Private Labels and International Trade: Trading Variety for Volume

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Abstract

This paper explores the role of private label trade intermediation in shaping the range and diversity of exports and imports. Whereas direct sales maintain a firm's unique product characteristics, or 'brand equity', trade through an intermediary often takes the form of 'private label' sales, under which multiple firms' output is pooled and re-sold under a new private label brand created by the intermediary. This paper shows that these private label arrangements result in greater total export and import volumes and lower average prices for consumers, but fewer independent varieties available to consumers in equilibrium. Normative implications are mixed: consumers trade variety for volume, independent exporters face greater competition from the new private label products, and intermediary firms can capture more of the gains from trade. We explore the implications of competition at the intermediary level and trade costs for the equilibrium pattern of private label and direct exporting and importing activities.

Keywords: Private Labels, Export Mode, Intermediaries, Heterogeneous Firms, International Retailers

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1 Introduction

Economists afford close scrutiny to barriers to trade and economic openness, yet research on international market access focuses almost exclusively on physical and political trade costs: tariffs, non-tariff barriers, and the transportation costs associated with physically moving products to market. Until recently, relatively little attention has been given to the commercial realities of international market access – the role and potential failure of the market mechanisms through which exporters in one country reach consumers in another country, whether through direct shipments, wholesalers, product-sourcing arms of international retailing firms or other intermediated trade channels.[1] In this paper, we join a small but growing literature that addresses these issues by examining the importance of intermediaries in trade. Our key contribution is to point out that not only do intermediaries shape firm's exporting decisions (which firms export and whether they ship directly or indirectly), but also, crucially, that intermediation can fundamentally change the characteristics of exported products, and thus the variety and nature of imports available to consumers.

Our starting point is to recognize that there are two distinct forms of trade intermediation, each with different implications for the equilibrium pattern of trade. The first form is the conventional notion adopted by the existing literature, where a trade intermediary serves as a go-between to reduce the average cost of transportation for potential exporters either by resolving an information asymmetry or incomplete contracts problem,[2] or by economizing on trade (or search) costs.[3] Crucially, this existing work implicitly assumes that intermediation does not otherwise change the underlying characteristics of the individual products shipped abroad. In contrast, we consider in this paper the possibility of *transformative* trade intermediation, under which exported products are fundamentally changed by the process of intermediation. In this paper, we argue that pooled-producer sourcing – the widespread practice in which a trade intermediary sources products from multiple independent producers to re-brand under a new umbrella brand – what the marketing literature calls a 'private label' – constitutes an empirically important and as yet unexplored form of transformative trade intermediation.[4] We identify and explore the

[1] An important exception is early work at the intersection between the trade and industrial-organization literatures that studies the effect of trade liberalization on firms' behavior and endogenous market structure; see, for example, Raff and Schmitt (2009) or Raff and Schmitt (2012).

[2] See Rauch and Watson (2004), Feenstra and Hanson (2004), Felbermayr and Jung (2008), and Felbermayr and Jung (2011)

[3] See Blum et al. (2010), Head et al. (2014), Antràs and Costinot (2011), Ahn et al. (2011), and Akerman (2010). Along a similar line, Bai et al. (2015) suggest that intermediation may reduce dynamic *market* learning potential for exporters.

[4] Hereafter, we use the term 'private label' to indicate any pooled product, which need not be a store brand

tradeoffs inherent to the two forms of product intermediation, and particularly the potential for horizontal product homogenization and profit-shifting via private label sourcing.

Building from recent empirical and theoretical work in the heterogenous firms literature, we develop a model of private label trade intermediation. The theoretical exercise delivers key insights that build on and refine existing work on trade intermediation. First and most concretely, private label contracts offer an additional form of low-cost market access for exporters, allowing more firms at the lower-end of the firm brand spectrum to reach foreign consumers. The private label channel thereby introduces another extensive margin for trade adjustment in addition to traditional (brand-preserving) trade intermediation and direct exporting. This private label trade channel has subtle and important differences compared to conventional (brand-preserving) wholesale trade intermediation or direct exports.[5] Most importantly, when trade intermediaries can pool products under a single private label brand, intermediation leads to product homogenization in equilibrium — forcing consumers to trade off variety for volume. By identifying a plausible mechanism that would cause the endogenous loss of product differentiation, our model carries immediate welfare implications for the broad class of trade models that leverage 'love-of-variety' preferences.

At the same time, we find that the effects of trade costs and market power among intermediaries are more nuanced than existing models of trade intermediation suggest. When, for instance, changes in trade costs or market concentration among intermediaries make private label trade more attractive, entry by low-end firms causes a 'brand dilution' effect, which can drive higher-end firms into brand-preserving exports, even in the presence of stronger pro-competitive effects of expanded trade. We show that intermediaries' (monopsony) market power can have non-monotonic effects on trade: too much concentration, and aggressive private label contracts crowd out direct exporters, limiting overall trade; too little concentration, and private label brand equity is diluted so much that overall exports fall. These results are new to the literature, and suggest a more complex relationship between trade intermediation and trade patterns than has been found in existing work.

Empirical Context. This paper is motivated by recent empirical work that demonstrates both the importance of intermediaries in trade and systematic variation in intermediary involvement across sectors and trading partners. Using detailed firm-level trade and transactions data for the United States, Bernard et al. (2010) find that intermediaries are disproportionately involved in trade with lower wage countries and in consumer goods sectors such as agricultural

and is not necessarily associated with a particular retailer.

[5] In the interest of tractability, the theory part of this paper abstracts from brand-preserving trade intermediation (or interpreted differently, subsumes it as a form of direct exporting).

products, clothing, and footwear. Ahn et al. (2011) and Bai et al. (2015) find similar patterns for China, Akerman (2010) for Sweden, and Blum et al. (2010) for South America.[6] At the firm level, evidence is broadly suggestive that the biggest, most productive firms export directly, while the majority of (typically much smaller) exporting producers use intermediaries on one or both sides of the border to reach foreign consumers. Taken together, these studies suggest the intermediaries are most involved in trade with lower-wage countries, less differentiated products, and smaller exporters.

Private label sales are likewise an important feature of the commercial landscape and follow similar patterns. According to ACNielsen (2005), private label sales comprise a large and growing share of retail purchases, making up roughly 17% of sales at surveyed retailers across 38 countries and 80 categories.[7] Private label sales are increasing world wide, with the strongest growth in emerging markets (where the share of private label products has been increasing at 11 percent per annum) compared to more modest growth in developed countries (e.g. 4 percent per year in Europe). Like intermediated trade more generally, the importance of private label sales varies markedly across product categories and is greater at the lower-end of the market, where private label products are on average priced 31% lower than their manufacturer-branded counterparts.[8] At the same time, private label trade seems particularly important for trade. In interviews reported by Timmor and Zif (2008), export managers cited private label sales as more important for success in exporting than for domestic sales. The same study also indicates that exporting under a private label is more frequently observed in consumer goods sectors like food, beverages, and textiles.

One example of an industry where private labels are particularly widespread is in apparel and textiles, which is also among the most highly traded sectors globally. In the U.S., the expansion of private labels in apparel began in the 1980s, and within a decade private labels constituted about 25% of the total US apparel market.[9] One the first retailers that pursued private label

[6] In related work, Head et al. (2014) test the impact of international retailers' local Chinese operations and subsequent *export activity* from China, while Basker and Van (2010a) and Basker and Van (2010b) consider the impact of Wal-Mart (a major trade intermediary) on *U.S. imports* from China

[7] Surveyed retailers included supermarkets, hypermarkets, mass merchandizers and some drug- and convenience stores. A separate 2011 study in 'Private Label Magazine' reported similar figures for individual retailers: in 2010, private label sales made up 18% of revenue at Wal-Mart, 24% at Costco, and 30% at Target Corp. stores (cf. Private.Label.Magazine (2011)).

