CESifo WORKING PAPERS

7580
2019

March 2019

The importance of consumer taste in trade

Bee Yan Aw, Yi Lee, Hylke Vandenbussche

CESifo

Impressum:

CESifo Working Papers
ISSN 2364-1428 (electronic version)
Publisher and distributor: Munich Society for the Promotion of Economic Research - CESifo GmbH
The international platform of Ludwigs-Maximilians University's Center for Economic Studies and the ifo Institute
Poschingerstr. 5, 81679 Munich, Germany
Telephone +49 (0)89 2180-2740, Telefax +49 (0)89 2180-17845, email office@cesifo.de
Editor: Clemens Fuest
www.cesifo-group.org/wp

An electronic version of the paper may be downloaded
· from the SSRN website: www.SSRN.com
· from the RePEc website: www.RePEc.org
· from the CESifo website: www.CESifo-group.org/wp

CESifo *Working Paper No. 7580*
Category 12: Empirical and Theoretical Methods

The importance of consumer taste in trade

Abstract

This paper documents the importance of consumer taste in trade flows using Belgian firm-product customs data by destination. We identify consumer taste through the use of a control function approach and estimate it jointly with other demand parameters using a very flexible demand specification. Consumer taste is identified for every trade ow. The results show that taste decreases in distance but this relationship is not monotonic. The contribution of consumer taste to actual export revenue ranges between 1-31% depending on the product category in the food industry. Overall, the demand shifters, taste and product quality explain twice as much of the variation in export revenues than cost.

JEL-Codes: F120, F140.

Keywords: tastes, quality, productivity, exports, firm-product.

*Bee Yan Aw**
The Pennsylvania State University
USA - University Park, PA 16802
byr@psu.edu

Yi Lee
National Tsing Hua University
Hsinchu, Taiwan 300
ylee@mx.nthu.edu.tw

Hylke Vandenbussche
University of Leuven (KU Leuven)
Belgium – 3000 Leuven
hylke.vandenbussche@kuleuven.be

*corresponding author

March 21, 2019
We thank especially thank Jonathan Eaton, Kala Krishna, Mark Roberts, Kim Ruhl, James Tybout and Stephen Yeaple, Lee Branstetter, Gabriel Felbermayr, Keith Head, Brian Kovak, Giovani Peri, Saso Polanec, Larry Qiu and other seminar participants at Penn State, Hong Kong University (HKU), Carnegie-Mellon amongst others. We thank the National Bank of Belgium for customs data.

1 Introduction

Recent papers in international trade have documented the importance of the demand side in explaining firm-level variation in revenue and export sales (Feenstra and Romalis (2014), Foster et al. (2016), Fan et al. (2016), Hottman et al. (2016), Roberts et al. (2018)). In this paper, we go beyond general firm-level appeal on the demand side by identifying two separate demand shifters for each product within the firm. The role of consumer taste in demand is analyzed separately from the role of product quality in demand. For this purpose we use data on trade flows across countries for the same products. This allows us to identify consumer taste as a separate source of variation in the data, clearly separating it from quality, market size, competition effects, distribution costs and markups which may also vary by destination.

There are several reasons for focusing our attention on consumer tastes. First, when firms export their products abroad, many keys to success are at the firm-product level, such as the marginal cost of production and the product quality.[1] But some critical determinants for success seem to go beyond cost and quality issues. For example, the export of horse meat to the United Kindgom (UK) or the United States (US) is unlikely to be successful, even when the quality of the horse meat is very high. Similarly, exporting pork to Muslim countries is likely to have limited export success for religious reasons, regardless of the quality of the pork. Hitherto this source of consumer heterogeneity has not been quantified. A second reason to study consumer taste is that over the past decade, firms marketing budgets have risen steeply, while their expenditures on innovation and cost-saving technology has fallen.[2] A recent survey by Accenture of around 287 US manufacturing firms, indicated that 61% of responding firms reported that seeking nirvana through offshoring for costs and productivity reasons was no longer their priority. Instead, the priority of firms was to get closer to the consumer and therefore to demand..[3] For example, Nike has recently been setting up speed factories to

[1] Antoniades (2015); Gervais (2015); Fan, Li and Yeaple, (2016, 2018); Verhoogen (2008).

[2] *The Economist*, https://cdn.static-economist.com/sites/default/files/images/print-edition/20150829$_{W}BC$539*.png*

[3] http://www.areadevelopment.com/BusinessGlobalization/4-20-2011/backshoring-us-manufacturing-labor-costs1266672.shtml

produce sneakers in the US again but tailored to local tastes. Adidas has done the same in Germany.[4] Thus, understanding the role of consumer taste can potentially shed new light on the location strategies that firms pursue which in turn affect the direction and magnitude of their trade flows.

A third reason is that consumer taste affects sales, revenues and hence firm growth. It is, therefore important to understand its role relative to other determinants of profits. This is an important step forward in the trade literature and potentially also in the industrial economics literature that studies firm growth and its underlying determinants. Consumer taste as a micro-economic determinant of exporting will also affect macroeconomic outcomes since aggregate exports are an important component of country-level GDP (Gabaix (2016); Giovanni and Levchenko (2012)). For this reason too, understanding the role of taste is important.

The current literature on quantifying taste in trade is limited to specific products. The importance of taste has been demonstrated for a few specific products using information on product-specific attributes by Atkin (2013) for rice and Cosar et al. (2018) for cars. Some other papers in the literature have used existing and external measures of quality such as Crozet et al. Mayer (2012) for French champagne and Armstrong and Chen (2009) for wine. But only for relatively few food products, such external measures exist. For most food products, no taste or quality indicators are available.

Our approach to identifying consumer taste does not use a demand residuals approach since this would potentially be confounding taste with other unobservable demand and cost shifters. Instead we want to tease out the part of the demand residual that is likely to best capture consumer taste. For this purpose, we adopt a control function approach with variables that capture different dimensions of consumer heterogeneity related to tastes across countries. In the control function for consumer taste, we include variables which have been successfully used in the international business and gravity literature, such as common spoken languages, religions,

[4] https://www.forbes.com/sites/retailwire/2017/09/27/nike-can-make-you-custom-sneakers-in-under-an-hour/#29d2a8ce72f6

culture and nationalities which are likely to affect taste.

There is an abundance of anecdotal evidence to suggest that wherever people share the same language, religion or cultural history, there is strong taste overlap.[5] For example, sea cucumbers are a delicacy in the Chinese-speaking part of the world but rank low in the taste of Westerners. Cheese is loved in many English-speaking countries, but many Chinese people find its taste appalling. Food habits in Australia are closer to the UK and the US than to Asia, clearly illustrating that culture can be more important than physical distance for taste since Australia is closer to Asia. Immigration and overlap in nationalities seems also associated with food habits. For example, pizza which originated from Naples in Italy, came to the US in the 19th century with the arrival of Italian immigrants.[6] Similarly, it was an influx of German and Italian immigrants into Australia in the 1950s that helped to expand the wine industry because they were adept to drinking European varietals.[7] The pizza and wine example illustrate how local tastes for food can be influenced by foreign immigrants. Common religion between countries may also generate a common taste. An example of this can be found in the attitudes towards alcohol in protestant versus Roman catholic countries. Northern European cultures which tend to be Protestant, perceive many problems related to alcohol which are expressed in numerous public policies to control its consumption and have low alcohol consumption rates compared to the more Southern European Roman Catholic cultures.[8]

In short, there is an overwhelming number examples that justify the use of common language, religion, culture and nationalities indicators in a control function approach for consumer taste. In this paper we apply it to food products but in principle our approach can be applied to any product category where taste is important. Combining it with information from our database, we generate a measure of consumer taste for every firm-product sold in every country. Our empirical identification of consumer taste closely follows the methods adopted in the

[5] Abbott Nutrition,"Ten Surprising Things that Affect Your Taste," August, 2017.

[6] https://slice.seriouseats.com/2006/02/a-slice-of-heaven-a-history-of-pizza-in-america.html

[7] http://sedimentality.com/wine-history/the-history-of-wine-in-australia/

[8] http://www.indiana.edu/ engs/articles/cathprot.htm

productivity literature. Similar to productivity, consumer taste is an unobservable in the data and can thus be proxied in the same way.[9]

We account for product quality in the demand specification also by using a control function approach. We follow the literature in this respect and proxy quality with imported input prices at the firm level, income levels of the destination countries and firm market shares (Bastos, Silva and Verhoogen (2018); Khandelwal (2010), De Loecker et al. (2016)). Higher quality outputs are positively correlated with input prices, income levels and market shares in a given destination country.

We estimate demand functions on trade data of 1,802 firm-product exports (CN8-level) of Belgian firms in eight different food categories using export quantities and prices by firm-product-destination. Since CN8 products are defined at a more aggregate level than the scanner data in Hottman et al. (2016), our product definitions are less refined. However, the advantage of our trade data is that we have destination-specific information on consumer purchases which allows us to study very different consumers across countries. The large variation in international consumer heterogeneity will help us to identify taste differences.

Finally, once we identify consumer taste and product quality as structural parameters, we then back out marginal cost from prices. Based on the joint demand and supply parameters we perform a decomposition of export revenues to assess the relative importance of taste in explaining firms' export revenues relative to other determinants like quality and cost, market size and markups. We pursue our analysis at the firm-product level, conditional on firms' export market participation. Our findings indicate that consumer taste is an important demand shifter, separate from quality and about equally important to marginal cost. Consumer taste accounts between 1-31% of actual export revenue depending on the product category.[10]

[9]This technique has been widely used in the productivity literature to avoid endogeneity of the inputs in the production function (Levinsohn and Petrin(2003); Olley and Pakes (1996).

[10]We know that the main contribution of the demand side lies at the intensive margin from the work of Roberts et al. (2018) who assess the role of firm-level demand heterogeneity in export participation. By conditioning on export participation we ignore fixed entry costs as a source of variation in trade decisions which was studied earlier by Aw et al. (2011).

The aim of our paper is to develop quite general quality and taste measures for a wide spectrum of traded food products, including those where quality and taste rankings do not exist. We propose a method that is easy to replicate and does not require any functional form assumptions on the demand or cost side. This will then allow researchers to study demand related aspects in many more markets in the future.

We structure the rest of the paper as follows. The next section lays out the empirical identification strategy in general. We discuss all the potential issues that can arise when estimating demand with and without the use of control functions and how we deal with them. Section 4 then discusses the construction and performance of the control functions. Next, in section 5 we show how marginal cost is backed out from price data after having estimated the full set of demand parameters but without using any functional form assumptions. Finally in section 6, we engage in a decomposition of trade flows.

2 General Demand Specification

2.1 Identification

In this section, we lay out the empirical identification of the demand parameters of the model and the potential endogeneity issues that we face. We leave the detailed discussion of the control functions to the next section.

