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Evidence for Danish Chocolate and Confectionery

Ina C. Jäkel

PII: S0167-7187(16)30393-9
DOI: <https://doi.org/10.1016/j.ijindorg.2018.11.002>
Reference: INDOR 2491

To appear in: *International Journal of Industrial Organization*

Received date: 29 November 2016
Revised date: 2 November 2018
Accepted date: 6 November 2018

Please cite this article as: Ina C. Jäkel, Product Appeal, Differences in Tastes, and Export Performance: Evidence for Danish Chocolate and Confectionery, *International Journal of Industrial Organization* (2018), doi: <https://doi.org/10.1016/j.ijindorg.2018.11.002>

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Highlights

- We analyze cross-country variation in export sales of a given firm and product.
- Domestic product appeal increases export sales.
- The effect is weaker in countries where tastes are different from domestic tastes.
- Our findings suggest that product appeal is evaluated differently across countries.

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Product Appeal, Differences in Tastes, and Export Performance: Evidence for Danish Chocolate and Confectionery*

Ina C. Jäkel

This paper studies the relationship between domestic market performance and export performance. We employ data on production and trade in the Danish chocolate and confectionery industry to obtain estimates of domestic ‘product appeal’ (reflecting non-price factors of domestic performance). Domestic product appeal is influenced not only by inherent characteristics of the product, but also by the tastes and preferences of domestic consumers. For many consumer goods, tastes depend on customs, culture etc. A product’s domestic appeal is therefore an imperfect predictor of foreign demand (and hence of export performance), especially in destinations where tastes differ substantially from domestic tastes. We combine estimates of domestic product appeal with information on destination-specific exports and a novel measure of differences in tastes across countries to confirm this hypothesis. Results are consistent across both a Tobit model with destination-specific censoring point and the BLP estimator, which additionally reveals substantial heterogeneity in tastes for product appeal within countries across consumers.

Keywords: Firm heterogeneity · Exports · Demand estimation.

JEL codes: F12, F14, L15.

*I would like to thank the editor and two anonymous referees for their detailed comments that significantly improved the paper. Thanks are also due to Emanuele Bacchiega, Andrew Bernard, Federico Ciliberto, Carsten Eckel, Marc-Andreas Muendler, Hans-Jörg Schmerer, and Frederic Warzynski for valuable comments and suggestions. This work has benefited from discussions with seminar and conference participants at ETSG (Leuven), WIFO (Vienna), the Midwestern Trade Meeting (St. Louis), IfW (Kiel), the University of Southern Denmark, Aarhus University, CESifo (Munich), LMU Munich and University of Trento. Anaëlle Petre has provided excellent research assistance. Financial support from the Tuborg Foundation and the Danish Council for Independent Research is gratefully acknowledged.

Ina C. Jäkel: Department of Economics and Business Economics, Aarhus University, Fuglesangs Allé 4, 8210 Aarhus V, Denmark. E-mail: inaj@econ.au.dk. Tel.: +45 871 65195. Fax: +45 871 65394.

1 Introduction

There is ample evidence that firm-specific attributes that are universal across markets (such as firm productivity) are strongly related to a firm's success, including survival, growth and export participation.¹ Often, however, firms are active on different markets, with varying market conditions: most notably, for an exporting firm, conditions in one destination market may be quite distinct from those on another destination market, or those on the domestic market. Indeed, even for a given firm, the variation in export sales across destinations is tremendous (Eaton et al., 2011). Interactions between characteristics of individual firms and those of the market have received only little attention, even though such market-specific idiosyncratic factors are essential for studying the intensive margin of exporting.

In this paper, we employ data for the Danish chocolate and confectionery industry and a novel measure of differences in tastes to study the cross-country variation in export sales. We argue that demand (and, thus, market performance) is imperfectly correlated across countries due to differences in consumer tastes. Empirically, we show that a product's appeal on the domestic market is a much poorer predictor of export performance in destinations where tastes differ substantially from domestic tastes.

The data set is unusually rich and provides information on production and trade at the firm-product level, which allows us to infer domestic sales and prices. In a first step, we employ these data to estimate domestic product appeal. Our approach builds on the discrete choice demand framework as put forward in Berry (1994). Since we do not have variety-specific information on product ingredients, we follow Khandelwal (2010) and define product appeal as the sum of all factors (such as product quality, brand recognition, consumer awareness etc.) which, conditional on price, generate higher market shares. Thus, product appeal measures non-price determinants of domestic market performance. Our estimates reveal that a higher domestic product appeal tends to be associated with higher output prices, higher input prices, a greater likelihood of being exported, and a wider set of penetrated markets.² However, export performance is not monotonically increasing in domestic product appeal: for example, many varieties with a high domestic product appeal are only sold on the domestic market.

¹See Foster et al. (2008) for evidence on the effects of productivity on firm survival and growth. Wagner (2007) provides a review of the evidence that links productivity and exporting.

²These patterns in the data are in line with the quality interpretation of the heterogeneous firms model in Melitz (2003) (though our estimates of product appeal capture more than just product quality in a narrow sense). See Crozet et al. (2012) for evidence using direct measures of product quality for the French Champagne industry.

In a second step, we test the hypothesis that domestic product appeal is a poorer predictor of export performance in destinations where consumers have very different tastes from domestic consumers. To this aim, we construct a novel measure of differences in tastes across countries, which is based on information on the *average* ingredients (such as cocoa, sweeteners etc.) of chocolate on confectionery sold in different countries. The data is obtained from Euromonitor's passport database. Differences in average ingredients across countries should to a large extent reflect differences in consumer tastes: for example products will on average have a higher sugar content in countries where consumers prefer a sweet product. While our novel measure of differences in tastes is correlated with proxy variables commonly used in the literature (such as linguistic proximity), it also reveals some of the limits of using such proxy variables.

We offer two different estimation strategies to uncover the relation between domestic appeal and export performance across destinations. First, we implement a reduced form approach, relating destination-specific exports to a variety's domestic product appeal and its interaction with cross-country differences in tastes. Following Eaton & Kortum (2001) and Crozet et al. (2012), we employ a Tobit estimator with destination-specific censoring point. This estimator solves the selection issue that we only observe exports for the subset of exporting firms. Results reveal that the relation between domestic product appeal and export sales is strong in destinations where tastes of domestic and foreign consumers accord well. In contrast, domestic product appeal has significantly less predictive power for exports to countries where tastes differ substantially from domestic tastes. We also find that the bias from selection into exporting is substantial: based on the subset of observations with positive export sales, we would predict a *negative* effect of domestic product appeal on export sales in a considerable number of destinations. The effect turns insignificant or positive across the entire set of destinations once we correct for selection into exporting.

In our second estimation strategy, we model the foreign demand for Danish chocolate and confectionery more formally, and apply the random coefficients logit model of demand in Berry et al. (1995) to our trade data. The Berry et al. (1995) framework takes into account heterogeneity in consumer tastes within a given country, and differences in substitutability across varieties. For example, we allow two high appeal varieties to be closer substitutes than a high appeal and a low appeal variety.³ Moreover, this analysis also explicitly accounts for pricing differences across firms and markets, and thus differences in market power, strategic interactions, etc. We

³The Berry et al. (1995) framework does, however, not allow us to account for selection into exporting.

find that the variation in tastes for product appeal across consumers within a given country is at least as large as the variation across countries in average tastes, but that the latter remains substantial even after controlling for the former.

A growing number of studies documents heterogeneity in demand across countries. Eaton et al. (2011) introduce country-specific demand shocks into a model of heterogeneous firms. Estimating the model based on French firm-level export data, they find an enormous idiosyncratic variation in demand across export markets: conditional on entry, firm-destination specific factors explain much more than 50 percent of the variation in sales across firms in any given market; see also Crino & Epifani (2012), Nguyen (2012) and Munch & Nguyen (2014). However, these studies remain largely silent on the origin of such demand idiosyncrasies across countries, which is the focus of our work. In order to rationalize the observed variation in demand across countries, Di Comite et al. (2014) propose a quadratic preference model with country-specific taste parameters, where exported varieties that match local tastes better succeed in capturing larger market shares. Our empirical analysis builds on the intuition of their theoretical framework. Empirically, we confirm that cross-country differences in tastes do indeed have an effect on the within-firm variation in sales across export markets.

Our empirical approach builds on recent applications of demand estimation which infer product appeal as the residual from a regression of market shares on prices.⁴ Foster et al. (2008) and Katayama et al. (2009) apply this approach to the analysis of firm productivity. In the trade literature, Khandelwal (2010) and Hallak & Schott (2011) obtain country-specific estimates of product appeal (interpreted as ‘product quality’) from aggregate trade data. Gervais (2014) infers ‘product quality’ at the plant-level and confirms that it is important in explaining export outcomes. Roberts et al. (2017) study firm-level heterogeneity in product appeal for a sample of Chinese footwear exporters. They find that the firm heterogeneity in product appeal is more important in explaining differences in export sales than firm heterogeneity in marginal costs. We extend this line of work by considering the within-firm variation in sales across export markets.

Our work is also related to empirical studies of the gravity equation which highlight the importance of bilateral affinity for aggregate trade patterns; see e.g. Felbermayr & Toubal (2010), Disdier et al. (2010) and Melitz & Toubal (2014). We show that bilateral affinity, measured in our framework as the similarity of consumer tastes, has a higher effect on exports

⁴In this literature, ‘product appeal’ is also referred to as ‘idiosyncratic demand’, or – more narrowly – as ‘product quality’.

for varieties with a high domestic product appeal, and hence affects trade patterns not only across country-pairs but also within country-pairs across varieties. Finally, several authors have provided empirical evidence that high-income countries demand higher quality; see e.g. Hallak (2006), Verhoogen (2008) and Flach (2016). We also find that high-income countries have a higher demand for varieties of high (domestic) appeal, but that this effect is entirely driven by the positive correlation of income per capita with the similarity in consumer tastes.

The next section discusses the choice of industry, introduces the data for Danish chocolate and confectionery producers, and presents our novel measure of differences in tastes across countries. Section 3 lays out the empirical strategy for estimating domestic product appeal and presents demand estimates. Section 4 discusses reduced form estimates on the link between domestic product appeal and export sales across destinations, as well as extensions to the benchmark model. In Section 5, we allow for consumer heterogeneity on the export market by estimating the foreign demand for domestic product appeal in a Berry et al. (1995) framework. Section 6 concludes the paper.

2 Data and empirical patterns

2.1 Choice of industry

Our main data source is the Danish firm register, from which we retrieve information on production and trade in the chocolate and confectionery industry. We discuss these data in more detail in Section 2.2. We also obtain information on the ingredients of chocolate and confectionery sold in different countries from Euromonitor's Passport database.⁵ In Section 2.3, we describe how we use these data to construct measures of differences in tastes across countries that are specifically tailored to the industry under consideration. Finally, Section 2.4 shows that demand for a given variety of chocolate and confectionery varies considerably across domestic and export markets.

Apart from the availability of industry-specific measures of differences in tastes across countries, the combination of several other features renders the chocolate and confectionery industry highly suitable for studying the relation between domestic product appeal and export performance. First, chocolate and confectionery exhibits a lot of both vertical and horizontal differentiation. For chocolate, for example, quality (as evaluated by experts) depends on the origin

⁵See www.euromonitor.com/passport.

and processing of the cacao, chocolate production practices, non-chocolate ingredient quality etc. However, personal tastes also play an important role: consumers have different preferences regarding e.g. different chocolate flavors and fillings or the sweetness of the product as driven by the cacao content (FCIA, 2018). The combination of both vertical and horizontal product attributes renders the products more prone to cross-country differences in consumer tastes.

Second, food products and other non-durable consumer goods are strongly influenced by customs, culture and national tastes and are therefore harder to internationalize (van Mesdag, 2000; Sangeeta Ramarapu, 1999). In the case of chocolate and confectionery, market analysts highlight that there are significant differences in tastes across countries; see e.g. KPMG (2012). European consumers, for example, attach a higher value to organic chocolate than Northern American consumers. Similarly, products highly valued by customers in the aging economies of Europe may face very different valuations on the Southern American market, which is mainly directed towards children.

Third, the industry is highly internationalized, and many varieties are exported to several markets. Hence, we are in a position to compare sales for the same variety across markets.

2.2 Data on production and trade

We employ information on production and trade recorded at the eight-digit level of the Combined Nomenclature (CN). Data on production are retrieved from the Commodity Statistics provided by Statistics Denmark. The data are based on a survey in which firms report sales of products measured in both values and quantities. We complement these data with information on export values and quantities by destination from the External Trade Statistics. The combination of both data sets allows us to retrieve domestic sales and prices for each variety. The construction of variables and data cleaning is described in more detail in the Online Appendix.