[8] According to the same ACNielsen (2005) study, the highest private label market shares are in refrigerated food (32 percent) and paper, plastic & wraps (31 percent), and lowest in cosmetics (2 percent). There is also substantial variation in the price differential between private label and manufacturer-branded products ranging from personal care products (where private labels sell for 46 percent less on average) to refrigerated food (with a price differential of 16 percent). (ibid)

[9] See Gereffi (1999).

strategy is J.C. Penney, whose private label lines account for up to 60% of women's apparel sales. As J.C. Penney is a pure retailing company and not a manufacturer, it imports apparel for its private labels from lower-wage countries, such as Mexico. In 1994, J.C. Penney established a buying office in Mexico City and its procurement of apparel went from $7 million in 1994 to $100 million in 1999. J.C. Penney buys apparel products, such as tee-shirts, underwear, and jeans, from twenty two independent Mexican manufacturers.[10] Here, a major international retailer – J.C. Penny – is serving as an intermediary that links Mexican exporters with U.S. consumers via private label arrangements.

To fix ideas further, and to highlight another connection between trade intermediation and pooled-producer sourcing, consider another example - the wine industry in New Zealand. Over the period between 2001 and 2011, New Zealand's wine market has has seen a dramatic expansion of private label exports.[11] Bulk wine is exported not in bottles, but in massive wine "bladders" of 20,000 liters or more. This bulk wine is shipped to retailers who blend and bottle it under private labels in major markets like the U.S., U.K., and Germany. In 2007, bulk exports were only 5 percent of total exports of New Zealand wine, but by 2011, this share had increased to 35 percent.[12] Many have argued that the dramatic increase in bulk and private label exports has amplified competitive pressure on independent New Zealand producers: a business survey conducted in early 2012[13] cited bulk wine exports as a key reason that 56 percent of New Zealand wineries suffered negative profits in 2011. Thus, at the same time that bulk wine homogenizes private label products via physical pooling, it can also reduce the market for independent varieties through a pro-competitive effect. Both of these effects contribute to a loss of variety for consumers, even as overall exports rise.

We view this potential tradeoff between variety and volume as an important and as yet unexplored feature of trade intermediation. Accordingly, we build a model to highlight the tension between private label and direct exporting, and show that the nature of trade intermediation can have important implications for the firms and varieties that succeed in the global marketplace. The reader may note that while we present and frame our analysis from the perspective of the exporting country, exports turn into imports the moment they reach their destination, so our results apply more generally to imports as well.

[10] For example, J.C. Penney also import directly from a Mexican-owned manufacturer Libra in Torreon, Mexico which claims the title of 'Blue Jeans Capital of the World'. See Bair and Gereffi (2003), and Bair (2002) for a review of the apparel industry in Mexico.

[11] From 2001 to 2011, the share of wine exports in bulk increased from 20 percent to almost 50 percent in new world countries. See Rabobank (2012).

[12] See ANZ (2012) report.

[13] As cited in PPB (2012) report.

Findings. We build a model of private label sourcing and trade intermediation that ties the prevalence of private label exports to fundamentals (market size, preferences, and costs of exporting). We start with a tractable heterogeneous firms model of intermediated trade, to which we introduce private label contracts. The model incorporates micro-founded building blocks from earlier work to identify an intuitive, plausible, and general sorting mechanism by which firms of differing ex-ante product characteristics self select into export modes. The largest exporters ship products directly (perhaps by establishing a foreign wholesale subsidiary, as in Felbermayr and Jung (2008)), while smaller exporters ship indirectly through intermediaries, and the smallest and least productive firms do not export at all.

The model highlights the key differences between two distinct business models for trade intermediation: brand-preserving exports, which would be preferred by larger exporters in more differentiated products (where exporting firms compete on brand-equity and cost), versus private label contracts (where exporters compete on cost alone). We show that the availability of private label trade intermediation increases total exports, reduces profits of the direct exporters, and induces some former direct-exporters to switch to private label exporting. The net effect on the total number of exporters is ambiguous, however: private label technology provides an additional mode of accessing the export market, leading to entry, but it simultaneously introduces a stark pro-competitive effect, pushing firms to exit. We find that the second effect dominates the first (i.e. there is net exit) when the intermediary's cost advantage over direct exporters is large, products are less differentiated, or exports from the rest of the world are large.

Using our model to study intensive and extensive margin adjustments to changes in trade costs, we find that an increase in *variable* trade costs reduces the range of direct exporters and shifts the range of exporters who use the intermediary toward higher brand equity. This strengthens the private label brand, but reduces the total range of exporting firms. At the same time, on the intensive margin, the quantity exported by an individual exporter via the intermediary remains unchanged, whereas a (surviving) individual direct exporter exports more following the reduction in competition from fewer differentiated products. Net, the extensive margin dominates, so that total export volume falls with an increase in variable trade costs, even as the most successful (direct) exporters become larger.

Turning to *fixed* costs, we again find asymmetric results for direct vs. intermediated exporters. Because intermediaries allow private label exporters to share the burden of fixed trade costs (whereas a direct exporter must bear fixed costs alone), an increase in the fixed cost of exporting would cause the range of firms who use the intermediary to increase and the range of direct exporters to shrink; the effect on the total number of exporting firms is generally ambiguous. On the intensive margin, an increase in fixed costs would lead a firm that uses intermediation to

export more, while the net effect on total export volume and individual direct export volumes are, in general, ambiguous.

In a final step, we use the model to explore the implications of market power exercised by trade intermediaries. We consider first a case in which many retailers each offer (exclusive) access to a subset of destination market consumers, and second a scenario where a single retailer faces potential entry and thus has to reduce the fee it sets to extract profit from exporting firms. While the insights from the baseline version of the model prove robust to the variation in market structure, a reduction in market power due to potential entry has significant implications. Small reductions in the market power of the intermediary render exporting under its private label more attractive: while direct exports fall, private label and total exports increase. As the pricing power of the retailer vanishes further, however, the negative aspects of the private label start to dominate as lower brand equity exporters are absorbed into the private label pool, leading to an increase in direct exports and a decline in overall export volumes.

Related Literature. Our paper is most closely tied to the growing trade literature on the importance the role of intermediaries in trade. As noted earlier, the existing body of work treats trade intermediaries as a go-between that reduces the average cost of transportation for potential exporters. The literature offers two different ways how the intermediaries facilitate this reduction in transportation costs for exporters. In the first group of papers: Rauch and Watson (2004), Feenstra and Hanson (2004), Felbermayr and Jung (2008), and Felbermayr and Jung (2011), the intermediary resolves an information asymmetry or incomplete contracts problem. The second explanation is suggested by Blum et al. (2010), Head et al. (2014), Antràs and Costinot (2011), Ahn et al. (2011), and Akerman (2010), where the role of the intermediaries is in economizing on trade (or search) costs. Along a somewhat different line, Bai et al. (2015) develop and find empirical support for a structural model in which trade intermediation may reduce dynamic market learning potential for exporters. In contrast to these papers, our contribution is to analyze *transformative* trade intermediation via product pooling and homogenization. A pair of papers, orthogonal our own but similar in spirit, look at potential implications for vertical *quality* adjustments in response to intermediation; see Dasgupta and Mondria (2011) and Iacovone et al. (2016) for theoretical model of endogenous quality upgrading in a heterogenous firms framework.

Our paper also contributes to existing work on private labels. In the (small) industrial organization literature on private labels, Mills (1995) and Gabrielsen et al. (2007) focus on how private label introduction affects the division of profits between manufacturer and retailer. For a broader review of the literature see Bergès-Sennou et al. (2004). In the marketing literature, study of private labels focuses instead on consumer behavior, largely through case studies. Unlike

these papers, we do not aim to explain the existence of private label sourcing, but rather to analyze the effects of availability of this form of trade intermediation on the variety and selection of firm exports. Our paper is the first to analyze the effects of private label intermediation in the market setting where firms produce differentiated products.

