004)	(0.004)	
log Distance$_j$ × Quality$_{iv}$		−0.018***	−0.014***
		(0.004)	(0.004)
log Distance$_j$ × Taste$_{ivjt}$		−0.011***	−0.005
		(0.004)	(0.004)
log Tariffs$_{vjt}$ × Quality$_{iv}$		0.011***	0.009***
		(0.003)	(0.003)
log Tariffs$_{vjt}$ × Taste$_{ivjt}$		0.013***	0.008**
		(0.004)	(0.003)
Observations	104,355	87,958	87,958
R-squared	0.455	0.719	0.722
Firm-year fixed effects	*Yes*	*No*	*No*
Firm-product-year fixed effects	*No*	*Yes*	*Yes*
Importer-year fixed effects	*No*	*No*	*Yes*

Notes: The dependent variable is the log f.o.b. unit value calculated at the HS-8 digit product level. All regressions are performed using ordinary least squares estimation. Robust standard errors clustered at the destination-time dimension indicated between parentheses. ***, **, * denote significance at 1%, 5% and 10% respectively. Intercepts included but not reported.

Table A.3: The Effects of Taste and Quality on Export Volumes of Cheese

	(1)	(2)	(3)
log Distance$_j$	−0.005***	−0.011***	
	(0.001)	(0.002)	
log Tariffs$_{vjt}$	0.004***	0.003***	−0.022**
	(0.001)	(0.001)	(0.010)
Taste$_{ivjt}$	0.669***	0.673***	0.674***
	(0.001)	(0.001)	(0.001)
Quality$_{iv}$	0.644***		
	(0.002)		
log GDP$_{jt}$	−0.004***	−0.002**	
	(0.001)	(0.001)	
log (GDP/cap)$_{jt}$	−0.007***	−0.006***	
	(0.001)	(0.001)	
log Distance$_j$ × Quality$_{iv}$		0.004***	0.004***
		(0.001)	(0.001)
log Distance$_j$ × Taste$_{ivjt}$		0.003**	0.002
		(0.001)	(0.001)
log Tariffs$_{vjt}$ × Quality$_{iv}$		−0.003***	−0.003***
		(0.001)	(0.001)
log Tariffs$_{vjt}$ × Taste$_{ivjt}$		−0.004***	−0.003***
		(0.001)	(0.001)
Observations	104,355	87,958	87,958
R-squared	0.965	0.983	0.983
Firm-year fixed effects	*Yes*	*No*	*No*
Firm-product-year fixed effects	*No*	*Yes*	*Yes*
Destination-year fixed effects	*No*	*No*	*Yes*

Notes: The dependent variable is the log export quantity at the HS-8 digit product level. All regressions are performed using ordinary least squares estimation. Robust standard errors clustered at the destination-time dimension indicated between parentheses. ***, **, * denote significance at 1%, 5% and 10% respectively. Intercepts included but not reported.

Table A.4: The Markup Effects of Taste and Quality of Ham

	(1)	(2)	(3)
log Distance$_j$	0.020**	0.035***	
	(0.008)	(0.010)	
log Tariffs$_{vjt}$	0.006	−0.002	0.031
	(0.010)	(0.011)	(0.026)
Taste$_{ivjt}$	0.047***	0.047***	0.045***
	(0.005)	(0.006)	(0.005)
Quality$_{iv}$	0.253***		
	(0.010)		
log GDP$_{jt}$	−0.015*	−0.017**	
	(0.008)	(0.008)	
log (GDP/cap)$_{jt}$	0.031***	0.028***	
	(0.005)	(0.005)	
log Distance$_j$ × Quality$_{iv}$		−0.006	0.001
		(0.007)	(0.007)
log Distance$_j$ × Taste$_{ivjt}$		−0.007	0.010
		(0.006)	(0.006)
log Tariffs$_{vjt}$ × Quality$_{iv}$		0.003	−0.003
		(0.005)	(0.006)
log Tariffs$_{vjt}$ × Taste$_{ivjt}$		0.032***	0.010*
		(0.005)	(0.006)
Observations	34,642	31,753	31,748
R-squared	0.552	0.699	0.709
Firm-year fixed effects	*Yes*	*No*	*No*
Firm-product-year fixed effects	*No*	*Yes*	*Yes*
Importer-year fixed effects	*No*	*No*	*Yes*

Notes: The dependent variable is the log f.o.b. unit value calculated at the HS-8 digit product level. All regressions are performed using ordinary least squares estimation. Robust standard errors clustered at the destination-time dimension indicated between parentheses. ***, **, * denote significance at 1%, 5% and 10% respectively. Intercepts included but not reported.

Table A.5: The Effects of Taste and Quality on Export Volumes of Ham

	(1)	(2)	(3)
log Distance$_j$	−0.006**	−0.011***	
	(0.002)	(0.003)	
log Tariffs$_{vjt}$	−0.002*	0.0006	−0.010
	(0.003)	(0.004)	(0.008)
Taste$_{ivjt}$	0.694***	0.694***	0.695***
	(0.001)	(0.002)	(0.002)
Quality$_{iv}$	0.596***		
	(0.003)		
log GDP$_{jt}$	0.005*	0.006**	
	(0.003)	(0.002)	
log (GDP/cap)$_{jt}$	−0.010***	0.009***	
	(0.002)	(0.002)	
log Distance$_j$ × Quality$_{iv}$		0.002	−0.004
		(0.002)	(0.002)
log Distance$_j$ × Taste$_{ivjt}$		0.002	−0.003
		(0.002)	(0.002)
log Tariffs$_{vjt}$ × Quality$_{iv}$		−0.001	0.001
		(0.001)	(0.002)
log Tariffs$_{vjt}$ × Taste$_{ivjt}$		−0.010***	−0.003*
		(0.002)	(0.002)
Observations	34,642	31,753	31,748
R-squared	0.958	0.973	0.974
Firm-year fixed effects	*Yes*	*No*	*No*
Firm-product-year fixed effects	*No*	*Yes*	*Yes*
Destination-year fixed effects	*No*	*No*	*Yes*

Notes: The dependent variable is the log export quantity at the HS-8 digit product level. All regressions are performed using ordinary least squares estimation. Robust standard errors clustered at the destination-time dimension indicated between parentheses. ***, **, * denote significance at 1%, 5% and 10% respectively. Intercepts included but not reported.