Table 1 gives a complete list of the 35 different eight-digit product codes included in the industry. These eight-digit products can be broadly classified into four broader types of confectionery: gum, sugar confectionery, chocolate confectionery, and sugared fruits. The Euromonitor data include information on product ingredients for three of these four types of confectionery; see below. (Sugared fruits are not included in the Euromonitor data.) In the following, we refer to the eight-digit product codes as ‘products’, and the broad product groups (gum, sugar confectionery, chocolate confectionery, and sugared fruits) as ‘types of confectionery’. Finally, we refer to an eight-digit product produced by a firm as a variety of that product. Our panel covers

Table 1: List of eight-digit products in the chocolate and confectionery industry

8-digit product	Explanatory notes	N	N Exp.	Confectionery type
17041010	Chewing gum in stripes, containing < 60% sucrose	1	.a	Gum
17041019	Chewing gum containing < 60% sucrose; excl. in stripes	15	12	
17049010	Liquorice extract	1	.a	Sugar confectionery
17049030	White chocolate	10	4	
17049051	Pastes, incl. marzipan	50	40	
17049055	Throat pastilles and cough drops	21	14	
17049061	Sugar coated “panned” goods, not containing cocoa	41	32	
17049065	Gum and jelly confectionery	75	66	
17049071	Boiled sweets, whether or not filled	59	48	
17049075	Toffees, caramels and similar sweets	26	15	
17049081	Other compressed tablets of sugar confectionery	12	5	
17049099	Other pastes, marzipan, nougat and other prepared sugar confectionery	136	108	
18061015	Cocoa powder, sweetened containing no sucrose	3	.a	Chocolate confectionery
18061020	Cocoa powder, sweetened containing $\geq 5\%$ but < 65% by weight of sucrose	6	0	
18061030	Cocoa powder, sweetened containing $\geq 65\%$ but < 80% of sucrose	5	2	
18062010	Chocolate and other food preparations containing cocoa, in packings of a content > 2 kg containing $\geq 31\%$, by weight, of cocoa butter and milk fat	30	19	
18062030	Chocolate and other food preparations containing cocoa, in packings of a content > 2 kg containing $\geq 25\%$ but < 31%, by weight, of cocoa butter and milk fat	20	17	
18062050	Chocolate and other food preparations containing cocoa, in packings of a content > 2 kg containing $\geq 18\%$ but < 31%, by weight, of cocoa butter	7	3	
18062080	Chocolate flavour coating in packings of a content > 2 kg	8	0	
18062095	Chocolate and other food preparations containing cocoa, in packings of a content > 2 kg containing < 18%, by weight, of cocoa butter	27	25	
18063100	Chocolate and other preparations containing cocoa, ≤ 2 kg, filled	88	26	
18063210	Chocolate and other preparations containing cocoa, ≤ 2 kg with added cereal, fruit or nuts	24	16	
18063290	Chocolate and other preparations containing cocoa, ≤ 2 kg (excl. filled and with added cereal, fruit or nuts)	40	24	
18069011	Pralines, whether or not filled, containing alcohol, ≤ 2 kg	31	17	
18069019	Pralines, whether or not filled, not containing alcohol, ≤ 2 kg	58	51	
18069031	Chocolates and chocolate products, filled (excl. in blocks, slabs or bars and pralines), ≤ 2 kg	61	32	
18069039	Chocolates and chocolate products (excl. in blocks, slabs or bars, pralines and filled), ≤ 2 kg (excl. filled)	60	50	
18069050	Sugar confectionery made from sugar substitution products, containing cocoa, ≤ 2 kg (excl. filled)	77	42	
18069070	Preparations containing cocoa, for making beverages, ≤ 2 kg (excl. filled)	18	16	
18069090	Other preparations containing cocoa, ≤ 2 kg (excl. filled)	66	44	
20060010	Ginger	16	2	Sugared fruit (not included in Euromonitor)
20060031	Cherries, with a sugar content of > 13%	6	0	
20060038	Other vegetables, fruit, nuts, fruit-peel and other edible parts of plants, with a sugar content of > 13% by weight	4	.a	
20060091	Guavas, mangoes, mangosteens, papayas, tamarinds, cashew apples, lychees, jackfruit, sapodillo plums, passion fruit, carambola, pitahaya, coconuts, cashew nuts, brazil nuts, areca nuts, cola nuts and macadamia nuts	1	.a	
20060099	Other vegetables, with a sugar content of $\leq 13\%$ by weight	1	.a	

Notes: The table gives a complete list of eight-digit product codes included in the chocolate and confectionery industry. The third and fourth column report, respectively, the number of observations per product and number of exporters per product. For data confidentiality reasons, the number of exporters can only be reported for product codes with at least five observations. For all other product codes, the number of exporters is reported as “.a”. The last column provides a mapping between eight-digit product codes and the types of confectionery considered in the Euromonitor data (see Section 2.3 for details).

Table 2: Summary statistics

Number of CN8 products: 35; Number of firms: 58; Number of observations: 1,104				
<i>Non-Exporter</i> : N (firm-year)=156		<i>Exporter</i> : N (firm-year)=238		
	Mean	Median	Mean	Median
Product scope	1.45	1	3.69	2
Importer	0.74	1	0.91	1
<i>Non-exported variety</i> : N (variety-year)=372		<i>Exported variety</i> : N (variety-year)=732		
	Mean	Median	Mean	Median
Domestic revenue	18,400,000	2,810,000	31,400,000	10,300,000
Domestic quantities	436,977	57,686	951,766	321,369
Domestic price	69.84	39.84	42.69	29.57
Export revenue			16,600,000	4,460,000
Export quantities			723,901	160,262
Export price			28.74	21.52
Export destinations			10	8

Notes: *Exporter* is defined at the firm level and coded one if the firm exports at least one product to at least one destination. *Exported variety* is defined at the firm-product level and coded one if the variety is exported to at least one destination. Domestic and export revenues are measured in Danish Kroner (DKK) and rounded to the 100,000s. Quantities are measured in kg and prices in DKK per kg. 1 DKK $\approx$ 0.187 USD in 2009.

the period 1997 to 2012 and comprises a total of 58 firms across all years. We have information on a total of 1,104 variety-year observations.

Table 2 pools observations across years and reports summary statistics by export status, defined at the firm level (upper part of the table) or the firm-product level (lower part of the table). 60 percent of firms export at least some of their varieties. These exporters are larger in terms of their product portfolio than firms that only sell domestically: the median exporter produces two products, compared with only one product produced by the median non-exporter. We also construct an indicator for import status, which equals one if the firm imports at least one intermediate good used in the production of chocolate and confectionery.⁶ Almost all exporting firms (91 percent) import some of their intermediate inputs, but importing is with 74 percent common even among non-exporters.

Turning to the firm-product level, 66 percent of all varieties are exported and the median exported variety is shipped to eight destinations.⁷ On average, exported varieties have larger domestic sales (in both quantity and value terms) than non-exported varieties. Aggregate export sales are to the contrary significantly lower than domestic sales. Hence, even the sales of exporters are biased towards the domestic market – despite a relatively small home market in Denmark. The average price of exported varieties is lower than the price of varieties that are only sold on the Danish market, which could be because these firms need to be more productive

⁶See the Online Appendix for details on the selection mechanisms for identifying relevant intermediate goods.

⁷The probability of being exported varies significantly across different product categories. For example, many varieties of *Gum and jelly confectionery* are exported (66 out of 75, or 88 percent), while varieties of *Filled chocolate* are much less likely shipped to foreign markets (26 out of 88 varieties, or 30 percent); see Table 1.

Table 3: Product ingredients by country and confectionery type

Confectionery type	Ingredient	Share DK	Country (Min)	Share	Country (Max)	Share
Chocolate confectionery	Cocoa Liquor	10.2	Vietnam	6.6	Cameroon	15
	Commodities	4.1	Cameroon	2.1	Bulgaria	10.4
	Fats and Oils	17.2	Vietnam	13.8	Cameroon	18.9
	Milk	15	Bulgaria	10.2	Colombia	16.9
	Sweeteners	51.3	Cameroon	45.9	Belarus, Uzbekistan	57.4
Gum	Miscellaneous Ingr.	29.1	Egypt, Morocco	16.9	Singapore	29.5
	Sweeteners	65.5	Poland	65.1	Colombia, Morocco	79.2
Sugar confectionery	Commodities	6.7	India	1.8	Tunisia	17.8
	Fats and Oils	2.1	Turkey, Venezuela	0.4	India	9
	Flours	6.4	Costa Rica; Thailand	0	Netherlands	9.1
	Milk	0.7	Turkey, Venezuela	0.3	India	10.9
	Sweeteners	79.1	India	73.1	Nigeria	94.3

Notes: The table is based on Euromonitor data and reports shares of ingredients in total ingredients for three of the four types of confectionery. ('Sugared Fruits' are not included in the Euromonitor data.)

in order to survive on export markets. Moreover, export prices tend to be lower than domestic prices, possibly due to a higher degree of competition on international markets.⁸

2.3 Measuring differences in tastes across countries

We want to test whether domestic performance is a better predictor of export performance in markets where consumers have tastes that are similar to domestic tastes. To this aim, we construct a novel measure of such cross-country differences in tastes.

Euromonitor's passport database provides information on the ingredients of chocolate and confectionery sold in different countries. Euromonitor only reports aggregate data; i.e., the data reflect the *average* amount of an ingredient across all producers that serve a given country. We assume that average ingredients used in production vary across countries depending on consumer tastes: for example, chocolate will on average have a higher cocoa content in countries where the cocoa content is highly valued by consumers. Similarly, the average amount of sweeteners is plausibly higher in countries where consumers prefer very sweet confectionery. We thus can use these data to construct a measure of differences in tastes across countries.⁹

We have information on average product ingredients separately for three of the four types of confectionery mentioned above: chocolate confectionery, gum, and sugar confectionery. For each of these types of confectionery, Table 3 gives the main ingredients as a share of total ingredients.

⁸Export sales are measured in free on board terms, i.e. including the costs connected to the transport of the commodity from the exporter to the export point at the Danish border or sea port. Similarly, domestic sales are calculated including general packaging, freight charges and insurance costs. Still, the types of costs included in both prices might differ slightly, rendering domestic and export prices imperfectly comparable.

⁹Danish producers only account for a very small share of overall sales of chocolate and confectionery in a given export market. Differences in export participation of Danish producers across countries are thus unlikely to affect average product ingredients.

To economize on space, we only report ingredients with a share in total ingredients of at least 5 percent in at least one country. For each type of confectionery and ingredient, we show numbers for (i) Denmark, (ii) the country/countries with the highest share of the ingredient and (iii) the country/countries with the lowest share of the ingredient. For example, the share of cocoa liquor ranges from 6.6 percent of all ingredients of chocolate confectionery in Vietnam to 15 percent in Cameroon. Denmark lies somewhere in the middle, with a share of 10.2 percent in total ingredients. The amount of commodities (such as fruits, nuts etc.) also varies considerably across countries: in India, commodities constitute a mere 1.8 percent of total ingredients of sugar confectionery, while the share is as high as 17.8 percent in Tunisia. For all three types of confectionery, sweeteners constitute the most important ingredient in all countries, but we again see sizable differences across countries: for sugar confectionery, for example, sweeteners make up for between 73.1 percent of ingredients in India to 94 percent in Nigeria.

Denote Ψ^c as the Euclidean distance between the shares of ingredients in Denmark and destination c :

$$\Psi^c = \left(\sum_l (t_l^c - t_l^d)^2 \right)^{1/2}, \quad (1)$$

where t_l^c denotes the share of ingredient l in country c and t_l^d denotes the respective share in Denmark. Ψ^c is our novel measure of cross-country differences in tastes. We first compute (1) by pooling shares of ingredients across all types of confectionery. We also construct Ψ^c for each type of confectionery (chocolate confectionery, gum, sugar confectionery) individually. We label these two variables “ Ψ^c (all conf. types)” and “ Ψ^c (by conf. type)”, respectively. For the latter variable, we can link the three types of confectionery in the Euromonitor data to the eight-digit CN codes used in the firm-product-level data, as indicated in the first column of Table 3. “ Ψ^c (all conf. types)” is our benchmark measure, and Ψ^c refers to this measure unless stated otherwise.

Figure 1 shows how Ψ^c relates to characteristics of the export market.¹⁰ We obtain data on GDP per capita from the World Development Indicators (WDI) and information on linguistic proximity to Denmark from Melitz & Toubal (2014). Based on the Linder hypothesis (Linder, 1961), we would expect countries to have similar tastes if they are at a similar stage of development. Figure 1(a) confirms this intuition: differences in tastes between Denmark and country c , Ψ^c , are smaller for higher income destinations. Linguistic proximity is often used as a measure of cultural proximity. Consumer tastes partly depend on culture, and we therefore expect cultural

¹⁰Figure B.1 in the Online Appendix shows results for the second measure of Ψ^c , which is specific to the different types of confectionery.

Figure 1: Differences in tastes and country characteristics

proximity to be negatively related to differences in tastes. Indeed, Figure 1(b) shows a negative relation between Ψ^c and linguistic proximity.