The remainder of the paper proceeds in the usual sequence. The next section presents a simple model of private label trade intermediation, and analyzes the effects of a private label option for firm behavior and the equilibrium pattern of trade. Sections 3 and 4 present a set of policy-relevant comparative statics, evaluating the effects of changes in (fixed and variable) trade costs and variations in market power at the intermediary level. Section 5 concludes.

2 The Model

In what follows, we develop a simple partial equilibrium model of direct and intermediated trade in which horizontally differentiated firms in a small open economy – 'Home' – compete to serve consumers in a foreign trading partner, 'Foreign'. Exporters choose between two different market access channels to reach consumers abroad. The first channel is direct exports, which preserve exporters' unique brand-equity, but entail a higher fixed cost. The second option is private label trade intermediation via an international firm-retailer. Under this option, exporters are required to pool their products under a single umbrella private label brand that is controlled by the intermediary. The fixed and variable costs of exporting via the private label contract are set endogenously by a profit-maximizing international firm-retailer. In the baseline version of the model, this intermediary acts as a (single price) monopsonist; Section 3 later relaxes this assumption to consider variation in the degree of market power.

We present the model in stages, beginning with the basic set-up and then introducing direct exporting and private label trade intermediation in turn. Sections 3 and 4 then use the model to explore a series of comparative statics exercises.

2.1 Basic Model

Consumers. The Foreign target market consists of a mass of L consumers. These consumers are served by both Home firms and the rest of the world. In keeping with a small-country setting, we treat Home exporters as atomistic profit maximizers that take as the aggregate sales from the rest of the world as given. To keep the model as simple as possible, we focus on only the foreign target market, omitting a domestic market at Home. This simplification is of little consequence,

and does not change the key results for firm selection or trade patterns.[14]

Consumer preferences are identical and given by the following quadratic utility function, which mirrors that in Ottaviano et al. (2002):

$$U = q_0^c + \alpha \int \lambda_i q_i^c di - \frac{1}{2}\gamma \int \left(q_i^c\right)^2 di - \frac{1}{2}\eta \left(\int q_i^c di\right)^2.$$

In the expression, q_0^c is individual consumption of a tradable numeraire good[15] and q_i^c is individual consumption of each given differentiated product i. The parameter α expresses the intensity of preferences for the differentiated product relative to the numeraire, while parameters γ and η are both strictly positive, which ensures that consumers prefer dispersed consumption of varieties (love of variety). To this starting point, then we introduce a new 'brand equity' parameter λ_i for each product i, which acts as a vertical demand shift parameter to indicate the (heterogeneous) strength of demand for each horizontally differentiated product.

The key advantage of this utility function is that the resulting inverse market demand for product i is linear in (own) quantity:

$$p_i = \lambda_i \alpha - \eta \frac{Q}{L} - \frac{\gamma}{L} q_i,$$

where q_i is aggregate consumption of product i and Q is the aggregate consumption of all non-numeraire products available in the marketplace.[16] Using Q^H and Q^W to denote aggregate sales of differentiated goods to Foreign from Home and the rest of the world, respectively, aggregate consumption in Foreign is then equal to $Q = Q^W + Q^H$.

Exporting Firms. We assume a single factor of production – labor – and categorize firms into two sectors: a basic numeraire sector, 0 and the remaining differentiated goods sector. The numeraire good is produced under constant returns to scale with a unit cost, which implies a unit wage to labor. In the differentiated goods sector, all firms have the same constant marginal cost of production, denoted by c, and differ only in by the exogenous firm 'brand equity' parameter, λ_i. Brand equity can be interpreted as the inherent popularity of the product, (exogenous) quality, or any other firm-specific demand shifter, for instance as in Demidova et al. (2012).[17]

[14] Given our set up with quasi-linear preferences and a numeraire good, it would be a relatively simple matter to close the model, but the extra modeling apparatus required to add a domestic market and impose balanced trade does not yield enough additional insight to warrant the additional complexity.

[15] While we focus attention on the export side in our partial equilibrium approach, the numeraire conceptually allows for balanced trade.

[16] We assume that every consumers' income is sufficient to ensure positive consumption of each differentiated product, i.

[17] Demidova et al. (2012) offer an empirical basis for using firm specific demand shocks, based on evidence from Bangladeshi apparel exporters.

Hereafter, we refer to a firm with a draw of λ as a λ-type firm. Finally, for tractability, let λ be distributed uniformly over the unit interval, $[0, 1]$.

Each firm randomly draws its parameter λ and then makes a decision whether to export or not. Exporters compete in quantities and there is free entry. Home firms can serve Foreign consumers through either direct exports (DE), which requires both a significant fixed cost, F^{DE}, to set up a direct marketing link or a store front in the export market, and a per unit trade cost of c^{DE}.[18] Once set up, the direct exporter sells under its own distinct label, preserving its brand equity, λ_i. Alternatively, a Home exporter can access the Foreign market via the distribution network of an international firm-retailer (IR), which we discuss in detail shortly.

2.2 Direct Exports

To fix ideas, suppose for a moment that firms can export directly or not at all. Given our assumptions, it is immediately clear that only the firms with sufficiently high brand equity will choose to export. This self-selection mechanism parallels earlier work on intermediated trade (and exporting by heterogeneous firms more generally), and is sufficiently straightforward that we relegate the formal derivation to Appendix A1.

The intuition is as follows. Under our assumptions, all Home exporters have identical costs of production and market access (F^{DE} and c^{DE}), but firm-level demand is monotonically increasing in brand-equity, λ, which acts as a vertical demand shifter for each firm. Thus, the firm-level profit from exporting is (strictly) increasing with λ: $\pi^{DE\prime}(\lambda) > 0$. Given our assumption of free entry, each firm's profit from the outside option – not exporting – is zero. Thus, a λ-type firm optimally exports if and only if $\pi^{DE}(\lambda) \geq 0$. Hereafter we define λ^{DE} to be the threshold zero profit exporter under direct exports, given implicitly by: $\pi(\lambda^{DE}) \equiv 0$.

2.3 Private-Label Trade Intermediation

We now introduce the possibility of private label trade intermediation via an international firm-retailer (IR). This IR has an established distribution network in the Foreign target market and a 'private label' technology that allows it to sell all of its sourced products under a single umbrella private label brand, denoted by k.

The brand-equity of the private label is determined by the set of exporters that sell through the IR. Specifically, let:

$$\lambda_k \equiv \frac{\int_\Gamma \lambda g(\lambda)\, d\lambda}{K},$$

[18] We assume that neither of these costs is prohibitive.

where Γ and K denote the (endogenous) set and measure, respectively, of firms that use the IR's distribution network. There are two alternative but isomorphic interpretations of λ_k. In the first, exports are (literally) pooled – as in the earlier example of bulk wine – by the IR. This pooling leads to a homogenous product, with an "average" brand equity, λ_k, for the private label. Alternatively, one might imagine that rational and risk-neutral consumers can observe the set of exporters that supply the IR, but cannot discern the producer of any given product sold under the private label. In this case, consumers will again assign the expected brand equity λ_k to all products sold under private label k as in the expression above.[19]

It is worth noting that this formal definition of a private label – as a pooled product sold to consumers under an umbrella brand – is an innovation relative to the (limited) existing literature on private labels. In economics, the only two papers to consider private labels are (as far as we know) by Mills (1995) and Gabrielsen et al. (2007), who analyze how the introduction of a private label brand can change the division of profits between a manufacturer and a retailer; these papers do not consider the broader market setting that supplies private labels or, thus, the question of how to model the sourcing of private label products from multiple producers. In the marketing literature, study of private labels has focused instead on consumer behavior, largely through case studies. Methodologically very different, these papers also sidestep formal definition of private label products. Our model is thus the first to analyze the effects of private label intermediation in the market setting where firms produce differentiated products. We believe that our definition of private labels as a pooled product sourced from multiple producers offers an empirically relevant and theoretically novel understanding of trade intermediation by international retailers.