Consumers in country d have the following general demand function Q_{jidt} for product i exported by firm j in year t:

$$q_{jidt} = Q_{jidt}[p_{jidt}, \lambda(X')_{jidt}, \delta(Y')_{jidt}, \gamma_{idt}, \epsilon_{jidt}] \tag{1}$$

where q_{jidt} is the quantity of product i sold by firm j that is consumed in country d and year t, $\lambda(X')$ represents the control function for consumer taste and $\delta(Y')$ represents the control functions for quality where X' and Y' are vectors of variables that proxy taste and quality respectively. We apply the insights from Levinsohn and Petrin (2003), Olley and Pakes (1996) and others by replacing the unobservables $\lambda(.)$ and $\delta(.)$ with observables using polynomial functions to estimate the coefficients which are then used to predict an index of quality and taste at $jidt$ level.[11] p_{jidt} is the price (f.o.b.) of product i provided by firm j exclusive of transport cost and distribution cost. Firm-level demand in a destination can thus vary due to the export price, the quality offered, the local taste as well as destination specific characteristics such as market size and market structure of the destination, captured by γ_{idt}, a set of product-country-year fixed effects. Given that our data are trade flows originating from Belgium γ_{idt} also captures product-country specific distance and distribution costs. Finally ϵ_{jidt} is the residual term which captures additional demand and cost shifters. But there could still be important firm-product variation of trade cost (transport and distribution costs and exchange rate fluctuations) and markups potentially present in the residual (ϵ_{jidt}) that could plague the identification of the demand parameters.

To address this endogeneity problem, we need to instrument for price. The instrument for price should be highly correlated with the export price to destination d, but should be uncorrelated with the part of the transport cost still present in the residual term. An instrument that satisfies these conditions is an average price of the same firm-product (ji), but exported to distant destinations. These destinations should not be in the proximity of country d because then the firm-product transport cost (τ_{jidt}) will be too similar and correlated between nearby countries. For this reason our instrument for price must be such that it represents the average price for the same firm-product that are at least 1000 km apart from destination d. This will ensure that the average price used as an instrument does not reflect firm-product transport costs

[11]By using a control function approach for consumer taste and product quality we avoid the endogeneity bias arising from correlation of these variables with the residual in the demand function. For instance, if not properly controlled for, taste will enter the residual of the demand function, rendering $E(p_{jidt}, \epsilon_{jiddt}) = 0$, affecting price as firms may set a higher price for products with a stronger taste. This would result in a misspecification of demand and biased coefficients.

to destination d. Or put differently we ensure that our instrument is such that $E(p_{jikt}, \tau_{jidt}) = 0$.

There is however another more subtle issue that can arise and which may still generate endogeneity. Suppose that the pass-through rates of costs (exchange rates, markups or other) into prices would systematically vary with the size of a firm in a destination (Amiti et al. (2014), Atkinson and Burstein (2008)). This could potentially undermine our instrumentation strategy because the price in another market would not necessarily get rid of the size effect. Whether a firm-product market share is positively correlated across markets is ultimately an empirical question. If being large means that pass-through rates are significantly lower than for products with small market shares, than our instrumented price would not correct for that and the instrumented price could still be correlated with the residual of equation (1).

For this purpose, we verify the bilateral correlations between firm-product ji's market size across destination markets. We find it to be very low and not higher than 0.2. Thus while a firm-product ji can be large in one market, it may end up being small in another market. This suggests that our instrument is still a good one, because the instrumented price will be characterized by a different pass-through rate than the price in destination d and therefore the instrumented price is unlikely to correlate with the residual, ϵ_{jidt}.

Estimation of the demand function in equation (1) translates in the following empirical specification which we estimate with a two-stage least squares (2SLS) estimation to obtain consistent estimates of the price coefficient and the consumer taste and quality index.

$$\ln q_{jidt} = \gamma_{idt} - \sigma_{id} \ln p_{jidt} + \ln\hat{\lambda}_{jidt} + \ln\hat{\delta}_{jidt} + \epsilon_{jidt} \tag{2}$$

where q_{jidt} is the quantity of export sold of product i that firm j sold in country d and year t. p_{jidt} is the f.o.b. price of the firm's product i that exports to country d. σ_{id} represents the price elasticities of demand which vary across destination country and (HS4)product markets,[12] γ_{idt} represents a set of product(HS4)-country-year fixed effects. $\ln\hat{\delta}_{jidt}$ is the estimated

[12]We estimate demand elasticities σ by destination both at the HS4 and HS6 product-level. Results hold

product quality index evolving from the control function for quality and $\ln\hat{\lambda}_{jidt}$ is the estimated local consumer taste index predicted by the control function for taste. ϵ_{jidt} accounts for any unobserved demand shock correlated with price as well as white noise.

Our instrument for price is defined as:

$$lnPIV_{jidt} = \frac{1}{N_{jit}} \sum_{k \in S_{jit}, k \neq d} lnp_{jikt}, \tag{3}$$

where S_{jit} is the set of the remote countries that firm-product ji is exported to in year t and N_{jit} is the number of export destinations in addition to country d for the firm-product ji.

2.2 Control Function for Consumer Taste

Control functions have long been used to account for unobservable productivity shocks in the estimation of production function coefficients (Levinshohn and Petrin (2003); Olley and Pakes (1996)). Here we estimate demand functions where we introduce a control function for consumer taste. For this purpose we define a polynomial function over observables that capture consumer heterogeneity across countries. Our control function for consumer taste is then embedded in the demand function and estimated jointly with other demand parameters. Put differently, to control for the unobservable consumer taste in equation (2) we proxy taste by using a control function approach, $ln\hat{\lambda} = \lambda(X')$ where X' is a set of proxy variables that capture the taste of consumers in country d for variety ji. The variables that we include for this purpose are threefold.

First, we include a country-level dimension of consumer heterogeneity through the use of bilateral country-level indicators on language, religion, nationality and cultural distance that have been used in the international business and early gravity literature. We can not just use a destination level trade share e.g. Belgian trade to China to capture the taste for Belgian goods

independent of the product market definition for σ but we obtain more observations at HS4 level.

in China, since this would be confounding taste with other factors such as with market size of the destination country. A normalization of the trade share would not solve this because we already include product(HS4)-country fixed effects in the demand function, which would make destination-level trade shares drop out in the estimation of the demand function. Instead we use a set of exogenous indicators which each capture a different aspect of consumer heterogeneity.

Second, we include a product-level dimension by accounting for the popularity of a specific Belgian product in the destination compared to other destinations e.g. the share of Belgian chocolates (all brands) going to China versus the rest of the world.

Third, we include a firm-level dimension e.g. how successful a firm is in selling its product to a particular destination compared to other destinations e.g. how much of a particular Belgian chocolate brand is shipped to China versus the rest of the world, where we normalize for the market size differences across destinations. This ultimately results in a firm-product-destination measure of consumer taste for every trade flow.

The business and in particular the marketing literature, extensively proxies for demand differences between countries by using indicators of cultural distance. One of the most frequently used indicators in this literature was originally developed by Hofstede (1980) and used extensively ever since.[13] Complementary but separately, the gravity literature has also pointed out a number of variables that capture important aspects of consumer heterogeneity across countries. These variables include common spoken languages and common religion between countries,[14] the extent of overlap between countries in nationalities[15] and the cultural distance between countries.[16]

For each of the four indicators e.g. common spoken language, common religion, common nationality and cultural distance, we construct a distribution for each indicator across destination countries. For the first three indicators, we construct bilateral country pair indices by

[13]Shenkar (2001), Beugelsdijk et al. (2017), Gollnhofer and Turkina (2015)
[14]Melitz (2008); Egger and Lassman (2012), Melitz and Toubal (2014); Egger and Toubal (2016)
[15]Felbermayer, Jung and Toubal (2010); Head and Ries (1998); Rauch and Trinidade (2002)
[16]Guiso et al. (2009); Felbermayer et al. (2010); Hofstede (1980), Kogut and Singh (1988)

using a method proposed by Egger and Toubal (2016). The bilateral indices reflect the closeness (or distance) in each dimension between any country pair cd. For example, to construct the closeness index between countries c and d in terms of common spoken languages (CL), we take the share of people that speak a language l in country c (s_{lc}) and multiply it by the share of people that speak the language l in country d (s_{ld}). Doing this for every language and summing over languages results in the Egger and Toubal (2016) indicator:

$$CL_{cd} = \sum_{l} s_{lc} s_{ld} \tag{4}$$

A high value for the indicator CL_{cd} indicates that countries c and d have similar distributions of spoken languages so that countries c and d are close in common spoken languages.[17] Based on the same logic, we construct the bilateral closeness indices for common religion (CR) and common nationality (CN). In Appendix A we document the construction of this closeness indicators more in detail.

For cultural distance, we turn to the Hofstede (1980) data. In this data there are 6 different dimensions of culture (i.e. individualism, power distance, masculinity, uncertainty avoidance, long-term orientation and indulgence) for every country. To turn them into one composite index on cultural distance between any country pair, we follow Kogut and Singh (1988). This consists in calculating the sum of the deviations along each of the six cultural dimensions between countries c and d (CD_{cd}) as follows:

$$CD_{cd} = \frac{1}{6} \sum_{k=1}^{6} \frac{(I_{kc} - I_{kd})^2}{V_k} \tag{5}$$

where I_{kc} represents the index for the k^{th} cultural dimension for country c, V_k is the variance

[17] Melitz and Toubal (2014) provide a set of variables to capture language difference across countries such as common official language, common spoken language, common native language, linguistic proximity. Some of these indices are highly correlated but common spoken language was found to have most explanatory power in gravity which is also what we use.

of the index of the k^{th} cultural dimension. $(I_{kc} - I_{kd})^2$ reflects the distance in the k^{th} cultural dimension between countries c and d and a large $(I_{kc} - I_{kd})^2$ indicates that countries c and d are dissimilar in the k^{th} cultural dimension. Since the range of each cultural dimension is different, we divide $(I_{kc} - I_{kd})^2$ by the variation of the k^{th} cultural dimension. CD_{cd} stands for the cultural difference between countries c and d and a high CD_{cd} indicates that countries c and d are less similar in culture. As such the CD index is like an average difference across the 6 dimensions of the Hofstede indicator. The squared term corrects for the sign of the differences between countries but it also gives a larger weight to larger differences which then weigh more in the average.

