Verti-zontal differentiation in export markets ☆

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ABSTRACT

Many trade models of monopolistic competition identify cost efficiency as the main determinant of firm performance in export markets. To date, the analysis of demand factors has received much less attention. We propose a new model where consumer preferences are asymmetric across varieties and heterogeneous across countries. The model generates new predictions and allows for an identification of horizontal differentiation (taste) clearly distinguished from vertical differentiation (quality). Data patterns observed in Belgian firm–product level exports by destination are congruent with the predictions and seem to warrant a richer modelling of consumer demand.

1. Introduction

Many existing trade models of monopolistic competition identify cost efficiency as the main determinant of firm performance in export markets. In contrast, the analysis of demand factors has received less attention. Demand is typically assumed to be symmetric across varieties and countries. This symmetry in demand is imposed on very different products sold within the same country as well as for the same goods sold across different countries. These restrictive assumptions have led scholars to introduce random firm and country-specific shocks to match features of the data.[1]

The purpose of this paper is to relax the symmetric demand assumption in a love-for-variety trade model by allowing consumers in export markets to differ in two major respects. First, the demand function is allowed to vary across varieties within a destination country. This amounts to assuming that *preferences are asymmetric*. For example, suppose that the set of differentiated varieties is types of beers. Under asymmetric preferences, we allow the demand faced by Heineken to be different from the demand faced by Budweiser in a particular country. Second, the demand function can vary for the same variety across destination countries, depending on consumer taste and product characteristics. This amounts to assuming that *consumers across countries*

[1] Bernard et al. (2011), Hallak and Sivadasan (2013) and Munch and Nguyen (forthcoming).

are heterogeneous in taste. For example, the demand for Heineken can be stronger than the demand for Budweiser in one country, but it can be the opposite in another country where both beers are also sold.

Although firm heterogeneity in efficiency has empirically been confirmed to be very important in explaining firms' entry into export markets, this seems less the case for firm-level sales variation in different countries conditioning upon entry. Several papers analyzing the variability in firm-level prices and sales across a range of export destinations have reached the conclusion that cost factors alone cannot account for all the variation in the data and conclude that demand factors are important too.[2] In this paper we aim to rationalize the observed firm-destination variation by supplementing firm heterogeneity in costs with consumer heterogeneity. We do so by allowing each destination country to have a different set of asymmetric preferences over the varieties on offer. This is achieved in a simple and intuitive way in the quadratic utility used by Ottaviano et al. (2002), Melitz and Ottaviano (2008), and others. We build the model in two steps. We first introduce asymmetry in preferences across varieties within one country. Next, we allow every country to be characterized by a different set of asymmetric preferences across varieties. Hence, *each variety has a country-specific demand*, which offers an explanation for the strong variation observed in the quantities of identical varieties sold in various countries.

It is important to point out that varying variety–country sales need not result from market size differences nor from income differences, but from asymmetric preferences between varieties and taste heterogeneity across countries. Put differently, whereas in Melitz and Ottaviano (2008) firm–product–quantity variation across destinations may result from varying market size or from a varying number of competing varieties by destination, the new preferences introduced here show that even when exporting to a country of similar size, similar income level and the same number of competing varieties, quantities shipped may still vary due to taste differences affecting the market outcome in a way that has not been considered before.

In addition to firm–product heterogeneity in cost and taste, we also allow consumer preferences to be asymmetric in quality differences between varieties.[3] Without quality differentiation, the model would wrongly attribute the high sales of high priced varieties within a country entirely to taste differences, which is unlikely. Since quality also affects demand, it should be incorporated in the model in order to allow for a correct identification of taste effects. The model does not impose any correlation between cost, taste and quality but allows these parameters to move freely and independently of each other. For example, we do not impose any relationship between marginal cost and the quality of a variety, thus allowing higher quality to either stem from fixed costs such as investment in research and development or from the use of higher-quality and more expensive inputs. Nor do we impose a relationship between taste and quality. Thus, while both quality and taste affect the demand for a variety, they may work in opposite directions. The demand for a variety is thus ultimately determined by the interplay of the quality and taste.

Clear definitions of horizontal and vertical differentiation until now only exist in discrete choice models with indivisible varieties and with consumers making mutually exclusive choices, used in Industrial organization (Tirole, 1988) and, more recently, in trade (Khandelwal, 2010; Fajgelbaum et al., 2011). Discrete choice models incorporate both types of differentiation (Anderson et al., 1992). In contrast, a clear distinction between horizontal (taste) and vertical (quality) differentiation is largely absent in models where consumers have a love-for-variety and purchase many products in varying quantities. This is what we aim to accomplish in this paper where we propose love-for-variety preferences that include horizontal and vertical differentiation, which we refer to as *verti-zontal* preferences. Typically, varieties of the same good are horizontally differentiated when there is no common ranking across consumers when varieties are equally priced. In other words, horizontal differentiation reflects consumers' tastes that affect how much firms can sell of each variety. In contrast, varieties are vertically differentiated when all consumers agree on their ranking, and thus quality affects prices in all destination countries.

Unlike discrete choice models, we do not aggregate utility over individual consumers within a country but instead work with a representative consumer per country. This approach is predominantly data driven since shipments in trade by firm–product are typically only available at destination country-level. Our model is not unique in explaining the quantity variation observed in the data, but we will discuss why it is the single one to explain the joint variation in price and quantity of exported firm–products in the data (Section 4.3).

The introduction of asymmetries in quadratic utility and of heterogeneity across representative consumers results in a number of appealing features.

First, horizontal differentiation in our model is captured by one single parameter that varies across varieties and consumers for which we provide a micro-foundation that goes back to spatial models of product differentiation à la Hotelling (1929). This approach allows us to determine precisely how this parameter affects demand and sales *asymmetrically*. This concurs with Vogel (2008) who developed a Hotelling-like model with cost-heterogeneous firms and showed that firms choose asymmetric locations in the linear city model. Therefore, the model we propose in this paper may be viewed as an attempt at reconciling Chamberlin and Hotelling.

Second, our analysis generalizes quasi-linear preferences to introduce demand heterogeneity in a way that permits a separate identification of horizontal and vertical differentiation in a particular sense: the consumer-specific parameter of horizontal differentiation only affects equilibrium quantities but not prices. Thus, horizontal differentiation can be separated from vertical differentiation at the firm–product–country level and can empirically be distinguished by any researcher with access to data on firm characteristics. Horizontal differentiation in CES models cannot explain variation in sales for the same firm–product across countries because the elasticity of substitution is constant across varieties. To remedy for this, one can introduce a firm–product specific demand shock per country that accounts for sales variation of the same firm–product across countries without affecting prices. Horizontal differentiation between products is then the combination of a constant parameter of substitution and a variable shock at the firm–product level. Because the parameter of substitution also enters the price equation, a clear separation of horizontal and vertical differentiation is difficult to attain with the CES. Therefore we need a set of preferences which allows for a clear separation of quality and taste since both shift demand in different ways. Otherwise quality differences between varieties could be confounded with taste differences, and vice versa. In this paper we show that taste differences can shift demand without affecting price, while quality differences always imply a price change.

Third, asymmetric preferences in quadratic utility also result in a richer set of country-specific competition effects. With symmetric preferences, competition effects are a sole function of the number of firms in the destination country, which depends on market size. Allowing for asymmetric preferences generates competition effects that now also depend on the quality of the varieties on offer in the destination country and their interaction with local tastes. In addition, allowing for consumer heterogeneity across countries implies that two countries of similar size and GDP can still be subject to varying levels of competition. Even when the quality on offer in these two countries is the same, competition effects can differ because in one country high quality varieties

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