Differences in tastes may also be related to (agro-climatic) endowment differences across countries. In countries where one of the ingredients used in the production of chocolate and confectionery is locally produced and has therefore been cheap historically, local varieties will use more of this ingredient. Case studies show that consumers often develop a preference for such locally abundant ingredients.¹¹ Moreover, even though price differences across countries have been significantly reduced due to the integration of the global economy, historically grown differences in tastes often persist.¹²

Next, we therefore examine how differences in tastes across countries are related to the local abundance of two major ingredients of confectionery, namely cacao and sugars (sweeteners). From the Food and Agricultural Organization (FAO), we obtain information on production quantities of cacao and sugar cane;¹³ and focus on the top-20 producers of each of these ingredients. The production of cacao mandates a tropical climate, and the world's main cacao producers are developing and emerging countries in Africa, Latin America and Asia. Figure 3(a) shows that these countries often have tastes that are very different from Danish tastes. In contrast, producers of sugar cane are found in different parts of the world. Some of these countries (e.g., Vietnam or the Philippines) reveal tastes that differ a lot from the tastes of Danish consumers, but other countries (such as Australia and the United States) have tastes that seem

¹¹For example, Atkin (2013) finds that locally abundant foods are preferred in Indian regions. A similar pattern of regional consumption differences is observed by Head & Mayer (2013) for the expenditure on butter vs. olive oil in France.

¹²However, some studies also point to the global convergence of tastes; see, e.g., Aizenman & Brooks (2008).

¹³Sugar cane accounts for 80 percent of world sugar production.

to match Danish tastes quite closely; see Figure 3(b).

In sum, our novel measure of cross-country differences in tastes is related to variables which are commonly used to proxy such differences. However, Ψ^c also shows some of the limits of these proxy variables: for example, based on linguistic proximity, we would have predicted Finnish consumers to have very different tastes from those of Danish consumers. In contrast, our novel measure Ψ^c reveals that Finland is the country with tastes most similar to Danish tastes. Similarly, based on local access to intermediate inputs (cacao), we would predict a country like Brazil to have substantially different tastes compared to Danish tastes. In contrast, our novel measure reveals that differences in tastes between Denmark and Brazil are comparable to those between Denmark and Estonia, though Brazil is a significant producer of cacao but Denmark and Estonia are not.

2.4 Empirical patterns

Differences in consumer tastes imply that a variety's demand differs across domestic and export markets. As a first pass at the data, we therefore ask how export market performance is related to domestic sales. For each variety and year, we construct a measure of relative performance on the domestic market as the ratio of revenue over the revenue of the median variety. Figure 2 plots this ratio against the number of export markets served. The number of export markets is positively related to domestic performance, but only weakly so. Interestingly, a considerable share of non-exported varieties performs relatively well on the domestic market (with a revenue ratio exceeding one).¹⁴

Next, for each exported variety and each destination, we measure relative export performance as the ratio of revenue over the revenue of the median variety on that market. For the same set of varieties, we then reconstruct revenue relative to median revenues on the domestic market. Figure 3 plots these two relative performance measures against each other. Figure 3(a) shows that export performance is positively related to domestic performance in the top-10 export destinations (ranked by popularity among Danish chocolate and confectionery producers).¹⁵ However, the relationship becomes much weaker once we go beyond these most popular markets; see Figure 3(b): domestic performance explains around 18.5 percent of the variation in export

¹⁴Regression results confirm that only exporting to more than five markets is consistently associated with higher domestic sales. If we control for product fixed effects, exporting to only one destination is indeed *negatively* related to sales in Denmark; see Table B.1 in the Online Appendix. Figures 2 and 3 look at sales in value terms, but the plots look very similar if we look at quantities instead; see Figures B.2 and B.3 in the Online Appendix.

¹⁵Sweden, Germany, Norway, Finland, Faeroe Islands, Iceland, Great Britain, Netherlands, Spain and France.

Figure 2: Domestic sales and the number of export markets

(a) Top 10 destinations

(b) Other destinations

Figure 3: Domestic sales vs. export sales

performance in the top-10 destinations but only a mere 6.1 percent of the variation in other destinations.¹⁶ Moreover, in both figures we see a considerable share of varieties selling relatively little on the domestic market, while at the same time being highly successful on specific export markets, or vice versa.

Finally, we examine how export sales and export participation of Danish chocolate and confectionery producers vary across countries. Figure 4 shows average exports per variety and the number of exported varieties as a function of Ψ^c . Sweden, Germany, Norway, Finland and the Netherlands are the most important destinations. Moreover, both export sales and the number of exported varieties are declining in differences in tastes, Ψ^c . For example, average exports per variety range from more than three million DKK in Germany and Sweden – two countries with tastes that are very similar to Danish tastes – to less than 25,000 DKK in countries such as

¹⁶Note also that the elasticity of export performance to domestic performance is 0.554 in the top-10 destinations, but only 0.295 in other destinations. Similarly, the locally smoothed polynomial plot in Figure 3(a) is – for a large range of the data – much steeper than the one in Figure 3(b).

Figure 4: Differences in tastes and Danish exports of chocolate and confectionery

Morocco, Kenya and Guatemala, which have tastes that are very different from Danish tastes. A similar picture emerges when we consider the number of exported varieties: on average across years, close to 40 varieties are exported to the most popular destinations (Sweden, Germany and Norway). In contrast, the least popular destinations (such as India, Venezuela or Pakistan) are only served sporadically (and thus, on average across years, the number of exported varieties is smaller than one).

3 Estimating domestic product appeal

In this section, we derive estimates of “domestic product appeal”, reflecting non-price factors of domestic market performance. Our main analysis relies on the discrete choice framework of demand. In the multinomial logit model, the indirect utility of consumer i from consuming one unit of variety j is given by

$$u_{ijt}^d = \xi_{jt}^d - \alpha \ln p_{jt}^d + \varepsilon_{ijt}, \quad (2)$$

where p_{jt}^d is the price of variety j at time t , and the superscript d signals that all variables refer to the domestic market.¹⁷

The term ξ_{jt}^d reflects mean consumer valuations of variety j in the domestic market. Consumer valuations depend on product characteristics – such as, e.g., the sugar or cacao content –

¹⁷Note that this specification does not allow for consumer heterogeneity in α . We have also estimated the random coefficients models of Berry et al. (1995) on our data, but the results rejected any heterogeneity in consumer price responsiveness. With only few markets (i.e., years) and little variation in tastes across markets (time), it might in fact be hard to identify consumer heterogeneity in tastes. We therefore restrict the analysis to the multinomial logit model here. We will return to the Berry et al. (1995) framework in Section 5, when we estimate the foreign demand for Danish varieties.

and consumer tastes for these characteristics. They also depend on product branding, consumer awareness etc. Thus, consumer valuations are influenced not only by factors that are inherent to the product, but also by tastes and preferences. Following Katayama et al. (2009), we refer to ξ_{jt}^d broadly as the variety's 'appeal to (domestic) consumers'.¹⁸

Consumer heterogeneity enters through an individual-specific demand shock, ε_{ijt} , which is assumed to be extreme value distributed. Individuals consume one unit of the variety that yields the highest utility. They may also not consume any of the goods in the industry, which amounts to choosing an outside alternative (with utility normalized to zero). Under the given distributional assumptions, a variety's domestic market share s_{jt}^d is given by (Berry, 1994):

$$s_{jt}^d = \frac{\exp(\xi_{jt}^d - \alpha \ln p_{jt}^d)}{D_t^d}. \quad (3)$$

$\ln D_t^d = \ln[\sum_j \exp(\xi_{jt}^d - \alpha \ln p_{jt}^d)]$ is the inclusive value of all varieties sold in the market.

From (3), product appeal ξ_{jt}^d captures the sum of all factors which, conditional on price, generate higher market shares.

3.1 Estimation and identification

We employ the data on domestic quantities and prices to infer ξ_{jt}^d . Recall that a variety j is defined as an eight-digit product produced by a specific firm, and that many firms produce several varieties. We decompose ξ_{jt}^d into a firm fixed effect ξ_f^d , a time fixed effect ξ_t^d , and a deviation from the fixed effect which is unobserved, ε_{jt}^d . Moreover, we allow for differences in utility across types of confectionery. The demand parameters can be estimated from a linear regression of differences in market shares on prices and the fixed effects; see Berry (1994):

$$\ln s_{jt}^d - \ln s_{0t}^d = \xi_f^d + \xi_t^d + \beta_1 Gum_j + \beta_2 Chocolate_j + \beta_3 Sugared Fruit_j - \alpha \ln p_{jt}^d + \varepsilon_{jt}^d, \quad (4)$$

where Gum_j , $Chocolate_j$ and $Sugared Fruit_j$ denote indicators for the types of confectionery, and β_1 , β_2 and β_3 are the corresponding parameters. Sugar confectionery is the omitted category.

The dependent variable is the (log of the) domestic market share, s_{jt}^d , normalized by the market share of the outside good, s_{0t}^d (due to the normalization, the inclusive value in (3)

¹⁸Depending on the application, the literature has used different labels for the term ξ_{jt} , including 'product quality' (Khandelwal, 2010; Gervais, 2014), 'product appeal' (Katayama et al., 2009), or 'demand shock/component' (Foster et al., 2008; Roberts et al., 2017).

cancels out; see Berry (1994)). The error term, ε_{jt}^d , reflects changes in product appeal over time (e.g., driven by changes in product characteristics, changes in consumer valuations, promotional activities, etc.). For a multi-product firm, ε_{jt}^d also captures cross-sectional variation in the valuation of its different varieties.

We estimate the demand specification in Equation (4) based on information on the quantities sold domestically by Danish producers. We do not observe how much foreign producers sell in Denmark, and our sample therefore only includes a subset of varieties available to consumers. Estimates of α should thus be carefully interpreted as reflecting the price elasticity of Danish consumers for domestic varieties.¹⁹

We follow Nevo (2001) in defining the potential market size M_t^d as a fixed amount of consumption per capita. In particular, we assume that each Danish consumer could potentially consume 50 grams of confectionery per day, or 18.25 kg per year. With a usual serving size of 20-25 grams, this amounts to approximately two servings per capita per day. To calculate the potential market size M_t^d , we multiply yearly potential per capita consumption by the number of persons in Denmark. The market share of each variety is then given by its sales volume (in kg) divided by the potential market size, $s_{jt}^d = \frac{q_{jt}^d}{M_t^d}$. Similarly, the market share of the outside good is calculated as one minus the sum of the shares of all inside goods, $s_{0t}^d = 1 - \sum_j \left(\frac{q_{jt}^d}{M_t^d} \right)$.

A high realization of the demand shock ε_{jt}^d induces producers to raise prices, implying that the price coefficient is biased towards zero in an ordinary least squares (OLS) regression.²⁰ Determinants of marginal costs that are orthogonal to the demand shock constitute valid instruments. We employ two different IV strategies.

First, we explore variation in marginal costs across products, and information on prices across markets. In particular, we instrument $\ln p_{jt}^d$ with the log of the weighted average export price of firms producing the same eight-digit product g :

$$\ln \bar{p}_{gt}^x = \ln \left(\sum_{j' \in g} p_{j't}^x \cdot \frac{q_{j't}^x}{\sum_{j' \in g} q_{j't}^x} \right), \quad (5)$$

¹⁹Recall that we estimate demand in order to infer domestic product appeal ξ_t^d for Danish varieties only. Correct inference of ξ_t^d depends on unbiased estimates of the parameters of Danish demand for domestic varieties. Thus, we would argue that excluding foreign varieties is not an issue for our purpose.

²⁰Consumer choices depend on retail (or transaction) prices. p_{jt}^d is instead constructed from information on invoiced sales at the factory gate and roughly reflects the wholesale price. We therefore impose the crude approximation that retail prices are a (multiplicative) mark-up over wholesale prices and that this mark-up is constant across varieties. The difference between prices faced by consumers and those observed in the data then becomes an issue of data scaling and does not affect our estimates of product appeal.

where $q_{j't}^x \equiv \sum_c q_{j't}^c$ denotes aggregate exports of variety j' and $p_{j't}^x$ is its weighted average export price across destinations, i.e. $p_{j't}^x \equiv \sum_c p_{j't}^c \cdot \frac{q_{j't}^c}{q_{j't}^x}$. $\ln \bar{p}_{gt}^x$ captures product-specific marginal cost shocks. Marginal cost shocks are correlated across markets and varieties of a given product code, e.g. due to the use of similar intermediate inputs such as cacao, cereal, fruits, nuts and so forth. The instrument is therefore correlated with the domestic price.²¹ The identifying assumption is that (conditional on firm-, time- and confectionery-type fixed effects) the average export price of all exported varieties is uncorrelated with variety-specific demand shocks on the domestic market.

Second, we follow Hausman (1996) and exploit information on a variety's own price on foreign markets as an instrument for its domestic price.²² This instrument is only applicable for exported varieties. Here, the identifying assumption is that variety-specific demand shocks (conditional on ξ_f^d and ξ_t^d) are independent across markets. When using a variety's own export price as instrument, we can also extend the empirical specification in (4) to include more detailed product fixed effects, ξ_g^d , or product-year fixed effects ξ_{gt}^d . Including these fixed effects is important if the confectionery-type indicators (*Gum_j*, *Chocolate_j* and *Sugared Fruit_j*) do not adequately control for differences in demand across products.