To obtain firm-product-country variation, we calculate the weighted indices of CL, CR, CN, CD across all country pairs c and d within a firm-product ji.

$$M^m_{jidt} = s_{jidt} \times m_{Belgium,d}, \quad \text{where} \;\; m = CL, CR, CN, CD \tag{6}$$

where $m_{Belgium,d}$ represents for the m^{th} dimension of the indices on consumer heterogeneity (i.e., closeness in language(CL), closeness in religions(CR), closeness in nationality components(CN), and distance in culture(CD)) between countries d and Belgium. The weight s_{jidt} is the ratio of firm j's sales revenue in product(CN8) i that is exported to country d to firm j's total export sales in product i, normalized by the market size of the destination country.[18] The weights, s_{jidt} account for the firm-product's sales distribution across destinations, normalized for market size of the destination. To illustrate how the weight s_{jidt} operates consider the trade in Belgian chocolates. While consumers in China and Japan are similar to each other, they are very different from Belgium for every indicator of consumer heterogeneity. Based on the country-level indicators, our control function attributes a low value of consumer taste to

[18] We normalize by weighting the firm-product sales share with the GDP of the destination relative to the GDP of a reference country. For example, if country A's GDP is half of country B's GDP then we multiply a firm's trade flow going to country B by one half. This accounts for the difference in market size between countries A and B.

all Belgian products shipped to both China and Japan. Now suppose that a particular brand Godiva chocolates sells 5% of its global sales to China and 15% to Japan, this results in a taste for Godiva chocolates that is stronger in Japan. Suppose that another Belgian chocolate firm, Neuhaus ships 50% of its chocolates to Japan, than the control function assigns a stronger taste to Neuhaus in Japan.

And finally, in the control function for taste, we also include a product-level share by destination, z_{idt}, to capture how much of a product i is shipped to a particular destination d. So even when China and Japan each get a similar share of Godiva chocolates shipped to them, if the share of (all) Belgian chocolates shipped to Japan is higher than to China, the taste for all Belgian chocolates in Japan, including Godiva, will be higher than in China. A normalization of z_{idt} is not warranted since the estimation of the control function for taste is embedded in the demand function (equation (2)) which already includes product(HS4)-destination FE(γ_{idt}) that controls for product market size effects in the destination. Also z_{idt} does not drop in the demand estimation since measured at more disaggregate product(HS6)-country level.

The control function for consumer taste $\lambda(X')_{jidt}$, then becomes a function of the weighted bilateral indices between Belgium and the country of destination for spoken language (CL), religion (CR), nationalities (CN) and cultural distance (CD) as follows:

$$ln\lambda(X')_{ijdt} = ln\lambda[s_{ijdt} * (CL, CR, CN, CD), z_{idt}] \tag{7}$$

which will be proxied by a polynomial in these variables.[19]

Table 4 shows that the bilateral correlations of all the four indices are very low. Nevertheless we experimented with applying a principal component analysis on the four indicators in order to capture the extent of overlap information between them. This was not the case. In fact, the taste measure that we obtain by using a control function for taste using the principal-component

[19]We use a polynomial of order two. The use of a higher order polynomial of degree three does not affect our results qualitatively

measure is highly correlated with the control function for taste where we just include the four bilateral indicators (0.83). Therefore we do not gain much by applying a principal-component method as suggested by the low correlations between the dimensions of consumer heterogeneity in Table 4. In the estimation of the demand function, each of the (CL, CR, CD, CN) indicators is significant either by itself or in its interaction terms.[20] Thus, if we can not reduce the number of consumer heterogeneity dimensions, since this would end up in the residual of the demand estimation, thereby lowering our estimate of taste.

The resulting taste index then consists of (i) a country-level dimension that captures the bilateral consumer heterogeneity between Belgium and the destination and that affects the taste index for all products shipped there; (ii) a product-level dimension that indicates how important a destination d is for a particular exported (CN8) product; (iii) a firm-product-level dimension normalized for market size, that reflects how much a destination d likes an individual firm's product relative to other destinations.

Taste indices can be compared for the same firm-product across destinations or for different firm-products within destinations. Taste indices can also be aggregated at the level of the product group or the level of the country and are comparable across products and countries.

In the data, the structural parameter for consumer taste is measured at the most disaggregate level of trade flows in the data e.g. firm-product (CN8)-destination level. But in some product categories this is asking a lot from the data as it requires a sufficient number of destinations that each firm-product is shipped to. As a robustness check, we also verify our results for consumer taste defined at the product-destination level of aggregation but results remain qualitatively the same.

[20]Regression results on the demand estimation are available upon request but will not be shown for brevity

2.3 Control Function for Quality

For quality, we follow the literature as to what variables to include in the control function, $\delta(Y')$. Firms are likely to export high-quality products to high-income countries (Schott (2004)). Therefore we interpret a higher GDP per capita of the destination country as an indication that a higher quality good is shipped there. (Bils and Klenow (2001) and Hallak (2006)).

Producing high-quality products generally requires high-quality inputs (Kugler and Verhoogen (2011), Bastos, Silva and Verhoogen (2018) and Fan et al. (2018)). To control for input prices we construct a firm-level import price index by calculating the weighted sum of import prices (unit values) of each imported product within a firm.[21] We normalize import prices of inputs by their (CN8)product mean to control for absolute price differences across products. Finally, high quality products may have a higher market share (Khandelwal (2010); De Loecker et al. (2016)).

Given that in the data, firms may export a product i to several countries other than country d, we use the weighted sum GDP per capita across all countries($WGDP_{jit}$) that a firm-product pair is exported to. As weights we use the sales share of a firm-product ij to country d in the total exports of firm-product ij. This measure accounts for the idea that the higher the average GDP of all the countries that a firm-product is exported to, the higher the quality of the product.

In addition, we also include the local GDP per capita of the destination, weighted by the firm-product market share ($LGDP_{jidt}$) in the control function for quality. The weight that we use is the share of firm-product ij in country d over the total sales of product i in country d. Additionally, we include the firm-product market share within destination d (f_{jidt}). This captures the idea that within a destination, higher quality products have a higher market share.

Our quality measures thus capture the following ideas. The higher the income level ($WGDP_{jit}$)

[21] Here $PIMP_{jt} = \sum_z \sum_o s_{jzot} \times IMP_{jzot}$ where s_{jzot} is the import share of firm j's total imports that come from good z imported from country o and IMP_{jzot} is the import price of good z coming from country o.

of the destination countries that the firm-product pair ji is exported, the higher the product quality that the firm offers. We further allow firms to quality differentiate across destinations, by including the local GDP per capita of destination d ($LGDP_{jidt}$), to capture the notion that firms may offer higher quality to countries with higher local GDP per capita.[22] Additionally, we include the firm-product market share within destination d which attributes higher quality to higher market shares. And finally since producing high-quality products also require high-quality inputs, we also insert imported input prices in the control function for quality ($PIMP_{jt}$).

The control function for quality then becomes $\delta(Y')_{jidt}$ a function of Import prices ($PIMP_{jt}$), the weighted GDP per capita across destinations ($WGDP_{jit}$), the weighted local GDP per capita of the destination ($LGDP_{jidt}$) and the firm-product market share within the destination (f_{jidt}):

$$ln\delta(Y')_{jidt} = ln\delta[PIMP_{jt}, WGDP_{jit}, LGDP_{jidt}, f_{jidt}] \quad (8)$$

This control function is introduced in the demand function as a polynomial in these variables, whose coefficients are simultaneously estimated with other demand parameters.

3 Demand Estimation

We estimate the demand function:

$$\ln q_{jidt} = \gamma_{idt} - \sigma_{id}\ln p_{jidt} + \ln\lambda(X^{'})_{ijdt} + \ln\delta(Y^{'})_{jidt} + \epsilon_{jidt} \quad (9)$$

To ensure that the Corr(lnp_{jidt}, ϵ_{jidt}) = 0, we use the average export prices in other remote destinations k (ln p_{ji-dt}) as the instrument variable for price as shown in equation (9). We

[22]Schott (2004) finds a positive relationship between the unit value of U.S. imported products and the per capita GDP of exporters.

define remote countries based on the following criteria: (1) country k and country d do not share the same border; (2) country k and country d do not have a colony history; (3) the distance between countries k and d is at least 1,000 km.

By using 2SLS, the estimation of the demand function in equation (9) allows us to empirically identify three important parameters e.g. the elasticity of demand $\hat{\sigma}_{id}$, the consumers' taste $ln\hat{\lambda}_{jidt}$ and quality index $ln\hat{\delta}_{jidt}$.

The empirical counterparts to the control functions for quality and taste represented in equations (7) and (8) are constructed at the firm-product-country level quality index ($ln\delta_{jidt}$) and taste index ($ln\lambda_{jidt}$) as follows:

$$ln\hat{\delta}_{jidt} = \sum_{v=PIM,WGDP,LGDP,f} \hat{\beta}_v X^v_{jidt} + \sum_{v=PIM,WGDP,LGDP,f} \sum_{n=PIM,WGDP,LGDP,f} \hat{\beta}_{vn}(X^v_{jidt} X^n_{jidt})$$
$$ln\hat{\lambda}_{jidt} = \sum_{l=CL,CR,CN,CD,z} \hat{\beta}_l X^l_{jidt} + \sum_{l=CL,CR,CN,CD,z} \sum_{m=CL,CR,CN,CD,z} \hat{\beta}_{lm}(X^l_{jidt} X^m_{jidt}) \tag{10}$$

4 Cost Estimation

We retrieve the demand parameters from estimating equation (9). In particular we obtain the elasticity of demand (σ) as the regression coefficient on price ($\partial lnq_{ijdt}/\partial lnp_{ijdt} = \sigma$), the optimal pricing condition for every destination is then used to back out the marginal cost from the prices without using any additional functional forms on the supply side.

$$p_{ijdt}[1 - (1/\sigma_{id})] = MC_{jidt} \tag{11}$$

Since prices are f.o.b. export prices, our estimates of marginal cost are exclusive of transport and distribution cost but inclusive of the marginal cost of production which also includes costs related to vertical (quality) and horizontal (taste) product differentiation.[23] Our estimates for

[23]Firm-product-destination-year ($jidt$) specific transport and distribution costs are unobservables of the demand function. But our instrumentation strategy, ensures that their presence in the residual does not contami-

marginal cost vary at firm-product-destination level since we back out cost from destination level prices.

5 Data Description and Documentation

Our trade data consist of Belgian customs data of manufacturing firms for the period 1998-2005 with information on firms exports in quantities and values by product and by destination and firm imports by product and country of origin. The Belgian export data has been handled at the National Bank of Belgiums (NBB) Trade Database, which covers the entire population of recorded trade flows.[24] The trade data are recorded at the firm-product-country-year level, i.e. they provide annual information on firm-level trade flows by 8-digit Combined Nomenclature (CN8) product and by country. Export prices and import prices are unit values which we obtain at the level of the trade flow, by dividing export values by quantities.[25]

The period 1998-2005 has a congruent reporting threshold for firms to be considered as exporters over time. This threshold at firm-product level was raised in 1998 from 104,115€ to 250,000€ but did not change afterwards until 2006. However, during the period of our analysis, the HS6 product classification altered three times. To address the changes in product classifications over time, we concord the product codes along the lines of Bernard et al. (2019).[26] In doing so we lose about 20% of export value in our data, but this ensures that our data are cleaned of product code changes.

In our analysis we focus on the Food industry. Belgium exports a wide range of food

nate the elasticity of demand, estimated as the coefficient on price. Thus, while we cannot separate them, they do not affect our estimates. See section 2.1.