The International Retailer. The benchmark version of the model assumes a single international retailer, which sets a two-part fee structure to maximize profit. The IR must offer the same contract to all potential Home exporters – essentially acting as a single-price monopsonist. Timing is as follows. First, the retailer offers a contract $\{\Delta, f\}$ to all Home exporters, where Δ is a per unit "intermediation fee" and f is a fixed " finders fee" paid by a Home exporter to the IR to sell under the private label.[20] Given this contract, Home firms the decide whether to export directly, to accept the private label contract, or not to export at all.

We assume that the private label intermediation is costly for the retailer, so that the IR needs to pay a fixed cost of F^R (which turns out to be immaterial as long as it is not prohibitive) and a per unit cost of c^R for each unit sold under the private label. The IR is assumed to have a

[19] Note that consumer's utility function is linear in λ_i, hence consumers are risk-neutral with respect to λ_k.

[20] Equivalently, these fees can be interpreted as lower pass through prices for exporters, where the IR gets its 'cut' by offering exporters lower prices for products sourced under the private label.

variable cost advantage compared to direct exporters: $c^R < c^{DE}$.

From here, we can derive the equilibrium private label contract and describe the range of direct exporters and private label exporters in equilibrium. In what follows, we discuss the results and the basic intuition underlying for the key mechanisms; formal step-by-step derivations can be found in Appendix A2.

We first solve for the set of Home firms that choose a private label contract over direct exports for a given private label contract $\{\Delta, f\}$. Using q_k to denote the individual output of each private label exporter and $Q_k^{H,PL} = Kq_k$ to represent the total output of all Home firms supplying under the private label, the total output sold in the Foreign market when both channels — private label and direct exporting — are available amounts to $Q = Q^W + Q^{H,DE} + Q_k^{H,PL}$, where $Q^{H,DE}$ represents aggregate sales of differentiated products via direct exports by Home firms.

It is both intuitive and straightforward to show that firms with high λ choose to export directly, while firms with lower λ choose to export under the private label. To see this result more formally, note that π^{DE} is strictly increasing in λ while π^{PL} is the same for all λ, since the profit of a private label exporter depends only on the value of brand equity, λ_k. That is, when exporting through the IR, an individual firm's brand-equity superseded by the private label.

From here, we can define an upper threshold firm, $\bar{\lambda}$, that is just indifferent between direct exports and intermediated trade under the private label. Implicitly this threshold is given by:

$$\pi^{DE}\left(\overline{\lambda}\right) = \pi^{PL}. \tag{1}$$

Similarly, there is a lower threshold type, $\underline{\lambda}$, that is just indifferent between the private label contract and not exporting at all (zero profit). It follows immediately that that Home firms with $\lambda \in (\overline{\lambda}, 1]$ are direct exporters and firms with $\lambda \in \left[\underline{\lambda}, \overline{\lambda}\right]$ export under the private label contract. Firms with $\lambda \in [0, \underline{\lambda})$ do not export at all.

Lemma 1 *In equilibrium, firms with greater brand-equity λ self-select to export directly while lower λ firms export under the private label.*

This result is consistent with the existing literature – e.g. Blum et al (2009), Felbermayr and Jung (2009), Akerman (2010) – which predicts that low productivity firms use intermediaries to access export markets. The difference so far is simply that in our model the sorting is along a brand equity dimension, rather than productivity.

Furthermore, note that if in equilibrium there are some firms that choose not to export at all (i.e., as long as $\underline{\lambda} > 0$) then it must be the case that the profit from private label exporting is zero:

$$\pi^{PL} = 0. \tag{2}$$

To understand this result, suppose that instead, $\pi^{PL} > 0$. In this case, since there is free entry into the private label contract, positive profits would induce Home firms with $\lambda < \underline{\lambda}$ to accept the private label contract. As these firms self-select into private label exporting, the average brand equity of the private label product λ_k will decline, reducing π^{PL} to zero. Since there is also free exit from the private label contract, π^{PL} cannot be negative. Hereafter, we focus on the case in which some firms choose not to export at all, so that $\underline{\lambda} > 0$.

Using the zero profit condition for exporting under the private label and the self-selection thresholds above, we can then derive the optimal (profit maximizing) contract offered by the IR:

Lemma 2 *The equilibrium private label contract is:*

$$\Delta = c_r, \;\; f = \frac{L}{\gamma}\left(\frac{2}{3}\sqrt{\frac{\gamma F^{DE}}{L}} + \frac{1}{3}\left(c^{DE} - c_r\right)\right)^2.$$

That is, in equilibrium the IR maximizes its profit by setting its per unit fee equal to its per unit cost of exporting (zero mark-up of intermediation costs) and choosing the fixed fee to extract all of the surplus from Home private label exporters. This makes sense: since all exporters earn the same profit under the private label option, and the outside option is zero profit, the IR simply maximizes sales by lowering the (per unit) price of intermediation to marginal cost, and then captures all resulting gains from exporting via the fixed fee, f. This fixed fee f is larger when the Foreign market is larger (L is larger), the IR's cost advantage, $\left(c^{DE} - c_r\right)$, is larger, or the fixed cost of exporting directly, F^{DE}, is larger.

Finally, using Lemma 2 and the definition of the threshold private label exporters ($\underline{\lambda}$ and $\overline{\lambda}$) we can derive the equilibrium measure of Home firms that export under the private label:

Lemma 3 *The measure of Home firms exporting under the private label is*

$$K = \frac{2}{\alpha}\left(\frac{2}{3}\sqrt{\frac{\gamma F^{DE}}{L}} + \frac{1}{3}\left(c^{DE} - c_r\right)\right).$$

(See Appendix A2 for detailed derivation.) This expression predicts that there will be more private label exporters when the IR has a greater cost advantage, $\left(c^{DE} - c_r\right)$, or the fixed cost of reaching a foreign consumer by exporting directly, $\frac{F^{DE}}{L}$ is higher. Likewise, more exporters will choose private label intermediation when consumers have less intense preferences for differentiated products (lower α). Summarizing, all else equal, private label exports will capture a greater market share of total trade when direct exporting entails a costly fixed fee, distribution is more efficient under intermediaries (relative to direct exporting), or product differentiation is less important to consumers.

2.4 Effects of Private Labels on Exporting Firms

In this section, we ask how the availability of a a private label export channel affects Home exporters. Suppose that initially Home firms can export only directly, which is the scenario outlined in sub-section 2.2. We can now explore what happens to the range of Home exporters, their individual output, and their profits when an international retailer with a private label retailing technology enters the scene.

The introduction of the private label option reshapes the pattern of trade and the modes by which Home exporters reach their Foreign consumers. First, note that (unsurprisingly) the availability of an additional export mode will necessarily raise total Home exports. The proof is by contradiction: were this not the case (that is, if total Home exports decreased), then as demonstrated formally in the appendix, the output and the profit of each direct exporter would increase in the face of weaker competition. But if direct exporters benefitted from lower aggregate exports, more firms would enter direct exporting, causing $\overline{\lambda}$ to fall. But then if there were more direct exporters, each of them exporting more, we would have that the total output of direct exporters rises. Adding any (new) exports under the new private label, total Home exports necessarily would be higher, which contradicts the initial premise. We therefore conclude that the total quantity Q^H exported by Home country firms must be higher when the private label contract is available.

By similar logic, it is straightforward to see that there will be fewer Home direct exporters: $\overline{\lambda} > \lambda^{DE}$. Given that total Home exports rise with the introduction of the private label option, (as argued above and demonstrated in equations (3) and (4) in Appendix A2) it must hold that both output and profit of Home direct exporters will fall. Some of them, therefore, will exit. The following Proposition summarizes these results.

Proposition 1 *The availability of a private label contract results in:*

(i) greater total Home exports;

(ii) fewer Home direct exporters; and

(iii) lower individual output and reduced profit for surviving direct exporters.

In Appendix $A2$ we analyze how the availability of the private label export channel affects the total number of Home exporters and find that the effect depends on parametric assumptions. We summarize this finding as follows:

Proposition 2 *The availability of private label exporting can force lower brand equity Home firms to exit the export market. This will occur if the IR's cost advantage,* $\left(c^{DE} - c_r\right)$ *is high,*

substitutability between varieties, η, is high, or the volume of ROW exports per foreign consumer, $\frac{Q^W}{L}$ is high.