With demand parameter estimates in hand, we infer domestic product appeal ξ_{jt}^d as:

$$\hat{\xi}_{jt}^d = \ln s_{jt}^d - \ln s_{0t}^d + \hat{\alpha} \ln p_{jt}^d. \quad (6)$$

Note that we have not explicitly modeled the supply side. Thus, identification of domestic product appeal does not hinge on specific assumptions regarding the extent of competition between firms or pricing behavior of (multi-product) firms.²³

²¹To compute the instruments, we use information on all exported varieties of chocolate and confectionery, i.e. also information from smaller firms that appear only in the trade statistics but not in the commodity statistics. Note that there is one observation for which we cannot compute $\ln \bar{p}_{gt}^x$ because we do not observe any firms exporting the same product in the same year. Omitting a firm's own variety j from the computation in Equation (5) yields a variable that is highly correlated with $\ln \bar{p}_{gt}^x$ and does, thus, not significantly alter our results.

²²Foster et al. (2008) and Gervais (2014) use firms' physical productivity as an instrument for prices. However, this instrument yields implausible results for our sample, with estimated demand elasticities well below one. Following Piveteau & Smagghue (2017) and Amiti et al. (2016), we have also experimented with using changes in import prices, as driven by exchange rate changes, as instruments, but found this instrument to be weak in the first stage.

²³For example, under perfect competition, the (multiplicative) mark-up implied by our demand specification would read as $\frac{\alpha}{\alpha-1}$. With oligopolistic competition and single-product-firm pricing, we would have a mark-up of $\frac{\alpha(1-s_{jt}^d)}{\alpha(1-s_{jt}^d)-1}$. With oligopolistic competition and multi-product-firm pricing, the mark-up additionally includes a factor that accounts for cannibalization effects across a firm's varieties.

3.2 Demand parameter estimates

Table 4 presents demand parameter estimates based on Equation (4). We confront OLS estimates in columns (1) to (3) with results from the instrumental variable approach in columns (4) to (8).

Column (1) shows that $\hat{\alpha}$ is small and not statistically significant in the OLS specification with fixed effects for the different types of confectionery. This finding is in line with the predicted bias. Moreover, $\hat{\alpha}$ remains practically unchanged when we include more detailed product fixed effects ξ_g^d or product-year fixed effects ξ_{gt}^d ; see columns (2) and (3). Thus, accounting for product differences in demand does not help in increasing the performance of the OLS specification.

In the remainder of the table, we turn to the IV estimates. Independent on the choice of instrument, $\hat{\alpha}$ turns statistically significant and increases notably in size compared to the OLS regressions. We first return to our benchmark specification with indicators for the different types of confectionery. In column (4), we employ $\ln \bar{p}_{gt}^x$ as instrumental variable. The model shows a good fit in the first stage, with a high R^2 and a large F statistic of the excluded instrument. The estimate of α implies a price elasticity of demand for chocolate and confectionery of around 1.42. This estimate is comparable to others in the literature. For example, Piveteau & Smagghue (2017) find a price elasticity of 1.35 for ‘Food Stuffs’. We do not find significant differences in market shares across the different types of confectionery.

In column (5), we interact $\ln \bar{p}_{gt}^x$ with the indicators Gum_j , $Chocolate_j$ and $Sugared Fruit_j$ in the first stage. This model is over-identified and allows for additional testing. Following the recommendation in Angrist & Pischke (2008), estimation is via limited information maximum likelihood (LIML).²⁴ We now estimate a somewhat higher price elasticity of demand of 1.964 (though it deviates from the one in column (4) by less than one standard deviation). While the first stage F statistic is smaller than in column (4), the specification still passes tests of under- and weak-identification. In particular, the first stage F statistic of 8.387 exceeds the Stock-Yogo weak ID test critical value of 5.44. Finally, based on the Hansen J Statistic, we cannot reject the null hypothesis that the instruments are valid.

In column (6), we turn to the variety’s own export price as instrumental variable. This estimation is based on the sample of exported varieties only. The resulting estimate of $\hat{\alpha}$ is almost identical to the one in column (4). Interestingly, we now find that both Gum_j and

²⁴In the words of Angrist & Pischke (2008), “(...) LIML is less precise than 2SLS but also less biased.” With only one instrument, the LIML estimator is equal to the 2SLS estimator.

Table 4: Demand parameter estimates

	OLS			IV				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<i>Price</i>	-0.299 (0.288)	-0.229 (0.262)	-0.034 (0.343)	-1.418** (0.562)	-1.964*** (0.646)	-1.324** (0.660)	-3.091* (1.704)	-2.657* (1.429)
<i>Gum</i>	-0.936** (0.393)			-0.305 (0.702)	0.003 (0.879)	-1.482*** (0.466)		
<i>Chocolate</i>	-0.024 (0.342)			0.023 (0.346)	0.046 (0.361)	0.430 (0.343)		
<i>Fruit</i>	-0.596 (0.553)			-0.391 (0.631)	-0.291 (0.703)	-1.706** (0.767)		
Observations	1,104	1,104	1,104	1,103	1,103	732	732	732
R-squared	0.522	0.677	0.000	-0.125	-0.292	0.049	0.095	-0.249
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Product FE		Yes					Yes	
Product-Year FE			Yes					
Instruments				$\ln \bar{p}_{gt}^x$	$\ln \bar{p}_{gt}^x$; interactions	$\ln \bar{p}_{gt}^x$	$\ln \bar{p}_{gt}^x$	$\ln \bar{p}_{gt}^x$
First stage F statistic				25.533	8.387	22.445	7.918	6.348
First stage R-squared				0.657	0.662	0.700	0.761	0.868
rk LM Statistic				13.202***	15.512***	10.522***	5.993**	9.006***
Hansen J test, p -value					0.127			

Notes: The table reports results from the estimation of Equation (4). Robust standard errors, adjusted for clustering at the variety level, are given in parentheses. *, **, *** denote significance at the 10%, 5%, 1% levels, respectively. Product fixed effects are defined at the eight-digit level of the CN code. The rk LM Statistic refers to Kleibergen & Paap (2006)'s test of under-identification with the null hypothesis that the model is underidentified.

Sugared Fruit_j enter negatively, which implies that Danish consumers prefer sugar confectionery and chocolate confectionery over gum or sugared fruits.

Finally, in columns (7) and (8) we drop the three indicator variables for the types of confectionery, and instead include a full set of product fixed effects and product-year fixed effects, respectively. As in column (6), we employ each variety's own export price as instrument for the domestic price. Product fixed effects account for the general attractiveness of particular types of products, while product-year fixed effects additionally control for demand shocks that affect all varieties of the same product code. Thus, identification of the demand elasticity is now based on the within-product or within-product-year variation of prices, respectively. We estimate a price elasticity of demand between 2.66 and 3.09. These estimates are somewhat larger than those in previous columns, but comparable to estimates for other types of food products: for example, Nevo (2001) finds a price elasticity of demand for cereals of around 2-4.²⁵

3.3 Domestic product appeal

We employ the parameter estimates of column (5) in Table 4 to infer each variety's domestic product appeal according to Equation (6). In the Online Appendix, we provide robustness analysis using estimates from column (8) of Table 4. Table 5 shows that estimates of ξ_{jt}^d based on the different columns of Table 4 are highly correlated, with correlation coefficients between .948 and .987. The lower part of Table 5 shows that domestic product appeal is also positively correlated with both domestic prices and export prices. Assuming a positive relation between product appeal and product quality, this finding supports the assumption made frequently in previous studies that higher prices signal higher quality; see e.g. Kugler & Verhoogen (2012), Manova & Zhang (2012) and Hallak & Sivadasan (2013). Moreover, ξ_{jt}^d is positively related to firm size, measured either by the number of employees or product scope (the number of products produced by the firm).

We next investigate how domestic product appeal is related to a proxy of product quality. Specifically, following Manova & Zhang (2012), we assume that the quality of outputs is an increasing function of the prices of imported intermediate inputs. We first standardize log import prices by subtracting the average observed across all firms importing the product category. We

²⁵Both specifications also broadly pass tests of under- and weak-identification. In particular, the Kleibergen-Paap rk LM Statistic of under-identification is always statistically significant. The first stage F statistic also passes tests of weak-identification, though only at higher levels of 'maximal LIML size'; see Stock & Yogo (2005) for details.

Figure 5: Estimates of domestic product appeal $\hat{\xi}_{jt}^d$

then aggregate these demeaned import prices into a firm-level price index, which is given by the simple average of demeaned import prices across all intermediates imported by the firm. Since importing is an even more widespread phenomenon than exporting, we can construct the index for 85 percent of observations in our sample. Table 5 shows that the import price index is indeed positively correlated with $\hat{\xi}_{jt}^d$.

In Figure 5, we relate domestic product appeal to export participation. Figure 5(a) shows kernel density plots of $\hat{\xi}_{jt}^d$. The average domestic product appeal of exported varieties (red dashed lines) exceeds the one for non-exported varieties (blue solid lines). However, the graph also shows a large overlap in the distributions of $\hat{\xi}_{jt}^d$ for exporters and non-exporters at the upper end of the distribution. Hence, there is a significant share of varieties of high domestic product appeal that is not sold on export markets.

Figure 5(b) plots the share of varieties that are supplied to at least $c = 1, \dots, 64$ markets against the number of markets served, where $c = 1$ for non-exported varieties. Domestic product appeal is divided into four quartiles. In line with Figure 5(a), varieties from the lowest segment

Table 5: Correlation of $\hat{\xi}_{jt}^d$ with selected variables

	$\hat{\xi}_{jt}^d$	N
$\hat{\xi}_{jt}^d$ (based on column (4))	.987***	1,104
$\hat{\xi}_{jt}^d$ (based on column (6))	.982***	1,104
$\hat{\xi}_{jt}^d$ (based on column (7))	.948***	1,104
$\hat{\xi}_{jt}^d$ (based on column (8))	.987***	1,104
Domestic price ($\ln p_{jt}^d$)	.529***	1104
Average export price ($\ln p_{jt}^x$)	.234***	732
Product scope	.110***	1104
Log number of employees	.258***	1037
Import price index for intermediates	.120***	989

Notes: The table gives pairwise correlation coefficients. $\hat{\xi}_{jt}^d$ is based on column (5) of Table 4, unless noted otherwise. *, **, *** denote significance at the 10%, 5%, 1% levels, respectively.

of product appeal have consistently the lowest probability of being exported to any number of markets. However, looking at the three upper quartiles, we see a somewhat mixed picture. For example, varieties with intermediate levels of domestic product appeal have a higher probability of being sold on $c = 2, \dots, 8$ markets than varieties of the highest product appeal. The advantage of these varieties in penetrating more markets only becomes apparent at $c > 8$ destinations.

To sum up, higher domestic product appeal tends to be associated with higher output prices, higher input prices, a greater likelihood of being exported, and a wider set of penetrated markets. Assuming that product appeal is positively related to product quality, these findings are broadly in line with the quality interpretation of the Melitz (2003) model. However export participation is not monotonically increasing in domestic product appeal.

4 Domestic product appeal and export performance

How is domestic product appeal – reflecting non-price factors of domestic market performance – related to export performance? Recall that product appeal depends on both the inherent characteristics of the product and the tastes of the consumers. If consumer tastes are positively correlated across countries, varieties of a high appeal to domestic consumers should also perform better on foreign markets. However, if tastes differ across countries, a variety's appeal may be evaluated differently by foreign consumers.

Francois & van Ypersele (2002) introduce the concept of ‘cultural goods’ to define goods which face different consumer valuations abroad than at home. We argue that this concept should be understood broadly, and that it encompasses not only cultural goods in the narrow sense (i.e., arts and literature), but rather any good where national tastes are influenced by culture, history, customs, climate etc. For this comprehensive group of ‘cultural goods’, success on the domestic market is an imperfect predictor of success on export markets, especially in destinations where tastes differ substantially from domestic tastes.

In this section, we test this hypothesis in a reduced form approach, relating destination-specific exports to estimates of domestic product appeal ξ_{jt}^d , interacted with Ψ^c (our novel measure of cross-country differences in tastes). In Section 5, we model the foreign demand for domestic product appeal more formally, applying the Berry et al. (1995)-estimator to our trade data.

4.1 Empirical approach

Denote r_{jt}^c as variety i 's export revenue in destination c .²⁶ Our benchmark estimation equation reads as follows:

$$\ln r_{jt}^c = \lambda_0 \xi_{jt}^d + \lambda_1 \xi_{jt}^d \cdot \Psi^c + \beta' \mathbf{X}_{jt}^c + \vartheta^c + \vartheta_j + \vartheta_t + e_{jt}^c, \quad (7)$$

where λ_0 , λ_1 and $\beta' = (\beta_1, \dots, \beta_k)$ are parameters to estimate; and ϑ^c , ϑ_j and ϑ_t denote country-, variety- and year-fixed effects, respectively. $\mathbf{X}_{jt}^c$ is a $k \times 1$ vector of control variables.