[24] We exclude transactions that do not involve a "transfer of ownership with compensation". This means that we omit transaction flows such as re-exports, the return, replacement and repair of goods and transactions without compensation, e.g. government support, processing or repair transactions, etc.

[25] The CN8-product classification is similar to the HS6 classification for the first 6 digits but offers more product detail in the last two digits.

[26] Instructions for concordance of trade classifications over time can be found here: https://www.sites.google.com/site/ilkevanbeveren/Concordances and is described in Van Beveren et al. (2012)

products. The food industry accounts for 5-6% of total export revenue during 1998-2005. This results in a sample of 1,802 firm-products in seven different food categories (from HS2, 15-22) for which we can identify taste in every destination they are exported to.

The raw data on common languages and common religion come from Melitz and Toubal (2014),[27] while data on nationalities as a share of the population come from the World Bank[28] and finally, the cultural distance indicators are obtained from Hofstede (1980)..[29] In Table 1 we start by listing the four parameters and the level of aggregation at which they are measured empirically. This comprises the taste index (λ_{jidt}), the quality index (δ_{jidt}) and the marginal cost index (c_{jidt}) which are all estimated at the same level of disaggregation e.g. the firm-(CN8) product-country-year level. Our preferred estimate of the elasticity of demand (σ_{id}) is at the product-country level. The reason is that we require a sufficient number of firms selling the same product to the same country in the data for a well-behaved estimate. Estimating σ_{id} at (HS6) Product-Country level provides a large number of inelastic demand (< 1) estimates. In our preferred specification, we therefore estimate results using the demand elasticity at the (HS4)product-country level. Results on the importance of the taste parameter remain the same whether we identify σ_{id} at the (HS6) or (HS4)Product level.

Table 2 documents the number of trade flow observations, where each observation is a firm-product (CN8)-destination export flow. We have over 100,000 trade flows. Observations are spread relatively evenly over the broad product (HS2)classifications ranging from 15 to 22.[30] For expositional purposes, in Table 2 we aggregate over the destination countries, to show the number of observations in regional blocs to give an overview of where exports are being shipped around the world.

Table 3 documents the variation in the raw data on the bilateral indices between Belgium

---

[27] http://faridtoubal.com/research.htm. This dataset gives bilateral indicators for every pair of countries. Here we only use the data between Belgium and its trading partners.

[28] http://www.worldbank.org/en/topic/migrationremittancesdiasporaissues/brief/migration-remittances-data

[29] Hofstede indicator can be found from https://geerthofstede.com/research-and-vsm/dimension-data-matrix/

[30] HS2 range from HS2=15 which is Animal or Vegetable Fats and Oils to HS=22 which is Beverages, Spirits and Vinegar

and country of destination of common spoken language (CL), common religion (CR), common nationality (CN) and cultural distance (CD), where for expositional purposes we again aggregate destinations into regional blocs. The details of the construction of the Common Nationality (CN) index is reported in Appendix A. The other variables are from the literature and reflect the raw data. There are 194 countries for which we have bilateral indices on common language (CL) and common religion (CR), and 208 countries with information on common nationality (CN). However, there is much less information for the bilateral cultural index (CD) for which we have 62 countries. In the demand function estimation, we only keep countries with information on these four indices, which implies a loss of 24% of observations.

The correlations between the raw data on the four different bilateral indices, is given in Table 4. The matrix shows low correlations between all four, which justifies the inclusion of all of them as they seem to capture different aspects of consumer heterogeneity across space.

6 Parameter Estimates

6.1 Elasticity of Demand

From the estimation of the demand specification in equation (9), we obtain the elasticities of demand (σ_{id}). Table 5 documents the estimated average elasticities of demand (σ_{id}) which for expositional purposes we aggregate up to the broad (HS2)product categories. Average values range between 1.9 and 3.15 with standard deviations between 0.5 and 1.4. While these values may appear somewhat low compared to other studies, it has to be kept in mind that they result from a unique demand specification in which we separately include horizontal and vertical differentiation shifters. The inclusion of consumer taste and product quality demand shifters absorbs some of the variation that otherwise would be attributed to the demand elasticity. Without the inclusion of control functions for these additional demand shifters, an endogeneity bias would occur and result in an upward bias on the demand elasticity estimates. Thus it is not surprising that our estimated elasticities are lower than those resulting from more standard demand estimations.

6.2 Average of the Indicators across Regions

The main parameters of interest for this paper can be found in Table 6 where we average the estimated taste, quality and marginal cost indices by regional bloc. Average marginal cost and quality of exported products vary much less across destinations than taste. Table 6 indicates that taste of consumers for exported Belgian products varies substantially. The taste parameter is always positive for any firm-product-destination flow as long as a product is present in a market.[31]

6.3 Correlations of the Indicators

The correlation matrix between our demand and cost parameters is listed in Table 7. The low correlation between consumer taste and the marginal cost index confirms that our taste measure is not picking up the presence of distribution networks. Distribution networks require cost outlays (Arkolakis (2010)) which can only be financed by highly productive firms with low marginal cost. The low correlation between marginal cost and taste suggests that our taste measure captures an inherently different source of variation in the data than the presence of distribution networks.

6.4 Variance of the Indicators

One pertinent question that can be raised is whether the variance in the parameter estimates are mainly determined by the firm, product or destination level. In Table 8 we decompose the variance of the taste parameter in our data into its three potential sources of variation. In

[31] But note that the mean indices are expressed in logs which is why the taste index takes on a negative value in some regions.

columns (1)-(3) we show the decomposition of the variance of the consumer taste index. About 68% of the variation is explained by the country dimension, about 24% by the product dimension and only 8% by the firm dimension in the data. This suggests that consumer taste is a source of variation that is primarily driven by consumer heterogeneity across destination countries.

In columns (4) to (6) of Table 8, we decompose the variance of the quality index. Whether firms vary the quality of their product across destinations is an open question. In this paper we do not take an initial stance on how firms set quality. Therefore we empirically identify quality at firm-product-destination level, which is the most disaggregate level possible in the trade data. A decomposition of the variance of our quality measures in the data, shows that the main source of quality variation comes from the firm and product-level dimension explaining respectively 65% and 32% of the variance of the quality index. The country-dimension explains much less and only accounts for 3% of the quality index variance in our data. Thus, while we cannot exclude quality differentiation by destination, we find it to be small.

And finally in columns (7) to (9), we show the decomposition of the variance of the marginal cost index. Most of the variation in costs come from the product-level which explains around 60%, while the firm-level dimension explains about 27% and the country-dimension about 13% of the overall cost variance. This suggests that for most of the marginal cost differences in trade flows are due to different product-level technology resulting in different marginal costs.

7 The Importance of Consumer Taste

7.1 Consumer Taste and Distance

A first look at the data on the consumer taste index is shown in Figure 1. We aggregate our measure of consumer taste up to the country-level and then plot the average taste for Belgian food products for each destination in the world. The taste index is normalized between zero and one as indicated in the legend to the Figure. Darker colors reflect a higher level of the destination specific taste index. The world map clearly indicates how consumer taste evolves in space. Not surprisingly, taste for Belgian exported products is typically strong in nearby Western European countries. The map also shows that distance is not the only driving force underlying consumer taste. Taste for Belgian products is also strong in countries very far away from Belgium such as the U.S., Canada and Australia. The correlation between consumer taste and distance from Belgium in our data, is negative but not stronger than -0.6. This suggests that with a doubling of distance, taste falls by half. The scatterplot in Figure 2 between λ_{jidt} and distance (both in logs), shows the negative relationship. Eyeballing Figure 1 shows that distance from the country of origin is likely to contain information on consumer taste decay. However consumer taste for Belgian products does not vary monotonically with distance in space, suggesting that taste is really picking up another source of variation than distance which is to be expected since in the demand estimation of Equation (9), we included product-country fixed effects to control for bilateral distance at product market-level.

7.2 Taste for Chocolates

Both our measures of quality and consumer taste generate results that are intuitive and that correspond with case based evidence of quality and taste in some product categories. A good example is chocolates, a well-known Belgian export product. This is a product category for which the CN8-product classification makes a distinction between high-end dark chocolates with high cocao content (18062010) and low-end milk chocolates with low cocao content (18062030). Since cocao is the main and most expensive ingredient in chocolates, dark chocolate is generally regarded as higher quality than milk chocolate. When we compare this independent product quality ranking embedded in the product classification with the quality and taste indices obtained from our empirical strategy above, our priors are confirmed. In every destination where chocolates are sold, we find that high-end dark chocolates with a cocao content exceeding 30%, has a higher quality index than the low-end milk chocolate with a much lower cocao content.

Marginal cost for dark chocolates is significantly higher than for milk chocolates. In terms of taste, we consistently find stronger taste for the sweeter low-end milk chocolate than for more bitter high-end dark chocolate. These quality and taste rankings of chocolates are independent of the specification that we run or the level of aggregation of our consumer taste variable. The values generated by our taste and quality indices correspond quite well with industry reports on the chocolate market and chocolate consumption where milk chocolate typically holds the largest market share but dark chocolate is known to be more expensive and to have health benefits.[32]

7.3 The Decomposition of Export Revenues

How important is consumer taste in explaining export performance at the firm-product-country-year level? A decomposition of export revenues, which are a function of both demand and cost estimates, will allow us to assess the relative importance of consumer taste compared to quality and marginal cost.

Our decomposition is in the spirit of Hottman et al. (2016), but whereas they pursued it at firm-level, our decomposition is at firm-product-country level. The coefficients arising from the decomposition can be interpreted as the percentage variation in export revenues that is explained by each particular indicator including consumer taste.

Based on the estimated demand function (Eq. (2)) and the firm's optimal price (Eq. (11)), firm j's export revenue of product i in country d can be expressed as:

$$\begin{aligned} lnr_{jidt} &= lnp_{jidt} + lnq_{jidt} \\ &= \gamma_{idt} + (1-\sigma_{id})lnp_{jidt} + ln\widehat{\lambda}_{jidt} + ln\widehat{\delta}_{jidt} + \epsilon_{jidt} \\ &= \underbrace{\gamma_{idt} + (1-\sigma_{id})ln\left(\frac{\sigma_{id}}{\sigma_{id}-1}\right)}_{M_{idt}} + (1-\sigma_{id})lnc_{jidt} + ln\widehat{\lambda}_{jidt} + ln\widehat{\delta}_{jidt} + \epsilon_{jidt} \end{aligned} \quad (12)$$

[32] https://www.grandviewresearch.com/industry-analysis/chocolate-market

Equation (12) shows how export sales revenue at firm-product-country level can be decomposed into its separate components: the variation of market size and market competition, including markup variations (M_{idt}), firm-product-destination costs (lnc_{jidt}), firm-product-destination quality ($ln\hat{\delta}_{jidt}$) and firm-product-destination consumer taste ($ln\hat{\lambda}_{jidt}$).