This last proposition shows that the effect of the availability of the private label export channel on the total mass of exporters is ambiguous. On the one hand, private label intermediation opens up an additional mode by which Home firms can reach foreign consumers, which should allow new Home firms to start exporting. At the same time, however, brand dilution under the private label option reduces product differentiation and carries a stark pro-competitive effect that works to reduce the set of Home exporters. The second effect dominates if direct exporting is sufficiently difficult for Home firms, either because the international retailer's cost advantage is large enough or because the competition among Home firms strong enough, that is the products are very close substitutes or the rest of the world is very large compared to the Home country.

Summarizing, the implications of private label trade intermediation are mixed. Private label intermediation can serve as a low cost vehicle for increasing market access, and unambiguously increases the aggregate volume of trade. At the same time, however, private labels reduce product differentiation, both directly – by homogenizing the output of those exporters that sell via the international retailer – and indirectly, by crowding out direct exporters via a pro-competitive effect. Consumers therefore face a tradeoff between the variety and volume of trade. Exporters, meanwhile, face steeper competition and earn lower profits. Under plausible conditions, the number of exporters may even fall after the introduction of a private label option.

3 Trade Costs

Using the basic model, we now investigate the effects of changes in both fixed and variable trade costs and (in the next section) changes in market power at the intermediary level. For the former, note that our analysis applies to both real trade costs as well as tariffs.[21]

3.1 Variation in Variable Trade Costs

Consider first a uniform increase in the variable trade costs for both direct and intermediated trade, c^{DE} and c_R. That is, suppose that trade costs increase by the same per-unit cost, t – like a specific tariff or third party shipping cost – such that direct and intermediate trade costs are given by $c^{DE} + t$ and $c_R + t$, respectively.

[21] The revenue that arises from a tariff does not affect our analysis as it accrues to the importing country, whereas the effects we analyze below play out in the exporting country.

First, it is easy to see how the optimal contract offered by the retailer is affected since, as already demonstrated, the IR sets the per unit fee to exporters, Δ, equal to its marginal cost. Thus, any increase in variable cost bill be passed on by the retailer one-for-one. The fixed component of the contract, meanwhile, remains unaffected since it depends only on the *difference* between the marginal cost of intermediated versus direct exporting (Lemma 2). At the same time, however, the increase in variable cost will cause the upper and lower cut-offs increase, and by the same amount. Thus, on the extensive margin, a uniform increase in variable trade costs will reduce the set of direct exporters but leaving the mass (if not the identity) of private label exporters unchanged.

On the intensive margin, it is straightforward to show that private label exporters do not export more or less individually or as a group, since the fixed cost to them of retailing via the private label channel is unaffected. (The increase in private label brand-equity just offsets the increase in variable trade costs under the IR.) In contrast, direct exporters shrink in number but individually increase their sales since competition is weaker. Appendix A3 demonstrates that the (negative) extensive margin effect dominates, so that aggregate Home exports fall.

We summarize these findings in the following proposition:

Proposition 3 *A uniform increase in variable trade cost leads to:*

1. *higher thresholds for private label exporters but no effect on mass or output;*
2. *a reduction in the mass of direct exporters, yet higher individual quantities for each (surviving) direct exporter; and*
3. *lower aggregate Home exports.*

3.2 Variation in Fixed Trade Costs

We now focus on a variation in the fixed cost of exporting. As above, we would in principle want to consider a synchronous change in both fixed costs, F^{DE} and F_R. However, this turns out to be unnecessary, since the fixed cost of the retailer plays no role in the model (assuming that it is not prohibitive). Thus, we concentrate on varying just F^{DE}. Note that the fixed fee of the private label contract remains unchanged even if we were to vary F_R.

First, consider the effect of an increase in the fixed cost of exporting on the optimal contract offered by the IR. Again, given that the IR optimally sets the per-unit distribution charge, $\Delta = c_R$, it is immediate that the change in F^{DE} does not affect the variable fee for private label intermediation. Instead, the IR will simply extract more profit via the fixed fee, f, since firms'

outside option (direct exporting) becomes more costly. On the extensive margin, the mass of private label exporters increases, since $\bar{\lambda}$ increases with F^{DE}.

Turning to the intensive margin, each firm that chooses to use the retailer exports more, since the fixed fee of exporting under private label goes up with the fixed cost of direct exporting. When λ_k rises, so too do per-firm private label exports. Since we already saw that the mass of these firms increases as well, total private label exports increase.

Finally, the effect on aggregate export volumes is again ambiguous: the net effect depends on whether the decline in the volume of direct exports is outweighed be the increase in private-lable trade. In Appendix A4 we show that if α, $\gamma F^{DE}/L$ or $\left(c^{DE} - c_r\right)$ are high then we see higher aggregate exports in response to an increase in the fixed cost of direct exports, while the effect on the individual quantity of each direct exporter is the opposite. We summarize these findings in the following proposition:

Proposition 4 *An increase in the fixed cost of direct exporting leads to:*

1. *a higher mass and individual quantity of private label exporters;*
2. *a lower mass of direct exporters; and*
3. *opposite effects on the individual quantity of direct exporters and aggregate exports (the respective direction depending on the demand intercept, the level of the per capita fixed cost, and the variable cost difference between both channels).*

The economic intuition for this result is as follows. When the fixed cost of direct exporting increases, using the private label channel offered by the international retailer becomes relatively more attractive. Even though the retailer siphons off profits, there is an increase in the quantity per private-lable exporter, as well as the mass of these exporters, and hence total quantity exported via the international retailer. At the same time, the mass of direct exporters shrinks, as the increase in fixed cost renders this channel less attractive. The quantity of the remaining direct exporters reacts to the change in competitive pressure, and this is why there are opposing effects on their quantity versus total quantity exported. Which way total quantity changes depends on the effect on the total mass of exporters, the quantity effect of intermediate firms (who switch from direct exporting to using the international retailer), and the exact increase in output of each of these private label firms.

4 Retailing Market Structure

So far we have assumed in our model that the trade intermediary (international retailer) is a monopolist (or monopsonist vis-à-vis the exporting firms). We now relax this assumption and consider alternative market structures in the intermediary retailing sector. The objective is to investigate the robustness of our results with regards to this assumption.

4.1 N Retailers Each Controlling 1/N of the Market

First, we show that the monopoly set-up is equivalent to a market structure where N international retailers each control access to a segment of size $1/N$ of the market. That is, there are N retailers each offering access to L/N of Foreign consumers in the export market.[22] In the interest of keeping the analysis tractable, we assume that all retailers have the same per unit costs of c^R, and the same fixed costs, F_R.

Consider retailer $k \in N$ who offers a private label contract of the form (Δ_k, f_k). Since this retailer offers access to to only $1/N$ of the market, the demand faced by a producer who exports under this contract is

$$p_k = \lambda_k \alpha - \eta \frac{Q}{L} - \frac{\gamma q_k}{(L/N)}$$

where q_k is an individual quantity and Q is total exports in the Foreign market.

As in the baseline model, the profit of any firm that exports under the private label contract is zero and hence, the individual output of a firm exporting under the private label and the average brand equity of the private label k equal to

$$q_k = \sqrt{\frac{f_k L}{\gamma N}}, \ \lambda_k = \frac{1}{\alpha}\left(2\sqrt{\frac{N f_k \gamma}{L}} + \eta \frac{Q}{L} + c + \Delta\right).$$

As before, the profit of a firm choosing to export via retail intermediaries has to equal the profit of a direct exporter at the cut-off, and this condition pins down the brand equity of the firm who is indifferent between exporting directly and under the private label:

$$\overline{\lambda} = \frac{1}{\alpha}\left(2\sqrt{\frac{\gamma F^{DE}}{L}} + \eta \frac{Q}{L} + c + c^{DE}\right).$$

Finally, the measure of private label k exporters is:

$$K_k = 2\left(\overline{\lambda} - \lambda_k\right) = \frac{2}{\alpha}\left(2\sqrt{\frac{\gamma F^{DE}}{L}} - 2\sqrt{\frac{N f_k \gamma}{L}} + c^{DE} - \Delta\right).$$

Turning attention to the decision problem of the retailers, each retailer k chooses the contract to maximize her profits:

$$\Pi_k = K_k q_k \left(\Delta_k - c^R\right) + K_k f_k - F_R.$$

[22] Note that they are still monopolists in those submarkets, and therefore no pro-competitive effect arises.