Year effects ϑ_t control for world-wide conditions on the chocolate and confectionery market, and domestic (demand) conditions in Denmark in particular.²⁷ Destination effects ϑ^c control for the general level of demand for Danish chocolate and confectionery on the foreign market. Yearly demand shocks that are specific to individual destination markets are (partly) accounted for by including GDP and GDP per capita in the vector of control variables.²⁸ $\mathbf{X}_{jt}^c$ also includes physical labor productivity φ_{jt} .²⁹ In Section 4.4 we discuss robustness to adding further variables to the vector $\mathbf{X}_{jt}^c$.

The predicted effect of domestic product appeal on export revenues in destination c is given by:

$$\hat{\lambda}^c = \hat{\lambda}_0 + \hat{\lambda}_1 \cdot \Psi^c. \quad (8)$$

The parameter λ_1 captures the cross-country variation in the effect of domestic product appeal on export performance: $\lambda_1 < 0$ is consistent with the notion that domestic product appeal has less predictive power for exports to destinations where tastes differ substantially from domestic tastes. The presence of variety fixed effects in (7) implies that λ_1 is identified from the within-variety variation in the effect of domestic product appeal on exports across destinations and time.

If firms face fixed costs of exporting, they export only if the demand for their products is sufficiently large to make positive profits. The destination-specific export probability in our sample

²⁶In the Online Appendix, we provide supplementary results where the intensive margin of exporting is measured in terms of export quantities rather than export revenues.

²⁷Controlling for domestic demand conditions is important because these are likely correlated with our measure of domestic product appeal: in good years, market shares conditional on prices go up, and ξ_{jt}^d increases for all varieties.

²⁸Our results are robust to replacing destination and year fixed effects by destination-year fixed effects; see the Online Appendix.

²⁹We calculate φ_{jt} as the number of output units per employee assuming that, for multi-product firms, workers are distributed across products according to their revenue share.

constitutes a mere eleven percent.³⁰ Denote $\underline{r}^c$ as the destination-specific export threshold, such that observed revenues r_{jt}^c are zero for all firms with potential exports below $\underline{r}^c$. Assuming a log-normal distribution for e_{jt}^c , our model therefore has a Tobit structure. While we do not observe the threshold above which positive exports are recorded, a maximum likelihood estimate of $\underline{r}^c$ can be obtained as the minimum of observed export sales in destination c (Eaton & Kortum, 2001; Crozet et al., 2012).³¹ Destinations that are easier to enter have a lower censoring point, reflecting lower fixed costs of exporting. In a simple OLS regression, the estimate of $\lambda^c = \lambda_0 + \lambda_1 \Psi^c$ will be downward biased: a variety of low domestic product appeal (ξ_{jt}^d) is exported only if it faces some other positive destination-specific demand shock (e_{jt}^c). Hence, e_{jt}^c and ξ_{jt}^d are negatively correlated in the selected sample with positive exports.

4.2 Benchmark results

Table 6 shows results from the estimation of Equation (7). We first estimate OLS specifications for export revenues, ignoring any observations with zero exports; see columns (1) to (4). Columns (5) to (8) show results from a linear probability model (LPM) for the destination-specific export probability, demonstrating that selection into exporting is important, and that it is determined by the same factors that determine export revenues. Finally, we estimate the Tobit model with destination-specific censoring point, which corrects for selection into exporting; see columns (9) to (12).

For each model, we report four specifications. Each specification includes an interaction of domestic product appeal ξ_{jt}^d with a destination characteristic. First, we employ our two measures of differences in tastes across countries, Ψ^c , which are based on the Euromonitor data. Recall that Ψ^c is alternatively computed for all products jointly or for three of the four types of confectionery (chocolate confectionery, gum, sugar confectionery) individually. As robustness checks, we also report results where Ψ^c is replaced by a more traditional measure of bilateral affinity – namely linguistic proximity – or GDP per capita.

The main parameters of interest are λ_0 and λ_1 , from which we can infer the destination-specific effect of domestic product appeal, λ^c . At the bottom of Table 6, we report minimum

³⁰In destinations with very few observations on exports, the threshold for the Tobit specification (discussed in the following) might suffer from large measurement error; see footnote 31 for details. We therefore exclude destinations with less than ten export flows from the sample.

³¹ Denote Ω_c as the set of varieties exported to destination c . We treat $\widehat{\ln \underline{r}^c} = \min_{j \in \Omega_c} (\ln r_{jt}^{c, ob}) - 0.0001$ as the censoring point such as to not treat the marginal exported variety as censored. Robustness checks treating the second lowest value of exports as the censoring point substantiate our results. Given the lack of suitable exclusion restrictions, the Tobit estimator is preferred to a Heckman selection model.

and maximum values of $\hat{\lambda}^c$, as well as the results of an F test (or a χ^2 test in the case of the Tobit model) with null hypothesis that the minimum and the maximum values of $\hat{\lambda}^c$ are equal. Since the main explanatory factor of interest ($\xi_{jt}^d \cdot \Psi^c$) varies across varieties and destinations, all standard errors are adjusted for clustering at the variety-destination level.³²

Consider first our novel measure of differences in tastes, Ψ^c , calculated for all types of confectionery jointly. Column (1) shows that domestic product appeal significantly increases exports, but only in destinations where tastes are similar to Danish tastes. In destinations where tastes differ substantially, the OLS specification predicts a *negative* effect of ξ_{jt}^d on export revenues. Column (5) shows a similar pattern for the export probability, with domestic product appeal having positive effects only in a subset of countries where Ψ^c is small. Compared to column (1), the Tobit model in column (9) corrects the main effect of ξ_{jt}^d , λ_0 , upwards but still implies substantial cross-country differences in the effect of domestic product appeal on export revenues.

The remainder of the Table confirms these patterns using different measures of bilateral affinity. Interaction terms of domestic product appeal with the alternative measure of Ψ^c enter negatively, while interactions with linguistic proximity and GDP per capita have a positive coefficient. Moreover, the F and χ^2 tests always reject the null hypothesis that $\min(\lambda^c) = \max(\lambda^c)$. Hence, domestic product appeal has a significantly smaller effect on export revenues and the export probability in destinations where tastes (are expected to) differ substantially from domestic tastes.

Focusing on export revenues, Figures 6 to 9 visualize $\hat{\lambda}^c$, the predicted effect of domestic product appeal as a function of country characteristics. Differences in estimates between the OLS specification and the Tobit model always translate into an upward shift of the $\hat{\lambda}^c$ -line in the figures. Interestingly, the OLS estimates predict domestic product appeal to have a *negative* and statistically significant effect on export revenues in countries where tastes differ substantially from domestic tastes and in low-income countries; see Figures 6(a) and 9(a). In contrast, $\min(\lambda^c)$ is either positive or statistically insignificant in the Tobit model.

The cross-country variation in the effect of domestic product appeal on (potential) export revenues³³ implied by these estimates is substantial: based on the Tobit model in column (9), we

³²Estimates of domestic product appeal are generated regressors. Ideally, standard errors should be bootstrapped to correct for sampling variation in the demand parameter $\hat{\alpha}$. In practice, the large set of dummy variables together with a low percentage of uncensored observations leaves some parameters unidentified in each of the re-sampling steps, rendering the bootstrap infeasible.

³³Parameter estimates in the Tobit model reflect marginal effects on the latent variable, which in our case is

Table 6: Domestic product appeal and export performance across destinations

	Log export revenue; OLS			Export indicator; LPM			Log export revenue; Tobit					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
<i>Domestic product appeal</i>	0.657*** (0.097)	0.325*** (0.078)	0.045 (0.061)	-1.854*** (0.288)	0.046*** (0.003)	0.032*** (0.003)	0.003* (0.002)	-0.070*** (0.005)	1.214*** (0.155)	1.258*** (0.131)	0.739*** (0.097)	-0.341 (0.426)
<i>Domestic product appeal</i> × Ψ^c (all conf. types)	-0.055*** (0.010)				-0.003*** (0.000)				-0.037*** (0.015)			
<i>Domestic product appeal</i> × Ψ^c (by conf. type)		-0.023** (0.011)			-0.003*** (0.000)					-0.075*** (0.019)		
<i>Domestic product appeal</i> × Linguistic proximity			0.740*** (0.134)				0.078*** (0.008)				0.757*** (0.260)	
<i>Domestic product appeal</i> × Log GDP per capita				0.198*** (0.027)				0.009*** (0.001)				0.120*** (0.041)
<i>Log productivity</i>	0.977*** (0.192)	1.017*** (0.193)	0.933*** (0.176)	0.834*** (0.173)	0.021*** (0.003)	0.022*** (0.003)	0.019*** (0.003)	0.018*** (0.003)	1.775*** (0.299)	1.832*** (0.301)	1.618*** (0.274)	1.585*** (0.273)
<i>Log GDP</i>	-0.075 (0.658)	0.258 (0.641)	-0.009 (0.518)	0.034 (0.520)	-0.074*** (0.027)	-0.073*** (0.028)	-0.047*** (0.018)	-0.048*** (0.018)	0.629 (1.204)	0.767 (1.204)	1.094 (0.874)	1.093 (0.878)
<i>Log GDP per capita</i>	-0.566 (0.542)	-0.552 (0.535)	-0.372 (0.458)	-1.379*** (0.482)	0.030 (0.021)	0.025 (0.021)	0.031** (0.015)	0.017 (0.015)	0.866 (1.026)	0.803 (1.023)	1.328 (0.833)	0.892 (0.855)
Observations	5,818	5,817	6,703	6,729	55,732	54,274	70,055	70,115	55,732	54,274	70,055	70,115
R-squared	0.500	0.490	0.515	0.516	0.343	0.339	0.327	0.329	-	-	-	-
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Destination FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Variety FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Standard deviation of e_{jt}^c	-	-	-	-	-	-	-	-	4.749	4.747	4.727	4.723
$\max(\lambda^c)$	0.427	0.286	0.479	0.445	0.034	0.031	0.049	0.031	1.058	1.245	1.183	1.054
$\min(\lambda^c)$	-0.535	-0.051	0.045	-0.536	-0.014	-0.025	0.003	-0.013	0.406	-0.139	0.739	0.440
$\min(\lambda^c)=\max(\lambda^c)$, p-value	0.000	0.039	0.000	0.000	0.000	0.000	0.000	0.000	0.011	0.000	0.003	0.003

Notes: The table reports coefficient estimates from OLS, LPM and Tobit models. Robust standard errors, adjusted for clustering at the variety-destination level, are given in parentheses. *, **, *** denote significance at the 10%, 5%, 1% levels, respectively. The last line reports the p -value of an F (or χ^2) test with $H_0 : \min(\lambda^c) = \max(\lambda^c)$.

(a) OLS estimates

(b) Tobit estimates

Figure 6: λ^c as a function of Ψ^c (all conf. types, Euromonitor)

(a) OLS estimates

(b) Tobit estimates

Figure 7: λ^c as a function of Ψ^c (by conf. type, Euromonitor)

(a) OLS estimates

(b) Tobit estimates

Figure 8: λ^c as a function of Linguistic proximity

(a) OLS estimates

(b) Tobit estimates

Figure 9: λ^c as a function of GDP per capita

predict that a unit increase in ξ_{jt}^d increases potential exports by only 40.6 percent in countries with tastes that are very different from Danish tastes. In contrast, the same effects amounts to 105.8 percent in the country that has the most similar tastes to Denmark (Finland). These differences are magnified when differences in tastes across countries are measured for the three confectionery types (chocolate confectionery, gum, and sugar confectionery) separately: ξ_{jt}^d does not affect potential export revenues in destinations where differences in tastes are large, but increases potential exports by up to 124.5 percent in countries where differences in tastes are small.

Linder (1961) predicts that the similarity across countries in the tastes of consumers also depends on whether countries share similar cultures and on whether they are at a similar stage of development. Indeed, interaction terms of domestic product appeal with linguistic proximity and GDP per capita enter positively. Moreover, the implied variation across countries remains sizable. For example, in the Tobit model a unit change in ξ_{jt}^d increases potential exports by only 44 percent in the destination with the lowest income per capita. To the contrary, this effect is more than twice as large in high-income destinations.

Turning to the control variables in the vector $\mathbf{X}_{jt}^c$, we see that labor productivity has a positive and significant effect on export revenues and the export probability. Due to the high collinearity between GDP and GDP per capita, the corresponding parameter estimates are somewhat harder to interpret. Still, results for the Tobit model show a positive (though insignificant) effect of both variables on potential export revenues.