Following Hottman et al. (2016), we regress each component of the right-hand side of equation (12) on lnr_{jidt} to get the contribution of each component of firm-product-destination export revenue on total export revenues. This is given in equation (13).

$$\begin{aligned} M_{idt} &= \beta_M lnr_{jidt} + \varepsilon^M_{jidt} \\ ln\hat{\lambda_{jidt}} &= \beta_\lambda lnr_{jidt} + \varepsilon^\lambda_{jidt} \\ ln\hat{\delta_{jidt}} &= \beta_\delta lnr_{jidt} + \varepsilon^\delta_{jidt} \\ (1-\sigma_{id}) lnc_{jidt} &= \beta_c lnr_{jidt} + \varepsilon^c_{jidt} \\ \epsilon_{jidt} &= \beta_R lnr_{jidt} + \varepsilon^R_{jidt} \end{aligned} \tag{13}$$

Each of the β coefficients in equation (13) can now be interpreted as the "percentage variation of the revenue explained by the indicator". As such the β coefficients can directly be compared with each other.

Empirical findings of the decomposition are reported in Table 9. The decomposition results on consumer taste, given by β_λ, vary between 11-17%, depending on whether we define consumer taste at its most disaggregate level e.g. the firm-product-country level (col. (1)-(2)) or at the product-country level (col. (3)-(4)) and depending on whether we normalize the weight s_{ijdt} in the consumer taste control function by the market size of the destinations (columns (4)). In general we can say that defining consumer taste at its most disaggregated level in the data as in column (1), results in higher β_λ, while normalizing for market size lowers β_λ as in column (4). Decomposition results however appear stable and the importance of consumer taste in explaining export revenue is not too much affected by the level of aggregation and of the weighting scheme that we used in the control function for consumer taste.[33]

The corresponding estimated coefficients for the quality index ranges between 20-23% and for the marginal cost index between 13-14%. Market size and other effects account for about 7-8% of the variation in firm-product-country export revenues. The coefficient on the residual component ranges between 42-45%, depending on the specification.[34] Despite the fact that the residual component is substantial, the relative importance of consumer taste is important. Relative to the other structural parameters quality and cost, we find consumer taste in food products to be about equally important to marginal cost in the decomposition of trade flows. Table 9, shows that demand shifters (taste and quality) together explain twice as much of the variation in export revenues than costs, independent of the specification in the decomposition.

However, decomposition results vary a lot by product category. In Appendix Table A-3 we show decomposition results for every HS4 product category based on specification (2) in Table 9 which features a taste estimate of 13% which is in the middle of the range of estimates. Table A-3 decomposition results show that the importance of consumer taste index varies a lot depending on the product category and ranges between 1-31%. For example in product group Belgian Ice cream (2105), consumer taste explains 27% of the export revenues, compared to 24% explained by quality and 7% explained by marginal costs. Appendix Table A-3 decomposition results show that in some product categories, consumer taste can become more important than quality or marginal cost at firm-product-country level to explain variation in export revenues.

[33]In Aw et al. (2017), consumer taste was proxied by product-country dummies and picked up more of the variation in the decomposition. Here we tease out the part of the residual that is related to taste and find smaller results.

[34]Goodness-of-fit measures in firm-level panel data are typically very low, especially at the level of disaggregation that we consider in the data.

7.4 Robustness Checks

7.4.1 Balanced Panel Results

Thus far in the analysis, we have used all observations in our data set. But the question can be raised whether there are selection effects at work when not every product is exported to every destination. For this purpose we take a look at the minimum cutoff level of the indices and how they vary with distance from Belgium. If there are selection effects at work then we should find that the composition of Belgian export products differs across destination countries. Table 10 shows a positive correlation between distance to destination and the minimum product quality present in a destination. This suggests that the further away the destination, the higher the minimum quality offered in that country.[35] We also find a positive correlation between distance and the minimum cost at firm-product level. To understand this result, we have to keep in mind that the cost index used here also include the cost of producing higher quality. Therefore our cost measure is not simply the inverse of productivity as it is in other models. Similar to the minimum quality, the results in Table 10 suggest that the minimum cost of products present in a destination goes up in distance.[36] Finally, in column (2) of Table 10, we find a negative correlation between the distance to destination and the minimum tastes index present in the market. To understand this result we refer to Figure 1 clearly showing how taste decays in space. For every product shipped to a further destination, taste will be lower. hence the minimum cutoff in taste will also be lower in more distant destinations which is what is reflected in Table 10.

Results in Table 10 on the unbalanced panel data show that product composition varies across destinations. Fewer products are shipped to more distant destinations. Only products of higher quality, higher productivity and higher taste make it to more distant destinations. In

[35]Baldwin and Harrigan (2011) find similar results.

[36]The positive correlations between distance to destination and the quality (cost) threshold also hold if the 1 percentile of quality (cost) index is used instead of the minimum level of quality (cost) indices across firms within one destination.

the empirics, we condition on firms being present in a market and we do not explicitly study entry into export markets. The results in Table 10 suggest that a decomposition of export revenues into cost, quality and taste determinants, as we did in the previous section, may be affected by a different product composition being present in each destination.

To verify whether results change in a balanced panel we present Table 11 where we now only include trade flows that are present in every destination. Results for the balanced panel are similar to the ones in Table 9 even though the number of observations drops substantially. Taste continues to feature as an important determinant (10-16%) in the decomposition of export revenues. Compared to marginal cost, consumer taste together with quality still explain the large fraction of data variation in export revenue. The low values on the marginal cost coefficients in the balanced panel can be ascribed to the fact that the only products shipped to every country in our data belong to the food category chocolates (1806) for which cost differences between firm-products appear to be very low.

7.4.2 Age of the Firm

We next examine whether our results on consumer taste are picking up the age of the firm e.g. how long a firm-product has been present in a destination market. In order to define a firm-product age, we first drop the firm-(CN8)-product-destination combinations that appear in the first year of our panel since we have no information on how long they have been in the destination market e.g. we do not know their age.

Next, we run an OLS regression of our taste measure on ln(age). This results in a very low correlation of 0.03. When we then insert ln(age) as a separate regressor in the demand equation (9), the age variable is not significantly different than zero. The correlation of our taste variable in the models without and with age (whenever we have information on age), is around 0.98 implying that the ranking of our earlier taste index does not change much when controlling for the firm-product age in the demand function estimation as illustrated in taste with and without age included in the demand are plotted in Figure 3 which clearly showing the strong correlation between the two measures.

8 Conclusion

This paper is a generalization of the approach used in Aw et al. (2017) where consumer taste was estimated from a structural trade model with explicit demand and cost functional forms. We innovate our earlier approach by now proposing an identification strategy that is very general and independent of functional forms on the demand and cost side. Despite using a very different approach, we reach the same conclusion e.g. that consumer taste for many products and destinations is an important source of sales variation in the data.

In contrast to other literature, we do not apply a residuals approach to approximate consumer taste. Instead we tease out that part of the demand residual that is most likely capturing consumer taste heterogeneity. Our approach for identifying consumer taste consists in applying a control function approach similar to that used in the productivity literature. The variables that we include in the control function are coming from the international business and marketing literature as well as the early gravity literature and all reflect different aspects of consumer heterogeneity across countries. The approach is easy to replicate for anyone with access to firm-level customs data.

We find consumer taste to be important in explaining exporters' success. Taste is a fundamentally different source of heterogeneity in the data than quality even though the two dimensions are often lumped together to make up firm-appeal. In the data we find quality of a product to vary mostly by firm, while consumer taste for a product varies more by country than by firm.

This has important implications for firm growth. When firms enter export markets, they need to recognize the important role played by destination specific consumer tastes. The literature thus far indicate that export entry patterns are solely ascribed to entry costs (Albornoz et al. (2012), Morales et al. (2019)). But the findings in this paper put forward an interesting hypothesis - that similarity of consumer tastes between the countries can also affect entry patterns.

Another line of future research for which consumer taste can be important is the gravity literature (Redding and Weinstein (2019)). Without disentangling consumer taste from distance in a gravity model, the role attributed to distance will be overestimated. Distance is typically considered as a proxy for transport cost, but in this paper we show that distance in part also reflects the decay of consumer taste in space. Without explicitly controlling for consumer taste, the distance coefficient in gravity models will be biased.

Our finding that the demand side is important for export revenue may also offer a potential explanation for the productivity puzzle. In recent years, firms invest less in cost reductions and productivity improvements, but more in product innovation and marketing (Peters, Roberts, Vuong and Fryges (2017); Van Beveren and Vandenbussche (2010). This comes as no surprise to us given that in the decomposition of export revenues, we find demand factors to explain most of firms' success.

The importance of consumer tastes also underlines that firm learning about the demand side of the market is crucial. This is consistent with the very recent research on firm dynamics and the growth of new firms through demand accumulation' emphasized by Foster, Haltiwanger and Syverson (2016) and customer accumulation by Eaton, Eslava, Jinkins, Krizan and Tybout (2015). In particular, Foster et al. (2016) show that the size gap between new businesses and established ones does not reflect productivity gaps but rather show differences in demand fundamentals. The findings in this paper confirm the importance of demand at a very disaggregate level of the trade data.

References

[1] Albornoz, Facundo, Héctor Calvo Pardo, Gregory Corcos, and Emanuel Ornelas (2012) "Sequential exporting" *Journal of International Economics, 88(1), pp. 17-31.*

[2] Amiti, Mary, Oleg Itskhoki and Jozef Konings (2014) "Importers, Exporters, adn Exchnage Rate Disconnect," *American Economic Review, 104(7), pp. 1942-1978.*

[3] Armstrong, Mark and Yongmin Chen (2009) "Inattentive Consumers and Product Quality," *Journal of the European Economic Association, 7(2-3), pp. 411-422.*

[4] Antoniades, Alexis (2015) "Heterogeneous Firms, Quality, and Trade", *Journal of International Economics, 95, pp. 263-273.*

[5] Arkolakis, Costas, (2010) "Market penetration costs and the new consumers' margin in international trade" *Journal of Political Economy, 118, pp. 1151-1199.*

[6] Atkeson, Andrew and Ariel Tomás Burstein (2008) "Pricing-to-Market, Trade Costs, and International Relative Prices," *American Economic Review, 98(5), pp. 1998-2031.*

[7] Atkin, David (2013), "Trade, Tastes and Nutrition in India", *American Economic Review, 103(5): pp. 1629-1663.*

[8] Aw, Bee-Yan, Mark Roberts and Daniel Yi Xu (2011) "R&D investment, exporting, and productivity dynamics", *American Economic Reveview 101 (4), pp. 1312-1344.*

[9] Aw, Bee-Yan and Yi Lee (2017) "Demand, Costs and Product Scope in the Export Market", *European Economic Review 100, pp. 28-49.*

[10] Baldwin, Richard and James Harrigan (2011) "Zeros, quality and space: trade theory and trade evidence", *American Economic Journal: Microeconomics 3 (2), pp. 60-88.*

[11] Bastos, Paulo, Joana Silva and Eric Verhoogen (2018) "Export Destinations and Input Prices," *American Economic Review, 108(2), pp. 353-392.*