The contract that solves this maximization problem is:

$$\Delta_k = c^R,\ f_k = \frac{L}{9N\gamma}\left(2\sqrt{\frac{\gamma F^{DE}}{L}} + c^{DE} - c^R\right)^2.$$

It is straightforward to see that the resulting measure of private label exporters is the same as in our benchmark model.

Importantly, note that each private label exporter will supply all retailers and hence will cover the whole consumer market. Since the range of exporters supplying under the private label is the same for every retailer, the average brand equity of each private label is also the same in each segment of the market.

Finally, it is easy to show that the cut-off between private label and direct exporting, the total quantity of private label exports and total exports are the same as in our benchmark model; that is, they are robust to the variation in market structure we have considered in this subsection. This result should not be surprising – segmenting a symmetric market among multiple symmetric intermediaries does not reduce their market power relative to direct exporters, and so there are no meaningful changes to private label contract terms or, thus, market outcomes.

4.2 Reducing Monopoly Power

We now consider an exogenous reduction in the monopoly power of the (single) retailer. Let us think of its market power as being reduced by potential entry, or due to impending regulation. Let this competitive pressure put an upper bound on the retailing fee f that the retailer can charge from Home exporters.[23]

The fee is thus bound at a level lower than in the monopoly case:

$$f < \frac{L}{\gamma}\left(\frac{2}{3}\sqrt{\frac{\gamma F^{DE}}{L}} + \frac{1}{3}c^{DE} - \frac{1}{3}c_r\right)^2$$

whereas the per unit fee of retailing remains the same,[24] and equals the marginal cost of the retailer:

$$\Delta = c^R.$$

It is easy to see that as the monopoly power of the retailer is reduced, i.e., the fixed fee f decreases, then each private label exporter will export less — that is, q_k decreases as a lower

[23] Alternatively, we could consider a model with an explicit oligopolistic market structure for intermediaries which would also lead to a lower, yet endogenously determined fixed fee. Such analysis is interesting but beyond the scope of the present paper.

[24] Formally, an upper bound on the fixed fee might lead to a higher variable component, but we abstract from this aspect here, implicitly assuming that the same competitive (or regulatory) pressure prevents such evasive action on part of the retailer.

output is needed to cover the fixed fee of private label exporting.[25] Fundamentally, this reduction in the intensive margin is caused by the increase in the set of private label exporters, which we demonstrate in Appendix A5. Thus, there are more private label exporters, but each one exports less individually.

In Appendix A5 we show that the effect on the total quantity of private label exports is not monotone - for sufficiently high levels of f, i.e., $f > \widetilde{f} = \frac{L}{\gamma}\left(\frac{2\sqrt{\frac{\gamma F^{DE}}{L}}+c^{DE}-c^{R}}{4}\right)^{2}$, the quantity increases as f falls, and then, once $f < \widetilde{f}$, starts to decrease as the fee falls even further.

We first summarize these results before turning to the intuition:

Proposition 5 *As the market power of the retailer is reduced, that is, as f decreases:*

(i) if $f > \widetilde{f}$, then total exports rise, direct exports fall, private label exports rise, and the measure of the direct exporters decreases

(ii) if $f < \widetilde{f}$ then total exports decrease, direct exports rise, private label exports fall, and the measure of the direct exporters increases.

The intuition is as follows. The reduction of the fee has a direct positive effect on the profitability of private label exporting. When f is very high, this first effect dominates such that intermediated private label exports rise and direct exports fall. But notice, too, that abstracting from cost considerations, private label exporting is otherwise less attractive than direct exporting. Thus, starting from a lower fixed fee (below the critical value defined above), a further decrease in f will induce higher brand equity exporters to revert to direct exporting via an adverse-selection mechanism, as ever lower brand equity exporters are brought under the private label contract.[26]

5 Conclusion

This paper studies the role of intermediation in international trade. In particular, we identify the potential importance of pooled-producer or 'private label' contracts in shaping not just the extent of market access — which firms manage to export overseas — but also the nature of traded goods – how the intermediation process *itself* affects the set of differentiated products that reach consumers abroad. In line with the existing literature, our model implies a sorting of potential exporters according to underlying firm characteristics: the best firms export directly,

[25] We continue to assume that the fixed fee f is sufficiently high so that there are some Home firms who do not export at all.

[26] As f decreases, the quality of the lowest quality private label exporter also falls, and for sufficiently low f all Home producers start to export, that is $\underline{\lambda} = 0$.

intermediate firms export via the intermediated private label channel, and the weakest firms do not export at all. The model we propose predicts that the availability of the additional channel to access the export market increases the volume of total exports of Home country firms, but at the expense of direct exporters, who reduce their individual quantity, partly switch to exporting under the private label or even leave the market.

Investigating the effects of variations in trade costs, we consider a synchronous increase in either the fixed or variable cost of trade, and focus on the possibly divergent responses of direct and intermediated exports. For an increase in variable costs, we find that the range of private label exporters shifts up toward higher brand equity exporters, while the number of direct exporters falls. And while the individual quantity of firms who make use of the private label contract remains unaffected, the anti-competitive effect of the increase in trade costs allows the remaining direct exporters to increase firm-level exports due to a reduction in the range of competing differentiated products. An increase in fixed costs increases the cost of direct exporting relative to intermediation. As a result, the range of private label exporters increases, while the number of direct exporters declines. And while firms who use the private label also produce more, the effect on direct exporters is ambiguous, leading to an ambiguous effect on total exports.

Relaxing our assumption of a single retailer, we also consider the implications of market structure *at the intermediary level* for the equilibrium pattern of firm level exports and trade; that is, how competition among the trade middlemen can have important implications for producers and consumers on both ends of the shipping route. We find that when N retailers each control access to 1/N of the destination market, our results remain unchanged. However, when we consider a decrease in market power leading to a reduction in the fee the (single) retailer charges, we find non-monotone effects. At first total exports rise as the fee falls but eventually the effect turns negative, as the lowest brand equity exporters join the private label pool, enabling direct exporters to regain market share.

The existence of private label trade intermediation raises important questions for both measurement and theory. At the most basic level, our model suggests that private label sourcing involves an extensive margin of low-end exporters. To what extent are these private label exporters identified in the data? How direct is their exposure to trade shocks? To what extent do existing firm-level trade data distinguish between traditional wholesalers and private label intermediaries? Data from the marketing literature suggest that private label sales are both widespread and growing, particularly in emerging markets. Our work suggests that the empirical trade literature should also recognize this important new margin of trade.

Along a different line, our work suggests that product differentiation may be endogenously

shaped by the market realities of international market access via trade intermediaries. To the extent that private label trade reduces horizontal product differentiation, these effects may be reflected in both endogenous markups and welfare consequences of trade. More broadly, our paper highlights a potential endogenous tradeoff between the equilibrium variety and volume of trade that has been largely overlooked by the existing literature. This oversight is particularly consequential for quantitative models of trade, in which love-of-variety preferences – and thus the diversity of differentiated products in equilibrium – play a central role in determining the gains from trade.