To sum up, our analysis shows that domestic product appeal is a better predictor of export sales in destinations with similar tastes to those of domestic consumers; and that these effects are economically large: Using a novel measure of differences in tastes across countries which makes use of Euromonitor data on differences in product ingredients, we find that $\min(\lambda^c)$, the smallest predicted country-specific effect, is less than half as large as $\max(\lambda^c)$. Our alternative measure of Ψ^c , which varies across confectionery types, even suggests that export revenues are entirely unrelated to domestic product appeal in countries where tastes are very dissimilar from Danish tastes. In the remainder of this section, we provide robustness analysis for the benchmark estimates in Table 6. Unless stated otherwise, we focus on the Tobit model for export revenues and the first measure of cross-country differences in tastes, Ψ^c (all conf. types).

“potential” exports rather than actual (observed) exports. If a variety’s potential export revenues are not enough to cover the fixed costs of exporting, actual exports are zero.

4.3 Non-homothetic preferences, Alchian-Allen effects, and export prices

Varieties of higher quality are more successful in attaining higher market shares conditional on price, and our estimates ξ_{jt}^d thus partly reflect product quality. The demand for product quality may vary across destinations due to factors other than cross-country differences in tastes. Moreover, export revenues depend on export prices, but prices (and mark-ups) may vary across varieties and destinations as well. In this section, we discuss these issues and we address them.

Non-homothetic preferences and Alchian-Allen effects

If preferences are non-homothetic (see, e.g., Fajgelbaum et al., 2011), product quality has a larger effect on export demand in high-income destinations because consumers in these countries have a higher willingness to pay for quality. The demand for quality also varies across countries due to the effects of per unit transport costs: Alchian & Allen (1964) argue that the relative demand for products of high quality is increasing with transportation costs because these costs constitute a smaller proportion of price for high-quality products. This intuition is commonly captured by allowing the effect of product quality to vary with the distance of the destination country.

Thus, we need to account for several drivers of differences in demand across countries: cross-country differences in the demand for domestic product appeal which are due to differences in tastes across countries; differences in the demand for product quality due to international income differences; and differences in the demand for product quality as driven by transport costs. Product quality and product appeal are positively correlated. Moreover, in the case of Denmark, Ψ^c is positively correlated with destination income per capita, while it is potentially negatively related to distance (consumers in more distant countries are more likely to differ substantially in their tastes). Non-homothetic preferences therefore imply an upward bias in previous estimates of λ_1 , while Alchian-Allen effects suggest a downward bias.

We pursue two different strategies for addressing these biases. First, we control for interactions of ξ_{jt}^d with Ψ^c , GDP per capita, and distance separately:

$$\ln r_{jt}^c = \lambda_0 \xi_{jt}^d + \lambda_1 \xi_{jt}^d \cdot \Psi^c + \lambda_2 \xi_{jt}^d \cdot \ln \text{gdp pc}^c + \lambda_3 \xi_{jt}^d \cdot \ln \text{dist}^c + \beta' \mathbf{X}_{jt}^c + \vartheta^c + \vartheta_j + \vartheta_t + e_{jt}^c. \quad (9)$$

In column (1) of Table 7, we show results from this first approach. The interaction with Ψ^c remains negative and statistically significant, and even increases in absolute size. Country-

specific predicted effects, $\hat{\lambda}^c$, are now calculated as:

$$\hat{\lambda}^c = \hat{\lambda}_0 + \hat{\lambda}_1 \cdot \Psi^c + \hat{\lambda}_2 \overline{\ln \text{gdp pc}} + \hat{\lambda}_3 \overline{\ln \text{dist}}, \quad (10)$$

where $\overline{\ln \text{gdp pc}}$ and $\overline{\ln \text{dist}}$ denote average destination GDP per capita and distance, respectively (i.e., $\hat{\lambda}^c$ is evaluated at the sample mean of these variables). Estimates of $\min(\lambda^c)$ and $\max(\lambda^c)$ show that domestic product appeal increases potential exports by 19.5 to 130.1 percentage points. We also find that domestic product appeal has a higher impact on export sales in more distant destinations, i.e. $\hat{\lambda}_3 > 0$. This finding confirms the Alchian-Allen hypothesis. The interaction of ξ_{jt}^d with destination income per capita is insignificant. Hence, conditional on differences in consumer tastes, international income differences do not contribute to explaining differences in the demand for domestic product appeal.

Our second strategy consists in turning to the import price index described in Section 3 as a proxy for product quality. Recall that this proxy is based on the assumption that producing higher quality output requires more costly inputs. Results from this alternative approach are reported in column (2) of Table 7. We find evidence of both Alchian-Allen effects and non-homothetic preferences: interactions of the import price index with GDP per capita and distance are positive and statistically significant. Most importantly, however, estimates of λ_0 and λ_1 are qualitatively and quantitatively similar to those reported in column (1).

Export prices and markup determinants

Does the relation between domestic and export market performance vary across countries due to differences in the foreign demand for domestic product appeal? Or is this variation largely driven by differences in firms' pricing behavior across export markets? To differentiate between these two alternative hypotheses, the remainder of Table 7 shows how export prices vary with product appeal and destination characteristics. For example, are varieties sold at higher mark-ups – and, thus, prices – in destinations where tastes are similar to domestic tastes?

If we follow our benchmark specification in Section 4.2 and include only the interaction term between ξ_{jt}^d and Ψ^c , this interaction enters positively in the export pricing equation. Thus, varieties of high appeal are indeed sold at *lower* prices in destinations where tastes are similar to Danish tastes. Once we extend the export pricing equation to control for interactions of ξ_{jt}^d with GDP per capita and distance, however, λ_1 turns insignificant; see columns (4) and (5). This finding is important because it suggests that the positive estimate of λ_1 found for export

Table 7: Non-homothetic preferences, Alchian-Allen effects, and export prices

	Log export revenue, Tobit		Log export price, OLS		
	(1)	(2)	(3)	(4)	(5)
<i>Domestic product appeal</i>	-0.506 (1.128)	0.195 (1.093)	-0.099*** (0.017)	0.138 (0.115)	0.120 (0.120)
<i>Domestic product appeal</i> $\times \Psi^c$ (all conf. types)	-0.063** (0.028)	-0.066** (0.027)	0.011*** (0.002)	0.003 (0.003)	0.003 (0.003)
<i>Domestic product appeal</i> $\times$ Log GDP per capita	0.035 (0.085)	0.007 (0.084)		-0.028*** (0.009)	-0.025*** (0.010)
<i>Domestic product appeal</i> $\times$ Log distance	0.221*** (0.050)	0.168*** (0.049)		0.017*** (0.005)	0.016*** (0.005)
<i>Log import price index</i>		-31.629*** (6.991)			0.657 (0.824)
<i>Log import price index</i> $\times$ Log GDP per capita		0.925* (0.500)			-0.109* (0.066)
<i>Log import price index</i> $\times$ Log distance		2.747*** (0.480)			0.072* (0.039)
<i>Log GDP per capita</i>	0.481 (1.108)	0.293 (1.098)	0.019 (0.162)	0.122 (0.170)	0.113 (0.170)
<i>Log productivity</i>	1.738*** (0.300)	1.827*** (0.302)	-0.119*** (0.036)	-0.107*** (0.036)	-0.109*** (0.036)
<i>Log GDP</i>	0.967 (1.217)	1.317 (1.210)	-0.103 (0.182)	-0.070 (0.182)	-0.051 (0.183)
Observations	55,732	52,547	5,750	5,750	5,681
R-squared	—	—	0.754	0.756	0.753
Year FE	Yes	Yes	Yes	Yes	Yes
Destination FE	Yes	Yes	Yes	Yes	Yes
Variety FE	Yes	Yes	Yes	Yes	Yes
Standard deviation of e_{jt}^c	4.745	4.712	—	—	—
$\max(\lambda^c)$	1.301	1.309	0.135	0.033	0.181
$\min(\lambda^c)$	0.195	0.156	-0.054	-0.015	0.132
Difference sig.	0.023	0.014	0.000	0.336	0.327

Notes: Columns (1) and (2) report coefficient estimates from the Tobit model with export revenues as dependent variable. Columns (3) to (5) report OLS estimates from the export pricing equation. Robust standard errors, adjusted for clustering at the variety-destination level, are given in parentheses. *, **, *** denote significance at the 10%, 5%, 1% levels, respectively. The last line reports the p -value of an F (or χ^2) test with $H_0 : \min(\lambda^c) = \max(\lambda^c)$.

revenues in column (1) of Table 7 is not purely driven by pricing differences across firms.

Nevertheless, columns (4) and (5) yield several interesting insights into firms' export pricing behavior: first, we might have expected that consumers in high-income destinations are less price responsive, and that varieties of high appeal are therefore sold at higher prices in these destinations. Results show the exact opposite pattern. The literature on mark-up determinants may help us in interpreting this finding. As noted before, product appeal is conceptually closely related to quality. Coibion et al. (2007) review the literature on how mark-ups may vary across different quality segments, and suggest an elegant theoretical explanation of why empirical findings are at times contradictory. On the one hand, higher quality products are often bought by less price responsive consumers, and thus have higher mark-ups. On the other hand, higher profits in the high-quality segments may induce entry and thus crowding of the segment, leading

to higher price elasticities and lower mark-ups. Thus, the correlation of quality (product appeal), mark-ups and prices can be positive or negative, depending on the industry and market under consideration.

We can extend this intuition to a cross-country perspective: varieties of high domestic appeal have higher mark-ups and prices in destinations where (i) consumers are less price responsive; and/or where (ii) there is more competition for products of high domestic appeal because there are more varieties with similar characteristics. The results in column (4) thus seem to suggest that high- ξ_{jt}^d varieties face more competition in high-income destinations, and firms therefore have to lower their prices (despite the circumstance that consumers might also be less price responsive).

A second pattern emerging from the export pricing equation is that export prices for varieties of high appeal are increasing in geographical distance. Again, we may interpret this finding through the lens of the theoretical arguments in Coibion et al. (2007) as suggesting that varieties of high domestic appeal face less competition in distant destinations, and therefore are able to charge higher prices than in destinations that are close by.

Finally, column (5) of Table 7 shows how export prices correlate with the import price index. This correlation is positive, especially in distant destinations but less so in high-income destinations.³⁴ These patterns closely mirror those for domestic product appeal.

4.4 Further robustness checks

Export experience

New firms are on average considerably smaller than their well-established counterparts. Moreover, even established firms typically start small when breaking into new (export) markets. Foster et al. (2016) show that these stylized facts are to a large extent driven by the sluggish accumulation of demand. Our estimations so far are completely static and thus have not allowed for the possibility that it takes time to develop a customer base. We next account for the role of export experience in determining export sales.

In particular, we include two indicator variables: $1(y_{i,t-1}^c = 1)$ is defined as lagged export status by variety and destination; and $1(y_{f,t-1}^c = 1)$ is defined as lagged export status by firm

³⁴Denoting θ_0 , $\theta_{\text{gdp pc}}^c$ and θ_{dist}^c as the coefficients on the import price index and its interactions with country characteristics, the predicted effect of import prices on export prices for each country can be derived as $\theta_c = \theta_0 + \theta_{\text{gdp pc}}^c * \ln \text{gdp pc}^c + \theta_{\text{dist}}^c * \ln \text{dist}^c$. Note that this effect is positive for the majority of countries, i.e., import prices and export prices are almost always positively correlated, but the size of the effect varies across destinations.

and destination. Thus, we allow for differential effects of export experience at the firm level and firm-product level. Results in column (1) of Table 8 show that varieties which have been exported to a given destination already in the previous year have considerably larger sales than varieties with no previous export experience. A variety's export sales also increase if the firm has experience in exporting other varieties to that destination, but this effect is considerably smaller.³⁵ In column (2), we estimate a more flexible specification, where previous export experience interacts with ξ_{jt}^d and Ψ^c . Export experience is more beneficial for varieties of low product appeal, which could reflect the circumstance that varieties of high appeal have larger export sales already in their first year of exporting. We expected that export experience is more important in unfamiliar markets, i.e. if cross-country differences in tastes are large. However, the data reject this hypothesis.

Varieties with a high value of ξ_{jt}^d are more likely exported (see Figure 2). Thus, ξ_{jt}^d and export experience are positively correlated, suggesting a source of upward bias in λ^c in our previous estimations. Indeed, both the direct effect of product appeal (λ_0) as well as the interaction with cross-country differences in tastes (λ_1) decrease in absolute size in columns (1) and (2) of Table 8 compared to the benchmark model in column (9) of Table 6. Nevertheless, cross-country differences remain sizable: $\max(\hat{\lambda}^c)$ is twice as large as $\min(\hat{\lambda}^c)$.³⁶

Foreign ownership

Multinational firms are more successful in penetrating export markets. If being part of a multinational is also correlated with domestic product appeal, we face an omitted variable bias. To address this concern, we retrieve information on foreign ownership from the foreign enterprise statistics. The data are available for the period 2002-2012 only. On average across years, 18 percent of Danish chocolate and confectionery producers have a foreign owner. Domestic product appeal tends to be slightly higher for varieties produced by a foreign multinational than for varieties produced by domestic firms, though these differences are marginally statistically insignificant (p -value of 0.107 in a one-sided t -test).