[12] Bernard, Andrew, Emily Blanchard, Ilke Van Beveren, and Hylke Vandenbussche (2019) "Carry-along Trade", *Review of Economic Studies, February, 86(2), pp.526-563.*

[13] Beugelsdijk, Sjoerd, Tatiana Kostova and Kendall Roth (2017) "An overview of Hofstede-inspired country-level culture research in international business since 2006" *Journal of International Business Studies, 48(1), pp. 30-47.*

[14] Bils, Mark and Peter Klenow (2001), "Quantifying Quality Growth", *American Economic Review, Vol. 91(4), pp. 1006-1030.*

[15] Cosar, Kerem, Paul Grieco, Shengyu Li and Felix Tintelnot (2018), "What Drives Home Market Advantage?", *Journal of International Economics, 110(1), pp. 135-150.*

[16] Crozet, Matthieu, Keith Head and Thierry Mayer (2012) "Quality Sorting and Trade: Firm-level Evidence for French Wine," *Review of Economic Studies, 79(2), pp. 609-644.*

[17] De Loecker, Jan, Pinelopi Goldberg, Amit Khandelwal and Nina Pavcnik (2016) "Prices, Markups and Trade Reforms", *Econometrica, Vol. 84, Issue 2, pp. 445-510.*

[18] Eaton, Jonathan, Marcela Eslava, David Jinkins, C.J. Krizan, and James Tybout (2015) "A Search and Learning Model of Export Dynamics", *Meeting Papers 1535, Society for Economic Dynamics.*

[19] Egger, Peter and Andrea Lassmann (2012) "The Language Effect in International Trade: a Meta-analysis," *CEconomic Letter, 116(2), pp.221-224.*

[20] Egger, Peter and Farid Toubal (2016) "Common Spoken Languages and International Trade," *Chapter 9 in The Palgrave Handbook of Economics and Language, Edited by Ginsburgh and Shlomo Weber, pp.263-289*

[21] Fan, Haichao, Yao Amber Li and Stephen Yeaple (2016) "Trade Liberalization, Quality and Export Prices", *Review of Economics and Statistics, March, pp. 328-358.*

[22] Fan, Haichao, Yao Amber Li and Stephen Yeaple (2018) "On the Relationship Between Quality and Productivity: Evidence from Chinas Accession to the WTO," *Journal of International Economics, 110(1), pp. 28-49.*

[23] Feenstra Robert and John Romalis, (2014) "International Prices and Endogenous Quality", *The Quarterly Journal of Economics, Oxford University Press, vol. 129(2), pp. 477-527.*

[24] Felbermayr, Gabriel J., Benjamin Jung and Farid Toubal (2010) "Ethnic Networks, Information, and International Trade: Revisitng the Evidence," *Annals of Economics and Statistics, 97/98, pp.41-70*

[25] Foster, Lucia, John Haltiwanger and Chad Syverson (2016) "The Slow Growth of New Plants: Learning about Demand?", *Economica, 83(329), pp. 91-129.*

[26] Gabaix, Xavier (2016) "Power Laws in Economics: An Introduction", *Journal of Economic Perspectives, Vol. 30, No. 1, pp. 185-206.*

[27] Gervais, Antoine (2015) "Product Quality and Firm Heterogeneity in International Trade", *Canadian Journal of Economics, 48(3), pp. 1152-1174.*

[28] Giovanni, Julian and Andrei Levchenko (2012) "Country Size, International Trade, and Aggregate Fluctuations in Granular Economies", *Journal of Political Economy 120(6), pp. 1083-1132.*

[29] Gollnhofer, Johanna Franziska and Ekaterina Turkina (2015) "Cultural Distance and Entry Modes - Implications for Global Strategy," *Cross Cultural Management: An International Journal, 22(5), pp. 21-41*

[30] Guiso, Luigi, Paola Sapienza and Luigi Zingales (2009) "Cultural Biases in Economic Exchange," *Quarterly Journal of Economics, 124, pp. 1095-1131.*

[31] Hallak, Juan Carlos (2006) "Product Quality and the Direction of Trade", *Journal of international Economics 68 (1), pp. 238-265.*

[32] Hausman, Jerry A. (1996) "Valuation of New Goods under Perfect and Imperfect Competition," *The Economics of New Goods, edited by Timothy F. Bresnahan and Robert J. Gordon, pp. p. 207 - 248.*

[33] Head, Keith and John Ries (1998) "Immigration and Trade Creation: Econometric evidence from Canada," *Canadian Journal of Economics, 31, pp. 46-62.*

[34] Hottman, Colin, Stephen Redding and David Weinstein (2016) "Quantifying the sources of Firm Heterogeneity", *The Quarterly Journal of Economics, Vol. 131, Issue 3, pp. 1291-1364.*

[35] Hofstede, Geert (1980) *Culture's consequences: International differences in work-related values. Beverly Hills: Sage Publications.*

[36] Khandelwal, Amit (2010) "The long and short (of) quality ladders", *Review of Econmic Studies, 77(4), pp. 1450-1476.*

[37] Kogut, Bruce and Harbir Singh (1988) "The Effect of National Culture on the Choice of Entry Mode," *Journal of International Business Studies, 19(3), pp. 411-432.*

[38] Kugler Maurice and Eric Verhoogen (2011) “Prices, Plant Size, and Product Quality”, *Review of Economic Studies, 79, pp. 307-339.*

[39] Levinsohn James and Amil Petrin (2003) “Estimating Production Functions Using Inputs to Control for Unobservable”, *Review of Economic Studies, 70, pp. 317-341.*

[40] Melitz, Jacques (2008) “Language and Foreign Trade,” *European Economics Review, 52, pp. 667-699.*

[41] Melitz, Jacques and Farid Toubal (2014) “Native Language, Spoken Language, Translation and Trade,” *Journal of International Economics, 93, pp. 351-363.*

[42] Morales, Eduardo, Gloria Sheu and Andrés Zahler (2019) “Extended Gravity”, *Forthcoming in Review of Econimc Studies.*

[43] Olley, Steven and Ariel Pakes (1996) “The Dynamics of Productivity in the Telecommunications Equipment Industry” *Econometrica, 64(6), pp. 1263-1297.*

[44] Peters, Bettina, Mark Roberts, Van Anh Vuong, Helmut Fryges (2017) “Estimating Dynamic R&D Demand: An Analysis of Costs and Long-run Benefits” *The Rand Journal of Economics, 48(2), pp. 409-437.*

[45] Rauch, James and Vitor Trindade (2002) “Ethnic Chinese Networks in International Trade,” *Review of Economics and Statisitcs, 84(1), pp. 116-130.*

[46] Redding, Stephen and David Weinstein (2019) “Aggregation and Gravity Equation,” *NBER Working Paper, No.25464.*

[47] Roberts, Mark, Daniel Yi Xu, Xiaoyan Fan and Shengxing Zhang (2018) “The Role of Firm Factors in Demand, Cost, and Export Market Selection for Chinese Footwear Producers”, *Review of Economic Studies, 85, pp. 2429-2461.*

[48] Schott, Peter (2004) “Across-Product versus Within-Product Specialization in International Trade”, *Quarterly Journal of Economics, 119(2), pp. 647-678.*

[49] Shenkar, Oded (2001) “Cultural Distance Revisited: Towards a More Rigorous Conceptualization and Measurement of Cultural Differences,” *Journal of International Business Studies, 43, pp.12-17.*

[50] Van Beveren, Ilke and Hylke Vandenbussche, (2010) “Product and process innovation and firms’ decision to export,” *Journal of Economic Policy Reform, vol. 13(1), pp. 3-24.*

[51] Van Beveren, Ilke, Andrew Bernard and Hylke Vandenbussche (2012) "Concording Trade and Production data over time", *NBER Working Paper 18604*.

[52] Verhoogen, Eric (2008) "Trade, Quality Upgrading, and Wage Inequality in the Mexican Manufacturing Sector", *Quarterly Journal of Economics, 123(2), pp. 489-530*.

Table 1: Level of Estimated Parameters

Parameters	Variables	Level of Analysis
σ_{idt}	Demand Elasticities	(HS4)Product-Country
λ_{jidt}	Taste Index	Firm-(CN8)Product-Country-Year
δ_{jidt}	Quality Index	Firm-(CN8)Product-Country-Year
c_{jidt}	Marginal costs Index	Firm-(CN8)Product-Country-Year

Note: We also identified demand elasticities (σ) at (HS6)Product-Country level and the decomposition results did not have a significant change. Estimating σ at (HS6)Product-Country level provides a large number of (HS6)Product-Country markets with inelastic demand ($\sigma < 1$). Therefore, we estimate the demand elasticity at the (HS4)Product-Country level.

Table 2: Number of Observations by (HS2)Industries and Regions

	15	16	17	18	19	20	21	22	Total
AU	65	1	174	507	75	84	85	108	1,099
EA	360	78	706	1,945	337	605	558	675	5,264
EE	1,283	662	1,137	2,482	1,193	1,367	1,562	1,203	10,889
ME	522	139	787	1,816	579	1,156	664	524	6,187
NA	41	36	406	1,018	208	443	205	377	2,734
SA	49	8	81	181	57	52	89	120	637
SAM	311	74	327	1,002	282	506	319	395	3,216
SSA	321	64	443	376	337	395	471	448	2,855
WE	4,990	11,273	7,294	11,046	7,719	10,073	8,972	6,234	67,601
Total	7,942	12,335	11,355	20,373	10,787	14,681	12,925	10,084	100,482

Note: Regions: AU: Australia and New Zealand, EA: East Asia, EE: East Europe, ME: Middle East, NA: North America, SA: South Asia, SAM: South America, SSA: Sub-Saharan Africa , WE: West Europe.
(HS2)Industries: 15: Animal or Vegetable Fats and Oils, 16: Meat, Fish or Crustaceans, 17: Sugars and Sugar Confectionery, 18: Cocoa and Cocoa Preparations, 19: Preparations of Cereals, Flour, Starch or Milk, 20: Preparations of Vegetables, Fruit, Nuts, 21: Miscellaneous Edible Preparations, 22: Beverages, Spirits and Vinegar.

Table 3: Average Bilateral Indices on Consumer Heterogeneity between Belgium and Destinations

	CL	CR	CN	CD
AU	0.5781	0.1480	0.0006	2.2243
EA	0.1698	0.0889	0.0001	2.2696
EE	0.1954	0.2006	0.0003	1.4109
ME	0.1232	0.0376	0.0009	1.8414
NA	0.6188	0.2532	0.0012	1.8832
SA	0.0589	0.0865	0.0001	2.2769
SAM	0.2946	0.3705	0.0001	2.3689
SSA	0.2349	0.1890	0.0002	0.9718
WE	0.5866	0.2987	0.0055	1.7329

Note: CL: Common Spoken Language Index, CR: Common Religion Index; CN: Common Nationality index; CD: Culture Difference Index. Regions: AU: Australia and New Zealand, EA: East Asia, EE: East Europe, ME: Middle East, NA: North America, SA: South Asia, SAM: South America, SSA: Sub-Saharan Africa ,WE: West Europe.
The details of the construction of Common Nationality (CN) variable is reported in Appendix A. The other variables reflect the raw data.
There are 194 countries with the bilateral indices on CL and CR, and 208 countries with information on CN. However, there is less information for the bilateral cultural index CD for which we have 62 countries. In the demand function estimation, we only keep countries with information on these four indices and lose 24% of observations.