A Appendix

A.1 Direct exports only

In this Appendix we solve for equilibrium in the basic case when firms can export directly or not at all. In this scenario, a λ-type firm solves the following profit-maximization problem:

$$\max_q \left(\left(\lambda\alpha - \eta\frac{Q}{L} - \frac{\gamma q}{L} - c - c^{DE} \right) q - F^{DE} \right),$$

where $Q = Q^W + Q^{H,DE}$ is the aggregate output sold in the Foreign market. The profit-maximizing output of a λ-type firm is then:

$$q^{DE}(\lambda) = \frac{L}{2\gamma}\left(\lambda\alpha - \eta\frac{Q}{L} - c - c^{DE} \right), \tag{3}$$

with associated profit:

$$\pi^{DE}(\lambda) = \frac{L}{4\gamma}\left(\lambda\alpha - \eta\frac{Q}{L} - c - c^{DE} \right)^2 - F^{DE}. \tag{4}$$

Then the threshold λ^{DE} implicitly equals to:

$$\lambda^{DE} = \frac{1}{\alpha}\left(2\sqrt{\frac{\gamma F^{DE}}{L}} + \eta\frac{Q}{L} + c + c^{DE} \right). \tag{5}$$

Aggregating over the set of exporting firms, $\lambda \in [\lambda^{DE}, 1]$, per capita output sold in the Foreign market equals:

$$\frac{Q}{L} = \frac{Q^W}{L} + \frac{1}{L}\int_{\lambda^{DE}}^{1} q^{DE}(\lambda)d\lambda. \tag{6}$$

Using equations (5) and (6) we can derive the equilibrium level of λ^{DE}:

$$\lambda^{DE} = 1 - \frac{1}{\alpha\eta}\left(\sqrt{D} - 2\sqrt{\frac{\gamma F^{DE}}{L}}\eta - 2\alpha^3\gamma \right), \tag{7}$$

where we use the term D simply as a placeholder for the (somewhat messy) expression:

$$D \equiv 4\eta^2\gamma\left(\frac{F^{DE}}{L} + \frac{\alpha^3}{\eta}\left(\frac{\alpha^3\gamma}{\eta} + \alpha - \frac{\eta Q^W}{L} - c - c^{DE} \right) \right).$$

In words, the expression in (7) tells us that when the only way to reach Foreign consumers is via direct exporting, more exporters will undertake the direct export channel when the (fixed and variable) trade costs are lower, consumers value product diversity more, the Foreign market is larger, and there is less competition from the rest of the world.

A.2 Private labels

In this Appendix we first solve for equilibrium in the case of private label trade intermediation and then derive the effects of private label intermediation on Home exporting firms.

First, we find the contract offered by the IR in equilibrium. The inverse demand for private label k product is:

$$p_k = \lambda_k \alpha - \eta \frac{Q}{L} - \frac{\gamma q_k}{L},$$

where $Q = Q^W + Q^{H,DE} + Q_k^{H,PL}$. The profit of a Home firm that accepts the private label contract is thus:

$$\pi^{PL} = \left(\lambda_k \alpha - \eta \frac{Q}{L} - \frac{\gamma q_k}{L} - c - \Delta \right) q_k - f.$$

Solving, the profit-maximizing output equals:

$$q_k = \frac{L}{2\gamma} \left(\lambda_k \alpha - \eta \frac{Q}{L} - c - \Delta \right),$$

so that the profit of a Home firm exporting under a private label contract is:

$$\pi^{PL} = \frac{L}{4\gamma} \left(\lambda_k \alpha - \eta \frac{Q}{L} - c - \Delta \right)^2 - f. \tag{8}$$

It is straightforward to see that the profit of a direct exporter is the same as in (4) with the only difference that now total demand Q includes output of the private label product channeled through IR, $Q_k^{H,PL}$.

We focus on the case in which some firms choose not to export at all, so that $\underline{\lambda} > 0$. In this case, using (2) we have that the output of a Home firm exporting under the private label contract is:

$$q_k = \sqrt{\frac{Lf}{\gamma}}.$$

To find $\overline{\lambda}$ we use conditions (1) and (2) to get $\pi^{DE}\left(\overline{\lambda}\right) = 0$. We then have:

$$\overline{\lambda} = \frac{1}{\alpha} \left(2\sqrt{\frac{\gamma F^{DE}}{L}} + \eta \frac{Q}{L} + c + c^{DE} \right). \tag{9}$$

Then using condition (2) we can find λ_k:

$$\lambda_k = \frac{1}{\alpha} \left(2\sqrt{\frac{\gamma f}{L}} + \eta \frac{Q}{L} + c + \Delta \right).$$

Finally, using $\lambda_k = \dfrac{\underline{\lambda} + \overline{\lambda}}{2}$, we derive the value of the measure of Home firms exporting under the private label:

$$K = 2\frac{1}{\alpha}\left(2\sqrt{\frac{\gamma F^{DE}}{L}} - 2\sqrt{\frac{\gamma f}{L}} + c^{DE} - \Delta\right) \tag{10}$$

As one would expect, a higher per unit fee Δ or a higher fixed fee f charged by the IR decrease the measure of firms that accept a private label contract.

We are now ready to characterize the contract that maximizes the retailer's profit:

$$\Pi = Kq_k\left(\Delta - c_R\right) + Kf - F_R$$

Using (10), we have that:

$$\Pi = 2\frac{1}{\alpha}\left(2\sqrt{\frac{\gamma F^{DE}}{L}} - 2\sqrt{\frac{\gamma f}{L}} + c^{DE} - \Delta\right)\left(\left(\Delta - c_R\right)\sqrt{\frac{Lf}{\gamma}} + f\right) - F_R.$$

Maximizing the IR's profit gives us the equilibrium contact:

$$\begin{aligned} \Delta &= c_r \\ \sqrt{\frac{\gamma f}{L}} &= \frac{2}{3}\sqrt{\frac{\gamma F^{DE}}{L}} + \frac{1}{3}c^{DE} - \frac{1}{3}c_r. \end{aligned}$$

Next, we can solve for the thresholds $\overline{\lambda}, \underline{\lambda}$ and the average value of brand equity of the private label product λ_k. First, the per capita output sold in the target Foreign market is equal to

$$\begin{aligned} \frac{Q}{L} &= \frac{Q^W}{L} + \frac{1}{L}\left(\int_{\overline{\lambda}}^{1} q^{DE}(\lambda)d\lambda + Kq_k\right) \qquad (11) \\ &= \frac{Q^W}{L} + \frac{(1 - (\underline{\lambda} + K))}{4\gamma\alpha}\left(\frac{4}{\alpha}\sqrt{\frac{\gamma F^{DE}}{L}} + 1 - (\underline{\lambda} + K)\right) + \frac{2}{\alpha\gamma}\left(\frac{2}{3}\sqrt{\frac{\gamma F^{DE}}{L}} + \frac{1}{3}c^{DE} - \frac{1}{3}c_r\right)^2. \end{aligned}$$

We can now use (11), (9), and $\underline{\lambda} = \overline{\lambda} - K$, to solve for the lower threshold $\underline{\lambda}$:

$$\underline{\lambda} = 1 - K - \frac{1}{\alpha\eta}\left(\sqrt{D - 2K^2\alpha^4\eta^2} - 2\eta\sqrt{\frac{\gamma F^{DE}}{L}} - 2\alpha^3\gamma\right). \tag{12}$$

The upper threshold and average then follow immediately.

Next, we analyze how the availability of the private label export channel affects the exporting firms. We already know that total Home exports rise and there are fewer Home direct exporters. Next, we find the effect on total number of Home exporters. Using (7) and (12) we can derive the following:

$$\underline{\lambda} - \lambda^{DE} = \frac{K}{\alpha\eta}\left(\sqrt{\frac{D}{K^2}} - \sqrt{\frac{D}{K^2} - 2\alpha^4\eta^2} - \alpha\eta\right).$$

We see that $\underline{\lambda} > \lambda^{DE}$ if and only if

$$\frac{D}{K^2} < \frac{(\alpha\eta)^2}{4}\left(1 + 2\alpha^2\right)^2,$$

or, substituting for K and D, the mass of exporting firms decreases iff:

$$\frac{16\left(\frac{\gamma F^{DE}}{L}+\frac{\alpha^3\gamma}{\eta}\left(\frac{\alpha^3\gamma}{\eta}+\alpha-\left(\eta\frac{Q^W}{L}+c+c^{DE}\right)\right)\right)}{\left(\frac{2}{3}\sqrt{\frac{\gamma F^{DE}}{L}}+\frac{1}{3}\left(c^{DE}-c_r\right)\right)^2}<\left(1+2\alpha^2\right)^2, \tag{13}$$

which is generally ambiguous as it depends on parametric assumptions. Condition (13) will be satisfied when the international retailer's cost advantage, $\left(c^{DE}-c_r\right)$ is sufficiently high, substitutability between varieties, η, is sufficiently high, and/or the rest of the world's exports per foreign consumer, $\frac{Q^W}{L}$ are sufficiently high.