Column (3) of Table 8 shows that firms with a foreign owner have indeed substantially larger

³⁵Our Tobit estimates capture the effect of export experience on potential exports (i.e., a combined effect on both the likelihood of being active on a particular export market as well as sales on that market conditional on exporting). They are thus not comparable to previous estimates in the literature (see, e.g., Piveteau, 2016).

³⁶In the Online Appendix, we show that estimates of λ^c are also remarkably similar to those from the OLS regressions in column (1) of Table 6 when we condition the sample on being active in a given destination for 1, 2 or 3 years. Thus, we reject the hypothesis that the link between domestic product appeal, cross-country differences in tastes and export performance changes as a firm gains experience in an export market.

Table 8: Further robustness checks

	Log export revenue, Tobit				
	(1)	(2)	(3)	(4)	(5)
<i>Domestic product appeal</i>	0.793*** (0.099)	1.008*** (0.119)	1.274*** (0.171)	1.241*** (0.169)	
<i>Domestic product appeal</i> $\times \Psi^c$ (all conf. types)	-0.022*** (0.007)	-0.031*** (0.008)	-0.052*** (0.014)	-0.048*** (0.014)	-0.037*** (0.014)
$1(y_{i,t-1}^c = 1)$	6.172*** (0.143)	7.030*** (0.359)			
$1(y_{f,t-1}^c = 1)$	1.574*** (0.154)	1.628*** (0.157)			
$1(y_{i,t-1}^c = 1)$ $\times$ <i>Domestic product appeal</i>		-0.253*** (0.055)			
$1(y_{i,t-1}^c = 1)$ $\times \Psi^c$ (all conf. types)		-0.029 (0.035)			
<i>Foreign ownership</i>			4.097*** (1.489)	6.881*** (1.792)	
<i>Foreign ownership</i> $\times \Psi^c$ (all conf. types)				-0.302*** (0.092)	
<i>Log productivity</i>	1.586*** (0.248)	1.614*** (0.257)	1.778*** (0.355)	1.758*** (0.352)	
<i>Log GDP</i>	1.271* (0.735)	1.220* (0.737)	4.593*** (1.608)	4.436*** (1.604)	0.982 (1.069)
<i>Log GDP per capita</i>	0.420 (0.655)	0.465 (0.656)	0.410 (1.461)	0.450 (1.458)	0.810 (0.898)
Observations	46,889	46,889	25,509	25,509	39,262
Year FE	Yes	Yes	Yes	Yes	Yes
Destination FE	Yes	Yes	Yes	Yes	Yes
Variety FE	Yes	Yes	Yes	Yes	Yes
Variety-year FE	No	No	No	No	Yes
Standard deviation of e_{jt}^c	3.368	3.366	4.527	4.518	4.454
$\max(\lambda^c)$	0.698	0.877	1.057	1.039	—
$\min(\lambda^c)$	0.306	0.332	0.167	0.209	—
Difference sig.	0.002	0.000	0.000	0.001	—

Notes: The table reports coefficient estimates from the Tobit model with export revenues as dependent variable. Robust standard errors, adjusted for clustering at the variety-destination level, are given in parentheses. *, **, *** denote significance at the 10%, 5%, 1% levels, respectively. The last line reports the p -value of a χ^2 test with $H_0 : \min(\lambda^c) = \max(\lambda^c)$.

export sales than firms with a Danish owner. Column (4) reveals that the advantage of foreign owned enterprises in exporting is substantial when the export destination has similar tastes to Danish tastes, but it is negligible when the export destination has very dissimilar tastes. Most importantly, however, our main parameters of interest remain largely unaffected by the inclusion of these control variables.

Increasing marginal costs and capacity constraints

Our identification strategy has implicitly relied on the assumption that firms make their production decisions independently across markets. If marginal costs are increasing, or in the presence of capacity constraints, firms face a trade-off between domestic sales and export sales. Soder-

bery (2014) and Ahn & McQuoid (2017) find that total export sales and domestic sales are negatively correlated, and interpret this finding as evidence of increasing marginal costs. The trade-off between sales on different markets implies a spuriously negative correlation between ξ_{jt}^d and export sales. For example, consider a firm which experiences an extraordinarily good year at home. If the firm increases its domestic sales while prices remain unchanged, ξ_{jt}^d increases as well. However, due to increasing marginal costs or capacity constraints, the firm may need to cut back on its export sales. In essence, we are facing an omitted variable, which may lead to a downward bias in our estimates of λ^c .

In a first step, we examine whether capacity constraints are important for our sample of Danish chocolate and confectionery producers. Following the literature, this involves studying the correlation between domestic sales and *total* exports (i.e., ignoring the destination dimension). As shown in the Online Appendix, we can largely reject the hypothesis that a firm's domestic sales and its total export sales are negatively correlated. As noted by Ahn & McQuoid (2017, p.1185), "(...) for firms exhibiting constant marginal cost, there should be no observed relationship between domestic sales and foreign sales (...)".

Next, we return to our estimation framework where emphasis is on export sales *across* destinations. In order to control for the trade off between domestic sales and *total* export sales, we replace variety fixed effects ϑ_j with variety-year fixed effects ϑ_{jt} .³⁷ Identification now stems from the cross-country variation in export sales for a given variety in a given year. Results in column (5) of Table 8 show that λ_1 remains negative and statistically significant, and comparable in size to our previous estimates.

5 Modeling foreign demand in a Berry et al. (1995) framework

So far, we have focused on differences in tastes *across* countries, showing that a variety's appeal to domestic consumers is a better predictor of exports to markets where tastes are similar to domestic tastes. The analysis thus far has, however, ignored differences in tastes across consumers *within* countries. In the following, we model the foreign demand for Danish product appeal in a Berry et al. (1995, henceforth BLP) framework, where foreign consumers are allowed to differ in their 'taste' for Danish product appeal. Compared to the reduced form regressions in Section 4, we also explicitly model foreign demand as a function of prices. In doing so, we

³⁷More broadly, ϑ_{jt} also controls for other factors that have been argued to be important for export sales, such as innovation expenses, financing constraints, etc.

– indirectly – account for differences in market power across varieties, strategic interactions between firms, and other factors that are related to firms’ price setting, but at the same time might be correlated with product appeal.

5.1 Demand specification and identification

We return to the discrete choice framework of demand. In contrast to the estimation of the domestic demand equation in Section 3, we now additionally allow for consumer heterogeneity.³⁸

Denote u_{ijt}^c as the utility of consumer i in country c from consuming one unit of variety j :

$$u_{ijt}^c = \lambda_{it}^c \xi_{jt}^d - \alpha_{it}^c \ln p_{jt}^c + \vartheta_{igt}^c + \tilde{\xi}_{jt}^c + \varepsilon_{ijt}^c, \quad (11)$$

We have expressed the utility of foreign consumers as a function of the variety’s domestic product appeal, ξ_{jt}^d , and its price in destination c , $\ln p_{jt}^c$. Moreover, consumer utility depends on unobservable characteristics of variety j , $\tilde{\xi}_{jt}^c$. (We have chosen the notation $\tilde{\xi}_{jt}^c$ to signal that these unobservable characteristics can be thought of as country-specific deviations from ξ_{jt}^d .) ε_{ijt}^c is an individual-specific demand shock, which is assumed to be extreme value distributed.

Individuals consume one unit of the variety that yields the highest utility. They may also not consume any of the varieties, i.e., choose the outside alternative. We follow common practice in the literature by normalizing the utility of the outside good to zero, and including a consumer-specific constant ϑ_{igt}^c . This constant measures consumer i ’s ‘taste’ for chocolate and confectionery as compared to the outside alternative.

There are three sources of consumer heterogeneity in tastes: λ_{it}^c , α_{it}^c and ϑ_{igt}^c . We start with parsimonious distributional assumptions, and discuss extensions in Section 5.2 below. λ_{it}^c denotes the taste of consumer i for Danish product appeal, which we assume to be distributed with a country-specific mean and common variance as follows:

$$\lambda_{it}^c \sim N(\lambda_0 + \lambda_1 \Psi^c, \sigma_\lambda). \quad (12)$$

Note how λ_{it}^c captures heterogeneity in tastes both across and within destinations: for each country, *average* tastes for domestic product appeal are given by $\lambda^c = \lambda_0 + \lambda_1 \Psi^c$; the standard deviation σ_λ measures the variation across consumers around this mean. Importantly, the resulting specification of demand allows for substitution patterns to differ depending on product

³⁸Cf. footnote 17 above.

appeal: a consumer who chooses a variety of high product appeal is more likely to substitute towards another variety with high appeal than to a variety with low appeal.

We make the following distributional assumptions for α_{it}^c and ϑ_{igt}^c :

$$\alpha_{it}^c \sim N(\alpha, \sigma_\alpha) \quad (13)$$

$$\vartheta_{igt}^c \sim N(\vartheta_{jt}^c, \sigma_\vartheta) \quad \text{where} \quad \vartheta_{jt}^c = \vartheta_t + \vartheta^c + \vartheta_g + \phi_1 \ln \text{gdp pc}^c + \phi_2 \ln \text{gdp}^c \quad (14)$$

As before, ϑ_t and ϑ^c denote year and country fixed effects, respectively; and ϑ_g is a product fixed effect. Consumer tastes for chocolate and confectionery (as compared to the outside option) are thus allowed to differ across countries, time and products. Moreover, they are a function of GDP and GDP per capita.

Given the distributional assumptions on the idiosyncratic demand shock ε_{ijt}^c , we can derive the probability that consumer i will choose variety j ,

$$Pr_{ijt}^c = \frac{\exp(\lambda_{it}^c \xi_{jt}^d - \alpha_{it}^c \ln p_{jt}^c + \vartheta_{igt}^c + \tilde{\xi}_{jt}^c)}{1 + \sum_m \exp(\lambda_{it}^c \xi_{mt}^d - \alpha_{it}^c \ln p_{mt}^c + \vartheta_{igt}^c + \tilde{\xi}_{mt}^c)},$$

and, by integrating over the distribution of consumer tastes, the market share of variety j :

$$s_{jt}^c = \int Pr_{ijt}^c dF^c(\lambda_{it}^c, \alpha_{it}^c, \vartheta_{igt}^c). \quad (15)$$

In order to estimate this model of foreign demand, we need to construct each Danish variety's market share in each destination. We again assume that foreign consumers could potentially consume two servings (50 grams) of chocolate and confectionery per day. To calculate the potential market size M_t^c , we multiply yearly potential per capita consumption by the number of foreign consumers in destination c in year t . The market share of each variety is then given by its sales volume (in kg) divided by the potential market size, $s_{jt}^c = \frac{q_{jt}^c}{M_t^c}$.

To identify the demand parameters, we apply the GMM estimator proposed by Berry et al. (1995) as implemented in Vincent (2015). We refer the reader to Berry et al. (1995) and Vincent (2015) for details of the estimation.

Estimating the model requires two sets of instruments. First, export prices are endogenous because they are correlated with the unobservables in $\tilde{\xi}_{jt}^c$. We instrument a variety's export price $\ln p_{jt}^c$ with its domestic price $\ln p_{jt}^d$ (thereby reversing the instrumentation strategy used in the estimation of domestic demand in Section 3). Second, additional instruments are needed to identify the parameters governing consumer heterogeneity. Following the *Differentiation IV*

logic proposed by Ghandi & Houde (2016), we construct instruments which capture the extent to which variety j faces competition from varieties with similar characteristics:

$$A_{jt,1}^c = \sum_{j' \neq j} 1 \left(|d_{jt,j'}^c(\xi^d)| < z \cdot \text{sd}(\xi^d) \right) \quad (16)$$

$$A_{jt,2}^c = \sum_{j' \neq j} 1 \left(|d_{jt,j'}^c(\xi^d)| < z \cdot \text{sd}(\xi^d) \right) \cdot \xi_{j't}^d \quad (17)$$

$$A_{jt,3}^c = \sum_{j' \neq j} 1 \left(|d_{jt,j'}^c(\widehat{\ln p})| < z \cdot \text{sd}(\widehat{\ln p}) \right) \quad (18)$$

$$A_{jt,4}^c = \sum_{j' \neq j} 1 \left(|d_{jt,j'}^c(\widehat{\ln p})| < z \cdot \text{sd}(\widehat{\ln p}) \right) \cdot \xi_{j't}^d \quad (19)$$

where $1(\cdot)$ denotes the indicator function and $d_{jt,j'}^c(\xi^d) \equiv (\xi_{jt}^d - \xi_{j't}^d) \cdot 1(r_{j't}^c > 0)$. The first and third instrument count the number of other varieties which are close competitors of variety j and which are active in destination c : $A_{jt,1}^c$ counts the number of other varieties with similar product appeal to variety j ; and $A_{jt,3}^c$ counts the number of other varieties with similar prices. $\widehat{\ln p}_{jt}^c$ is constructed from a linear regression of export prices on exogenous variables, and $d_{jt,j'}^c(\widehat{\ln p}) \equiv (\widehat{\ln p}_{jt}^c - \widehat{\ln p}_{j't}^c) \cdot 1(r_{j't}^c > 0)$. The second and fourth instrument give the sum of product appeal of these ‘close competitors’. We calculate (16)–(19) setting $z = \{1, 0.1\}$. We thus have a total of 9 instruments (including domestic prices).³⁹

There are two sample restrictions that need to be kept in mind when interpreting our results in the following. First, the BLP framework only allows us to model the intensive margin of exporting. Thus, for each destination, the sample only includes those Danish varieties that are exported to that destination (for all other varieties, market shares are zero and prices unobserved). Second, foreign varieties (and third-country varieties) are unobserved in our data, and we therefore estimate demand based on only a subset of the varieties available to consumers. (In fact, ξ_{jt}^d would not be measurable for foreign varieties, even if their market shares and prices were observable.) Estimates of the demand parameters, including the heterogeneity parameters, should therefore be interpreted carefully, as they only reflect the foreign demand for Danish varieties (which in many destinations will be a small share of the overall market).⁴⁰ In particular, we cannot make inferences about patterns of substitution between Danish varieties and foreign varieties; and we have to assume that these substitution patterns do not depend on ξ_{jt}^d .