Table 4: Correlation Matrix of Consumer Heterogeneity Indices

	CL	CR	CN	CD
CL	1			
CR	0.0909	1		
CN	0.351	0.1689	1	
CD	-0.0599	-0.2031	-0.3495	1

Note: CL: Common Spoken Language Index, CR: Common Religion Index; CN: Common Nationality index; CD: Cultural Difference Index.

Table 5: Average Demand Elasticities by (HS2)Sectors

HS2 Industries	Mean(σ)	S.D.(σ)	Number of (HS4)Product-Country Pairs
15	3.1545	1.2242	41
16	2.2549	1.0154	33
17	2.4690	1.0547	69
18	1.7656	0.5413	39
19	2.2111	0.9907	46
20	3.0631	1.4856	81
21	2.1231	0.8161	60
22	1.9123	0.6634	34

Note: The demand elasticities are estimated at (HS4)Product-Destination level. Here we show the average over product categories and regional blocs. Similar elasticities are obtained at HS6-destination levels.
There are around 27% of HS4-Destination markets with estimated demand elasticities less than one. Only HS4-Destination markets with demand elasticities greater than one are reported in the Table.
(HS2)Industries: 15: Animal or Vegetable Fats and Oils, 16: Meat, Fish or Crustaceans, 17: Sugars and Sugar Confectionery, 18: Cocoa and Cocoa Preparations, 19: Preparations of Cereals, Flour, Starch or Milk, 20: Preparations of Vegetables, Fruit, Nuts, 21: Miscellaneous Edible Preparations, 22: Beverages, Spirits and Vinegar.

Table 6: Summary Statistics on Demand and Cost Indices

Region	Quality Index ($ln\hat{\delta}$)	Taste Index ($ln\hat{\lambda}$)	MC Index ($ln\hat{c}$)
AU	4.1617	0.0721	-0.4427
EA	4.0137	0.1404	-0.1306
EE	4.0389	0.1274	-0.0163
ME	4.0105	0.3090	0.9242
NA	3.6662	0.3754	-0.2548
SA	4.4479	0.0203	-0.1862
SAM	4.1510	0.0639	0.1941
SSA	3.9864	0.2802	0.0522
WE	3.7186	1.1351	0.3508
S.D.	1.3660	1.0310	0.9501

Note: Regions: AU: Australia and New Zealand, EA: East Asia, EE: East Europe, ME: Middle East, NA: North America, SA: South Asia, SAM: South America , SSA: Sub-Saharan Africa, WE: West Europe.

Table 7: Correlation Matrix of Quality, Tastes and MC indices

	Quality Index ($ln\hat{\delta}$)	Taste Index ($ln\hat{\lambda}$)	MC Index ($ln\hat{c}$)
Quality Index ($ln\hat{\delta}$)	1		
Taste Index ($ln\hat{\lambda}$)	-0.0623	1	
MC Index ($ln\hat{c}$)	-0.1842	-0.0600	1

Table 8: Variance Decomposition of Indices

Variation in:	Taste Index	Quality Index	MC Index
Firm	7%	65%	27%
Product	23%	32%	60%
Country	70%	3%	13%
	100%	100%	100%

We decompose the variations of the taste index into three components: (1) Variations across firms within the same (HS6)Product-Country market; (2) Variations across (HS6)Products within the same country; (3) Variations across countries.

Table 9: Decomposition of Firm-Product Export Revenues

	ln(TR)			
	(1)	(2)	(3)	(4)
β_λ (Tastes)	0.17	0.13	0.13	0.11
	(.002)***	(.002)***	(.002)***	(.002)***
β_δ (Quality)	0.20	0.22	0.23	0.22
	(.002)***	(.002)***	(.002)***	(.002)***
β_c (MC)	0.15	0.14	0.13	0.14
	(.003)***	(.003)***	(.003)***	(.003)***
β_M (Market Competition)	0.07	0.08	0.07	0.08
	(.003)***	(.003)***	(.003)***	(.003)***
β_R (Demand Residuals)	0.42	0.43	0.44	0.45
	(.003)***	(.003)***	(.003)***	(.003)***
Observations	38,949	37,928	37,480	37,617

Specification: (1) Firm-(CN8)Product-Country level Taste Index, (2) Firm-(CN8)Product-Country level Tastes Index, normalized by local GDP, (3) (CN8)Product-Country level Tastes Index, (4) (CN8)Product-Country level Tastes Index, normalized by local GDP.
Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1
When estimating the demand function, we loss 52% of total number of observations due to the following criteria: (1) dropping outliers in *lnp* (loss 6% of total number of observations); (2) dropping observations without information on the proxy variables of tastes index and IV for prices (loss 38% of total number of observations); (3) dropping (HS4)Product-country markets with the number of Belgium firms less than twenty. (loss 7% of total number of observations) Even we loss 51% number of observations, the sample in the demand function estimation captures 70% of total export value in the Belgium Food Industry.
Please refer Equations (13) and (**??**) for the regression equations.

Table 10: Relationship between Minimum Indices and Distance from Belgium

	Minimum Quality index	Minimum Tastes index	Minimum Cost index
ln(Distance)	0.1690	-0.0509	0.1396
	(0.014)***	(0.007)***	(0.015)***
Constant	1.9553	0.4891	-1.9616
	(0.124)***	(0.050)***	(0.148)***
Year dummy	yes	yes	yes
(HS2)Industry Dummy	yes	yes	yes
Observations	1,935	1,935	1,935
R-squared	0.113	0.060	0.197

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1
We also tried to use the quality (tastes, cost) index at 1% as the minimum cutoff value and get the similar results.
After controlling the market size (ln(GDP)) of the destination country, the relationship between distance and the minimum cutoff value did not change.

Table 11: Decomposition of Firm-Product Revenues (Balanced Panel)

	ln(TR)			
	(1)	(2)	(3)	(4)
β_λ (Tastes)	0.16	0.11	0.11	0.10
	(.004)***	(.004)***	(.004)***	(.004)***
β_δ (Quality)	0.20	0.22	0.22	0.23
	(.005)***	(.006)***	(.006)***	(.006)***
β_c (MC)	0.03	0.03	0.03	0.03
	(.004)***	(.004)***	(.004)***	(.005)***
β_M (Market Competition)	0.07	0.09	0.07	0.08
	(.004)***	(.004)***	(.004)***	(.004)***
β_R (Demand Residuals)	0.53	0.55	0.57	0.57
	(.007)***	(.007)***	(.007)***	(.007)***
Observations	5,358	5,170	5,153	5,107

Note: Balanced panel includes products that are sold to all countries and there are only four products are included: 18062010, 18063290, 18069019, 18069031.
Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1
Specification: (1) Firm-(CN8)Product-Country level Taste Index, (2) Firm-(CN8)Product-Country level Tastes Index, normalized by local GDP, (3) (CN8)Product-Country level Tastes Index, (4) (CN8)Product-Country level Tastes Index, normalized by local GDP

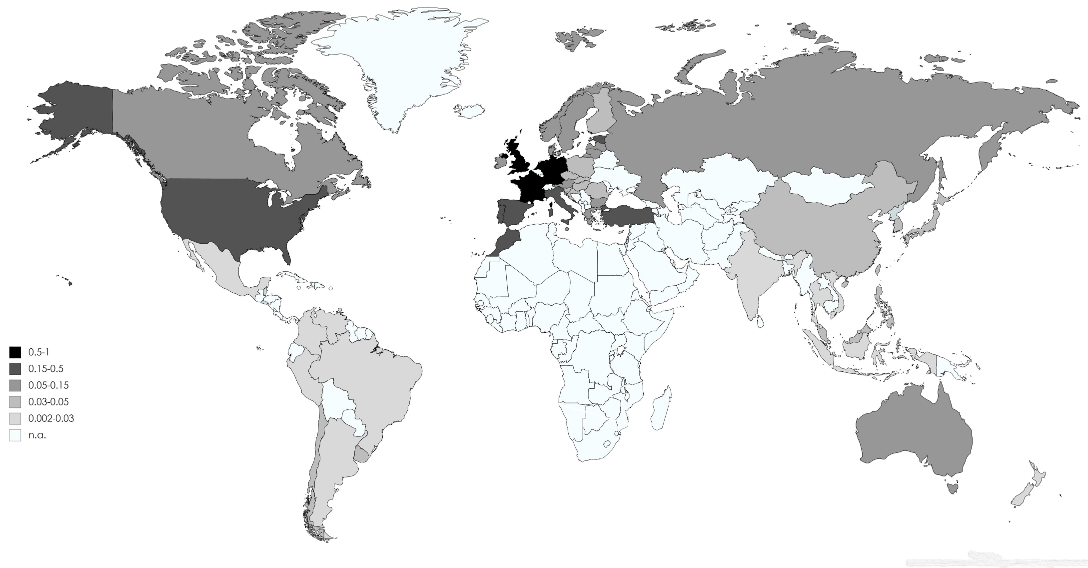

Figure 1: Taste for Belgian Food Exports

Note: Dark color indicates stronger taste for Belgian export products.