A.3 Variation in variable trade cost

In this Appendix we show that in the case of a uniform increase in the variable trade costs for both direct and intermediated trade, the negative extensive margin effect dominates and the aggregate Home exports fall while the output of a direct exporter rises.

First, using (11) and (12), and then differentiating Q with respect to t we get that the effect on total exports is negative:

$$\frac{dQ}{dt}=-L\frac{2\sqrt{\frac{\gamma F^{DE}}{L}}+(1-\overline{\lambda})\alpha}{\sqrt{D-2K^2\alpha^4\eta^2}}<0.$$

Next using (3) and differentiating with respect to t we can also show that the effect on the quantity of a direct exporter is positive

$$\frac{dq^{DE}}{dt}=-\frac{\eta}{2\gamma}\frac{dQ}{dt}-\frac{L}{2\gamma}=\frac{\alpha^3 L}{\sqrt{D-2K^2\alpha^4\eta^2}}>0.$$

A.4 Variation in fixed trade cost

In this Appendix we show that the effects of an increase in fixed cost of direct exporting on aggregate Home exports and individual output of a direct exporter are of opposite sign and the direction of each effect depends on the parameter's values.

Using (11) and differentiating with respect to F^{DE} we have that the effect on aggregate exports is

$$\frac{dQ}{dF^{DE}}=2L\left(\frac{\sqrt{\frac{\gamma}{LF^{DE}}}}{\sqrt{D-2K^2\alpha^4\eta^2}}\left(\frac{2}{3}K\alpha^3-\sqrt{\frac{\gamma F^{DE}}{L}}\right)\right).$$

Hence the sign of $\frac{dQ}{dF^{DE}}\gtrless 0$ depends on the sign of the following term

$$\left(\frac{8}{9}\alpha^2-1\right)\sqrt{\frac{\gamma F^{DE}}{L}}+\frac{4}{9}\alpha^2\left(c^{DE}-c_r\right)\gtrless 0$$

If α, $\gamma F^{DE}/L$ or $\left(c^{DE}-c_r\right)$ are high then we see higher aggregate exports in response to an increase in the fixed cost of direct exports. And since

$$\frac{dq^{DE}(\lambda)}{dF^{DE}}=-\frac{\eta}{2\gamma}\frac{dQ}{dF^{DE}}$$

we have the opposite effect on the individual quantity of each direct exporter.

A.5 Reducing monopoly power

In this Appendix we solve for the effects on outputs and the measure of Home exporters in the case of an exogenous reduction in the monopoly power of the retailer, i.e. a decrease in fixed retailing fee f.

First, we note that as previously the profit of private label exporters must be equal to zero:

$$\pi^{PL}=q_k^2\frac{\gamma}{L}-f=0.$$

Hence, each private label exporter's output equals

$$q_k=\sqrt{\frac{fL}{\gamma}}.$$

Note that as the monopoly power of the retailer is reduced, the fixed fee f decreases, and each private label exporter will export less — that is, q_k decreases.

Next, we determine the measure of private label exporters and their total exports. Since profits have to be equal at the threshold, and private label exporters make zero profit, i.e. $\pi^{DE}\left(\overline{\lambda}\right)=\pi^{PL}=0$, it follows that

$$\overline{\lambda}=\frac{1}{\alpha}\left(2\sqrt{\frac{\gamma F^{DE}}{L}}+\eta\frac{Q}{L}+c+c^{DE}\right),$$

and

$$\lambda_k=\frac{1}{\alpha}\left(2\sqrt{\frac{\gamma f}{L}}+\eta\frac{Q}{L}+c+c^{R}\right).$$

The measure of Home firms exporting under the private label then equals:

$$K=\overline{\lambda}-\underline{\lambda}=2\left(\overline{\lambda}-\lambda_k\right)=2\frac{1}{\alpha}\left(2\sqrt{\frac{\gamma F^{DE}}{L}}-2\sqrt{\frac{\gamma f}{L}}+c^{DE}-c^{R}\right).$$

As f decreases, K increases and there will be more private label exporters compared to the monopoly case.

The net effects on the total volume of intermediated exports takes some work. Given the mass of private label exporters, total private label exports amount to:

$$Q^{H,PL}=Kq_k=2\frac{1}{\alpha}\left(2\sqrt{\frac{\gamma F^{DE}}{L}}-2\sqrt{\frac{\gamma f}{L}}+c^{DE}-c^{R}\right)\sqrt{\frac{fL}{\gamma}}$$

and this quantity varies with the fixed retailing fee according to:

$$\frac{dQ^{H,PL}}{df} = \frac{1}{\alpha\sqrt{f}}\left(\left(2\sqrt{\frac{\gamma F^{DE}}{L}} + c^{DE} - c^{R}\right)\sqrt{\frac{L}{\gamma}} - 4\sqrt{f}\right)$$

In order to sign this derivative it proves convenient to define the following critical value of the fee:[27]

$$\widetilde{f} = \frac{L}{\gamma}\left(\frac{2\sqrt{\frac{\gamma F^{DE}}{L}} + c^{DE} - c^{R}}{4}\right)^{2}$$

Regarding the effect on the total quantity of private label exports, we have that for $f > \widetilde{f}$ the quantity increases as f falls, and then, once $f < \widetilde{f}$, starts to decrease as the fee falls even further.

The resulting equilibrium is determined by two conditions:

$$\pi^{DE}(\lambda) = \frac{L}{4\gamma}\left(\overline{\lambda}\alpha - \eta\frac{Q}{L} - c - c^{DE}\right)^{2} - F^{DE} = 0$$

and

$$\begin{aligned}\frac{Q}{L} &= \frac{Q^{W}}{L} + \frac{Q^{H,DE}}{L} + \frac{Q^{H,PL}}{L} = \\ &\frac{Q^{W}}{L} + \frac{(1-\overline{\lambda})}{4\gamma\alpha}\left(\frac{4}{\alpha}\sqrt{\frac{\gamma F^{DE}}{L}} + 1 - \overline{\lambda}\right) + \\ &2\frac{1}{\alpha}\left(2\sqrt{\frac{\gamma F^{DE}}{L}} - 2\sqrt{\frac{\gamma f}{L}} + c^{DE} - c^{R}\right)\sqrt{\frac{fL}{\gamma}}\end{aligned}$$

We want to understand how these equilibrium values change when f falls. Consider first the case where $f > \widetilde{f}$. For this range of market power we have that $\frac{Q}{L}$ and $\overline{\lambda}$ increase as f falls. To see this, suppose that $\frac{Q}{L}$ decreases. Then $\overline{\lambda}$ decreases as well, which results in higher $Q^{H,DE}$. As $Q^{H,PL}$ also increases, $\frac{Q}{L}$ would rise, which is a contradiction. Now consider the case where $f < \widetilde{f}$. In this range, $Q^{H,PL}$ decreases as f falls and $\overline{\lambda}$ decreases as well. The argument is the same as before, only with opposite signs.

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[27] Note that $\widetilde{f} < \frac{L}{\gamma}\left(\frac{2}{3}\sqrt{\frac{\gamma F^{DE}}{L}} + \frac{1}{3}c^{DE} - \frac{1}{3}c_{r}\right)^{2}$.

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