³⁹We only keep destination-years with at least two exported varieties, because the instruments in Equations (16)–(19) can not be constructed otherwise.

⁴⁰For example, foreign consumers may be more or less price responsive when purchasing foreign varieties than when purchasing Danish varieties. The price elasticity of demand that we estimate in the following may in that sense not be representative for the overall price responsiveness of foreign consumers. Also see footnote 43 for a discussion of the estimation of the heterogeneity parameters.

5.2 Results

The BLP approach differs from the reduced form approach of Section 4 in several respects: first, the BLP framework explains a variety's market share (measured in quantities), rather than its export revenues (measured in values). Second, export prices are explicitly incorporated into the export demand equation. Third, we drop variety fixed effects ϑ_j and replace them with product fixed effects ϑ_g , because we found that inclusion of ϑ_j exacerbates identification of consumers' price responsiveness.⁴¹ Finally, and most importantly, the BLP approach allows for consumer heterogeneity in tastes.

To gauge the implications of consumer heterogeneity, we thus start with a simple multinomial logit (MNL) model in columns (1) and (2) of Table 9. The multinomial logit model sets $\sigma_\lambda = \sigma_\alpha = \sigma_\vartheta = 0$. These parameter restrictions imply that a variety's market share can now be derived analytically. In particular, by normalizing a variety's market share with the market share of the outside alternative (see Section 3.1), we obtain the following linear model:

$$\ln s_{jt}^c - \ln s_{0t}^c = \lambda_0 \xi_{jt}^d + \lambda_1 \xi_{jt}^d \Psi^c - \alpha \ln p_{jt}^c + \vartheta_t + \vartheta^c + \vartheta_g + \phi_1 \ln \text{gdp pc}^c + \phi_2 \ln \text{gdp}^c + \tilde{\xi}_{jt}^c, \quad (20)$$

where $\tilde{\xi}_{jt}^c$ is the regression error term. Compared to the export performance regressions in Section 4, this model replaces export revenues with $\ln s_{jt}^c - \ln s_{0t}^c$ as dependent variable, and it accounts for (endogenous) prices.

Columns (1) and (2) show OLS and IV estimates, respectively. As before, we find that domestic product appeal significantly increases export demand, but only in destinations where tastes are similar to Danish tastes. The implied variation in λ^c across countries is sizable (though somewhat smaller than our previous OLS results):⁴² domestic product appeal significantly increases demand only in countries where tastes are similar to Danish tastes. In countries where tastes are very different, ξ_{jt}^d does not help in predicting the demand of foreign consumers. A second noteworthy finding in columns (1) and (2) is that the estimated price coefficient increases when we use a variety's domestic price as instrument for its export prices. Moreover, the price elasticity of demand of approximately 2.4 is comparable to estimates obtained for the domestic market in Section 3.

⁴¹Together with country and year fixed effects, variety fixed effects explain almost 75 percent of the variation in export prices.

⁴²Since the focus here is on the intensive margin of exporting only, results should be compared to OLS (rather than Tobit) results in Table 6.

Table 9: Foreign demand for Danish product appeal: MNL and BLP estimates

	Multinomial logit model		Random coefficients logit model			
	(1)	(2)	(3)	(4)	(5)	(6)
<i>Domestic product appeal</i>	0.766*** (0.094)	0.761*** (0.091)	0.631*** (0.063)	0.663*** (0.096)	0.726*** (0.252)	5.431* (2.992)
<i>Domestic product appeal</i> $\times \Psi^c$ (all conf. types)	-0.043*** (0.010)	-0.037*** (0.010)	-0.037*** (0.006)	-0.043*** (0.015)	-0.047** (0.024)	-0.053* (0.027)
<i>Log export price</i>	-1.786*** (0.150)	-2.369*** (0.489)	-2.236*** (0.221)	-4.323 (3.851)	-4.155* (2.194)	-8.522** (3.540)
<i>Log GDP</i>	-3.112** (1.340)	-3.020** (1.254)	-3.097*** (0.931)	-2.309 (1.716)	-1.230* (0.671)	-0.430 (8.715)
<i>Log GDP per capita</i>	1.990 (1.512)	1.828 (1.415)	2.066** (0.887)	1.255 (1.819)		
Standard deviations						
<i>Domestic product appeal</i> (σ_λ)			0.265*** (0.045)	0.319* (0.163)	0.267*** (0.071)	0.000 (2.469)
<i>Log export price</i> (σ_α)				0.889 (1.082)	0.670 (0.993)	1.080 (1.591)
<i>Constant</i> (σ_ϑ)				0.582 (2.233)	0.101 (4.348)	0.211 (6.185)
Interactions with demographics						
<i>Domestic product appeal</i> $\times$ <i>Income_i</i> (κ_1)					0.067 (0.203)	0.385 (0.729)
<i>Log export price</i> $\times$ <i>Income_i</i> (ς_1)						-0.463 (0.290)
Observations	5,368	5,368	5,317	5,317	5,317	5,317
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Product FE	Yes	Yes	Yes	Yes	Yes	Yes
Objective value	—	—	207.79	187.05	201.42	164.00
$\max(\lambda^c)$	0.585	0.606	0.477	0.483	0.529	5.209
$\min(\lambda^c)$	-0.168	-0.042	-0.167	-0.268	-0.292	4.285
Difference sig.	0.000	0.000	0.000	0.004	0.049	0.053

Notes: Columns (1) and (2) give coefficient estimates from the multinomial logit model of demand. Column (3) to (6) report estimates from the BLP estimator, as implemented in Vincent (2015). Robust standard errors are given in parentheses. *, **, *** denote significance at the 10%, 5%, 1% levels, respectively. The last line reports the p -value of an χ^2 test with $H_0: \min(\lambda^c) = \max(\lambda^c)$.

Next, we turn to the BLP approach. We start with a parsimonious specification of consumer heterogeneity in column (3), and add more complexity to the model in columns (4) to (6). For all specifications, we simulate 500 individuals for each market (destination-year combination).

In column (3), we allow for heterogeneity in λ_{it}^c but assume that consumers are homogeneous in their price responsiveness and their taste for chocolate and confectionery (i.e., we set $\sigma_\alpha = \sigma_\vartheta = 0$). The standard deviation of λ_{it}^c , $\hat{\sigma}_\lambda$, is statistically significant, suggesting substantial consumer heterogeneity in foreign consumers' taste for domestic product appeal. However, the inclusion of consumer heterogeneity has little effect on estimated differences in demand across countries: a country's average taste for Danish product appeal, $\lambda^c = \lambda_0 + \lambda_1 \Psi c$, remains comparable in size to the estimates from the multinomial logit model in column (2); see in particular $\min(\hat{\lambda}^c)$ and $\max(\hat{\lambda}^c)$ reported at the bottom of the table.

Figure 10: Tastes across and within countries

Column (4) drops the restriction $\sigma_\alpha = \sigma_\vartheta = 0$. Both additional parameters are imprecisely estimated, and – more importantly – their inclusion affects none of the parameters related to domestic product appeal (λ_0 , λ_1 and $\hat{\sigma}_\lambda$).⁴³ The effect of export prices on mean utility, α , increases in absolute size, but is now imprecisely estimated.⁴⁴

Based on column (4), we quantify the variation in foreign tastes for domestic product appeal across and within countries. Figure 10(a) depicts *average* tastes for ξ_{jt}^d as a function of cross-country differences in tastes, Ψ^c . The variation in average tastes is substantial, ranging from 0.483 in Finland (the destination that has tastes most similar to Danish tastes) to -0.268 in Morocco (the destination where tastes differ the most from Danish tastes). For Morocco and other destinations to the right of the graph, we can however not reject the null hypothesis that foreign demand is uncorrelated with domestic product appeal in Denmark.

Next, Figure 10(b) shows the variation in tastes within countries, taking Finland and Morocco as examples. The within-country variation in λ_{it}^c is indeed substantial: while average tastes for Danish product appeal are positive in Finland, a small fraction of Finnish consumers does not put value on ξ_{jt}^d . Similarly, while average tastes for ξ_{jt}^d are negative in Morocco, we see a non-trivial fraction of consumers who's utility increases with Danish product appeal. This split between consumers with positive and negative tastes is even more pronounced in countries

⁴³Recall that all parameters are identified based only on a subset of varieties available to consumers and, in particular, that foreign varieties are excluded from the sample. In that sense, the insignificance of σ_α and σ_ϑ needs to be interpreted carefully: foreign consumers might have heterogeneous preferences for prices and the outside good, but this heterogeneity could not be identified based on the sub-sample of varieties available for the analysis.

⁴⁴We have also estimated a model where consumer's price responsiveness is allowed to vary across countries according to $\alpha_{it}^c \sim N(\alpha_0 + \alpha_1 \ln \text{gdp pc}^c, \sigma_\alpha)$. We find that $\hat{\alpha}_1$ is negative but statistically insignificant, once more giving only limited evidence for non-homothetic preferences; cf. Section 4.3.

with intermediate values of Ψ^c (not shown in the figure). Moreover, the within-country variation in individual consumers' tastes for domestic product appeal is of a comparable magnitude as the cross-country variation in mean tastes (cf. above): taking consumers that are one standard deviation above and below the average in Finland, the taste for ξ_{jt}^d varies from 0.164 to 0.802.⁴⁵

Next, we bring in additional information to ask whether consumer characteristics can explain part of the variation in tastes across consumers. As a first step, we allow consumers' price responsiveness, α_i , to depend on the income of the consumer, and make the following distributional assumption:

$$\alpha_{it}^c \sim N(\alpha_0 + \varsigma \ln \text{inc}_{it}^c, \sigma_\alpha). \quad (21)$$

We simulate individual income, inc_{it}^c , from a country-specific log normal distribution with mean and standard deviation calculated based on information on GDP per capita and the Gini coefficient.⁴⁶ Due to collinearity, we drop GDP per capita from the specification for mean consumer utility. Column (5) of Table shows results. ς is positive as expected (i.e., consumers with higher income are less price responsive). However, the parameter is small and imprecisely estimated.

In column (6), we additionally allow consumers' taste for product appeal to vary with $\ln \text{inc}_{it}^c$:

$$\lambda_{it}^c \sim N(\lambda_0 + \lambda_1 \Psi^c + \kappa \ln \text{inc}_{it}^c, \sigma_\lambda). \quad (22)$$

Surprisingly, we find $\hat{\kappa} < 0$, suggesting that high-income consumers have *lower* tastes for high product appeal. However, the parameter is once again very imprecisely estimated. In sum, columns (5) and (6) reject the hypothesis that the variation in foreign consumers' tastes for domestic product appeal can be explained by income differences. This finding is also consistent with our previous results in Table 7, showing that (conditional on the interaction with cross-country differences in tastes, Ψ^c) varieties of high appeal do not perform better in high-income destinations than varieties of low appeal.

⁴⁵These effects are calculated as 0.483 ± 0.319 .

⁴⁶All country-specific variables are obtained from the World Development Indicators (WDI) of the World Bank.

6 Conclusion

Variety-specific sales vary – often substantially – across destinations, including the domestic market. We argue that this variation is not entirely random, but related to the interaction of features of the market and the variety. In this paper we hypothesize that sales vary across export markets because consumer tastes differ across countries. Such differences in consumer tastes imply that a variety’s domestic product appeal is an imperfect predictor of foreign demand, especially in countries where tastes differ substantially from domestic tastes. We test this hypothesis using data on trade and production in the Danish chocolate and confectionery industry. Results show that domestic product appeal has a statistically significant and economically large effect on exports in markets where tastes are similar to domestic tastes. In contrast, in countries where tastes differ from those of domestic consumers, the effect is significantly reduced. While we focus on one particular industry in this paper, marketing analysis suggests that international differences in tastes are important for many food items and non-durable consumer goods more in general (see e.g. van Mesdag (2000) and Sangeeta Ramarapu (1999)). Thus, it would be interesting to test the hypothesis presented in this paper based on data from other consumer goods industries.

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