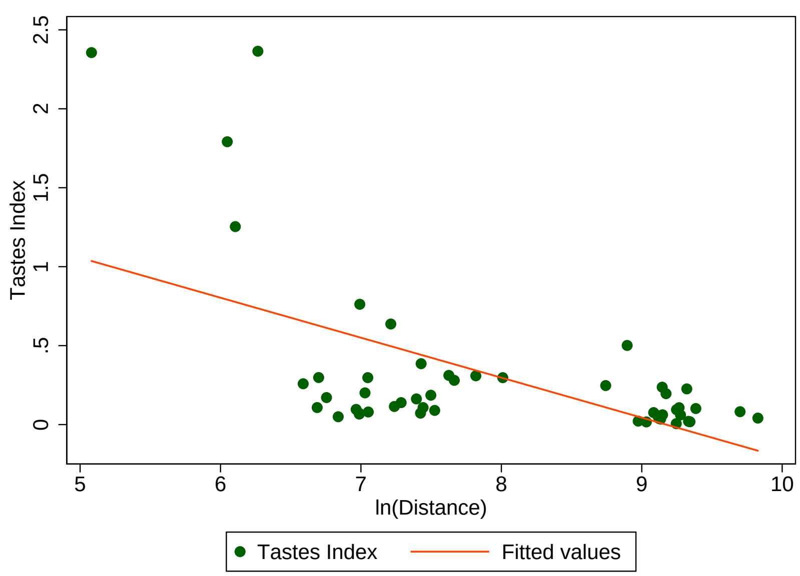

Figure 2: Relationship between Average Taste and Distance to Belgium, by Destination

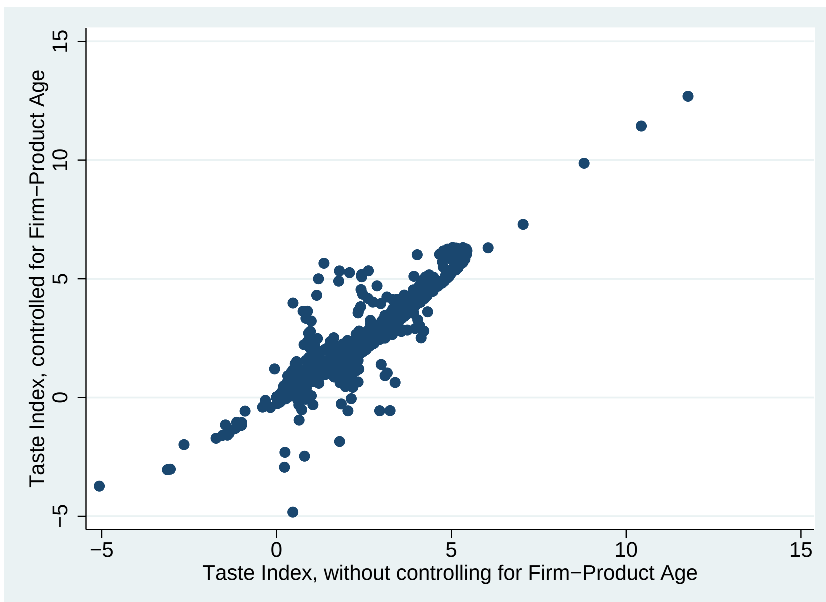

Figure 3: Taste with and without Controlling Firm-Product Age

Appendix A

Here we illustrate how we construct a bilateral indicator of closeness between any two countries. Consider the following hypothetical example where we have information on the share of migrants by country of origin as given in Table A-1.

Table A-1: Percent of Population, by Nationality

Country	**Share of the migrants over population (%)**		
	China	Mexico	Korea
U.S.	1	2	0.1
France	0.5	1	0
Japan	1	0	1

Table A-1 indicates that the distribution of nationality components is similar between the U.S. and France compared to the nationality components between Japan and the other two countries. We construct and indicator of bilateral closeness in nationality between any country-pair based on the Toubal and Egger (2016) index as follow:

$$CN_{U.S.,France} = 1 \times 0.5 + 2 \times 1 + 0.1 \times 0 = 2.5$$

$$CN_{U.S.,Japan} = 1 \times 1 + 2 \times 0 + 0.1 \times 1 = 1.1$$

$$CN_{France,Japan} = 0.5 \times 1 + 1 \times 0 + 0 \times 1 = 0.5$$

It's clear that the CN index between the U.S. and France (2.5) is higher than the CN index between the U.S. and Japan (1.1). This reflects the fact that the U.S. and France have similar nationality distribution comparing with the nationality distribution between the U.S. and Japan. Based on the same logics, we construct the closeness indices for common language (CL) and common religion distribution (CR) for any country-pair.

The top part of Table A-2 presents the top ten countries with the highest closeness indices between the destination countries and Belgium for common language CL, common nationality

(CN), common religious (CR), and culture distance (CD). The bottom part of Table A-2 reports the ten countries that are most dissimilar to Belgium in terms of these four indices. For example, Netherlands and France have the highest similarity in the distribution of spoken language with Belgium. Indonesia, Korea and Taiwan are less closer to Belgium in terms of spoken language. European countries have similar nationality distributions and the nationality components in Asian countries are dissimilar to Belgium.

Table A-2: Indices of Consumer Heterogeneity by Countries

1. Top ten countries relative to Belgium							
Country	CL	Country	CN	Country	CR	Country	CD
Netherlands	0.9998	Italy	1.8700	Malta	0.7456	France	0.2193
France	0.8952	France	1.0630	Venezuela	0.7305	Malta	0.5382
U.K.	0.6825	Netherlands	1.0600	Spain	0.7155	Czech	0.5544
Ireland	0.6628	Morocco	1.0500	Argentina	0.6999	Spain	0.6961
Canada	0.6584	Turkey	0.5570	Italy	0.6847	Italy	0.6968
Denmark	0.6548	Spain	0.4890	Colombia	0.6847	Germany	0.8082
Germany	0.6386	Germany	0.3540	Poland	0.6832	Turkey	0.9205
Sweden	0.6201	Portugal	0.2800	Croatia	0.6684	Poland	0.9774
Austria	0.6200	U.K.	0.2670	Ireland	0.6649	Brazil	0.9842
Malta	0.6124	Greece	0.1810	France	0.6489	Greece	1.0428

2. Bottom ten countries relative to Belgium							
Country	CL	Country	CN	Country	CR	Country	CD
Peru	0.0491	Bangladesh	0.0059	Thailand	0.0014	Hong Kong	2.8035
Russian	0.0327	Korea	0.0041	Sweden	0.0012	Ireland	2.8229
Brazil	0.0157	Latvia	0.0039	U.K.	0.0007	Malaysia	2.9461
Bangladesh	0.0118	Estonia	0.0037	Greece	0.0004	Colombia	2.9717
Vietnam	0.0087	Lithuania	0.0035	Latvia	0	Slovakia	2.9822
China	0.0059	Mexico	0.0029	Finland	0	Sweden	3.2554
Iran	0.0026	Trinidad	0.0023	Taiwan	0	Trinidad	3.3321
Indonesia	0	Malaysia	0.0016	Estonia	0	Singapore	3.4231
Korea	0	El Salvador	0.0012	Hong Kong	0	Venezuela	3.5313
Taiwan	0	Taiwan	0.0008	Japan	0	Denmark	3.8605

Note: CL: Common Spoken Language Index, CR: Common Religious Index; CN: Common Nationality index; DC: Difference in Culture Index.
Countries with the higher value of CL, CR and CN are more closer to Belgium in terms of CL, CR and CN. In contrast, countries are closer to Belgium in term of culture if the countries have lower value of CD.
There are 62 countries with information of all indices. Trinidad: Trinidad and Tobago.

Table A-3: Decomposition of Export Revenue, by (HS4)Products

(HS4)Sector	β_λ	β_δ	β_c	β_M	β_R	no.(observations)
1501	0.22	0.48	0.12	0.03*	0.15*	17
1507	0.13	0.31	0.33	0.02*	0.21	64
1511	0.04*	0.57	-0.07*	0.03*	0.42	22
1513	0.02*	0.52	-0.001*	0.39	0.07*	13
1515	0.13	0.35	0.20	0.17	0.15	333
1516	0.20	0.34	0.06	-0.01*	0.41	183
1517	0.20	0.30	0.08	0.16	0.27	1,361
1518	0.08*	0.37	0.20	0.24	0.11*	18
1601	0.11	0.26	0.06	0.26	0.31	442
1602	0.13	0.25	0.06	0.08	0.47	3,472
1604	0.31	0.28	0.08	0.06	0.27	145
1605	0.19	0.11	-0.06*	0.10	0.65	59
1701	0.14	0.23	0.08	0.09	0.46	584
1702	0.12	0.28	0.07	0.04	0.49	752
1704	0.11	0.20	0.22	0.06	0.41	3,999
1799	0.06	0.30	0.21	0.10	0.33	210
1806	0.11	0.18	0.03	0.07	0.61	11,198
1901	0.20	0.23	0.01*	0.15	0.40	421
1902	0.13	0.27	0.09	0.09	0.41	627
1904	0.11	0.42	-0.01*	0.09	0.40	131
1905	0.12	0.21	0.07	0.05	0.55	1,970
2004	0.16	0.23	0.30	-0.05	0.36	2,027
2005	0.18	0.30	0.15	0.08	0.29	763
2007	0.20	0.18	0.18	0.11	0.34	1,549
2008	0.17	0.28	0.03	0.10	0.41	1,196
2009	0.20	0.37	-0.01*	0.09	0.35	246
2102	0.29	0.27	0.004*	0.23	0.21	190
2103	0.17	0.27	0.05	0.003*	0.51	489
2104	0.20	0.22	0.10	0.19	0.30	66
2105	0.27	0.24	0.07	0.11	0.30	990
2106	0.11	0.25	0.05	0.07	0.52	3,091
2201	0.19	0.36	-0.05*	0.15	0.35	48
2202	0.01	0.35	0.03	0.46	0.14	18
2203	0.07	0.38	0.04	0.19	0.31	746
2208	0.16	0.16	0.05	0.10	0.53	488

Note:* Insignificant at 10%.

Table A-4: (HS4)Product Definition

HS4	Definition
1501	Pig fat (including lard) and poultry fat
1507	Soya-bean oil and its fractions
1511	Palm oil and its fractions
1513	Coconut (copra), palm kernel or babassu oil and their fractions
1515	Fixed vegetable fats and oils (including jojoba oil) and their fractions
1516	Animal or vegetable fats and oils and their fractions
1517	Margarine; edible mixtures or preparations of animal or vegetable fats or oils
1518	Animal or vegetable fats, oils, fractions, modified in any way
1601	Sausages and similar products of meat, meat offal or blood
1602	Prepared or preserved meat, meat offal or blood
1604	Prepared or preserved fish; caviar and caviar substitutes prepared from fish eggs
1605	Crustaceans, molluscs and other aquatic invertebrates, prepared or preserved
1701	Cane or beet sugar and chemically pure sucrose, in solid form
1702	Sugars, sugar syrups, artificial honey, caramel
1704	Sugar confectionery (including white chocolate), not containing cocoa
1806	Chocolate and other food preparations containing cocoa
1901	Malt extract; flour/starch/malt extract products, no cocoa (or less than 40% by weight)
1902	Pasta
1904	Prepared foods obtained by swelling or roasting cereals or cereal product
1905	Bread, pastry, cakes, biscuits, other bakers' wares
2004	Vegetables preparations (frozen)
2005	Vegetables preparations(not frozen)
2007	Jams, fruit jellies, marmalade
2008	Fruit, nuts and other edible parts of plants
2009	Fruit juices (including grape must) and vegetable juices
2102	Yeasts (active or inactive); prepared baking powders
2103	Sauces and preparations therefor
2104	Soups and broths and preparations therefor; homogenised composite food preparations
2105	Ice cream and other edible ice; whether or not containing cocoa
2106	Food preparations not elsewhere specified or included
2201	Waters, including natural or artificial mineral waters and aerated waters, not containing added sugar
2202	Waters, including mineral and aerated waters, containing added sugar or sweetening matter, flavoured
2203	Beer made from malt
2208	Ethyl alcohol, undenatured; of an alcoholic strength by volume of less than 80% volume; spirits, liqueurs and other spirituous beverages