Taste Heterogeneity, Trade, and the Within-Industry Home Market Effect[a]

Raphael Auer[b]

JEL-Classification: F12
Keywords: home-bias, within-industry trade, product heterogeneity

1. A Model of Product Heterogeneity

In Auer (2009), I develop a model of the determinants of demand for heterogeneous products, in which consumers do display a love of variety as in Dixit and Stiglitz (1977), but they are also characterized by a "taste" for good attributes as in Mussa and Rosen (1978). The model features products that are heterogeneous in their attributes and consumers that are heterogeneous in their taste for product attributes. The latter two-sided heterogeneity results in an equilibrium matching in which consumers with a high preference for a given attribute tend to buy from firms with a fitting high-attribute good, i.e., the two-sided heterogeneity leads to an assortative equilibrium matching of consumer valuations and good attributes.

In the model, each consumer has preferences over a homogenous O (outside) good and over a finite set of differentiated M (manufacturing) varieties. Each M firm produces exactly one differentiated variety that is characterized by its attribute a. Each consumer has a valuation v for the attribute a and is also characterized by an idiosyncratic and consumer-firm specific utility draw x.

Differences in attributes a can be seen as differences in good quality, but may also reflect more trivial product characteristics such as the good's color or the language used to label a product. Similarly, differences in valuations a reflect differences in people's tastes for the attribute. For example, some consumers might

a This document is an extended abstract of Working Paper Number 09.05 at the Study Center Gerzensee. I thank Thomas Chaney, Robert Feenstra, Gene Grossman, Marc Melitz, seminar participants at the 2009 Swiss Economic Society Meetings, and especially Philip Saurè for helpful discussions. The views presented in this document do not necessarily reflect those of the Swiss National Bank.

b Swiss National Bank (on leave at Princeton University); rauer@princeton.edu.

have a preference for cars painted in Ferrari Red, while others prefer British Racing Green. The two-sided heterogeneity results in an equilibrium matching in which consumers with a preference for green cars tend to buy from firms producing green cars, i.e., the two-sided heterogeneity leads to an assortative equilibrium matching of consumer valuations and good attributes.

Consumers also value variety, i.e., they prefer an economy featuring many different varieties of cars painted in British Racing Green to an economy featuring only one such variety. This love for variety motive is derived from a discrete choice setting in the spirit of MCFADDEN (1981), ANDERSON et. al. (1987 and 1992), and in particular GABAIX et al. (2006). Each consumer is endowed with an idiosyncratic and consumer-firm specific utility draw x, reflecting that a specific consumer, by chance, might like or dislike the output of a specific firm. Since having a larger number of such draws raises the expected maximum draw, consumer welfare rises with the number of available varieties. The love of variety motive partly blurs the assortative matching of consumer valuations and good attributes, since a high consumer-firm specific utility draw might lead to a consumer buying the good even if the good's attribute does not fit the consumer's valuation.

In equilibrium, the economy thus features expected assortative matching, i.e., consumer valuations and product attributes are on average matched assortative and a high attribute producer has relatively more consumers with a high preference for the attribute than a low attribute producer. The key implication of this matching, in turn, is that a firm's sales decrease more when a new firm with a similar product enters the industry than when a firm with a dissimilar product enters. Therefore, with trade, the composition of the foreign industry matters for the composition of the domestic industry.

I next lay down the functional forms used in AUER (2009) to model these intuitions, derive a firm's demand, and then describe the supply side of the economy. Throughout the analysis, let $i \in I$ index consumers (individuals) and $j \in J$ index manufacturing firms. Each of these consumers i is endowed with income $\theta_i = \theta$ in terms of labor and a valuation draw v_i. The consumer is also endowment with a consumer-firm specific draw $x_{i,j}$ for each firm in $j \in J$.

Consumers care about the valuation- and idiosyncratic draw- adjusted effective quantity of the manufacturing M good and the absolute quantity of the outside good O. Denoting the quantity consumer i consumes of the O good by o_i and the quantity she consumes from manufacturing firm j by $q_{i,j}$, consumer i's utility U_i is given by

$$U_i = (o_i)^{1-\alpha} \left(\sum_{j \in J} q_{i,j} e^{x_{i,j} + a_j v_i} \right)^{\alpha}. \tag{1}$$

Her consumption decision is subject to non-negativity for o_i and each pair i,j $q_{i,j} \geq 0$ as well as to her budget constraint

$$o_i p_O + \sum_{j \in J} q_{i,j} p_j \leq \theta_i. \tag{2}$$

The utility function (1) implies that for all consumers, all manufacturing goods are perfectly substitutable. However, different consumers have different rates of substitution between different varieties; in equilibrium, therefore, certain types of consumers are more or less likely to buy certain types of goods.

Consider first only the term $e^{a_j v_i}$ in (1).[1] The key feature of this term in the preferences is that the rate at which consumers value (or dislike) the attribute differs between consumers with different v_i. Assume that two consumers of valuations v_L and v_H ($v_H > v_L$) are offered to buy a certain good a_L at price p_L or a good a_H at price p_H where $a_H > a_L$. What is the maximum price difference between p_L and p_H at which each consumer would prefer the high a good? For the H-valuation consumer, this would be price ratio $p_H / p_L = e^{v_H(a_H - a_l)}$, while it would be $p_H / p_L = e^{v_L(a_H - a_L)}$ for the L-valuation consumer. Because higher valuation consumers value the attribute more, in equilibrium, they constitute the relatively larger group of consumers of H-attribute goods. For expositional clarity, a large part of the analysis below assumes that v_i can take only one of two possible values v_L, v_H. However, in general, this assumption is not necessary and valuations can take any positive value, i.e., $v_i \sim F_v(v)$ where $f_v(v) \geq 0$ for $v \geq 0$ and $f_v(v) = 0$ for $v < 0$.

Next, consider only the term $e^{x_{i,j}}$ in (1). $x_{i,j}$ is a consumer-firm specific shock, reflecting the fact that some consumers like or dislike the variety of a specific firm irrespective of the variety's attribute. In (1), the idiosyncratic taste shock introduces market power to the model: although firms cannot observe $x_{i,j}$, they can engage in first degree price discrimination by charging a higher price and only attracting consumers with high $x_{i,j}$ draws. Throughout the analysis, I assume that $x_{i,j}$ is distributed (maximum) Gumbel with scale and shape parameters 0 and $1/\beta$ respectively.

$$G_x(x_{i,j}) = \exp\left[-\exp[-x_{i,j}\beta]\right] \tag{3}$$

1 Both a_j and v_i are a scalars. It is straightforward to extend the model at hand to the case of multiple attributes. For example, if each consumer is characterized by independent valuations over K attribute dimensions, the predictions developed below continue to hold exactly as long as specialization is incomplete in the K attribute dimensions.

The consumer–firm specific shocks are orthogonal to firm attribute or consumer valuation and are independent across firms and consumers: $x_{i,j} \perp x_{i,n}$ for $n \neq j$. GABAIX et al. (2006) demonstrate that these assumptions in combination with a utility function similar to (1) yield an ideal-variety microfoundation for the constant elasticity of substitution (CES) demand system of DIXIT and STIGLITZ (1977). It is noteworthy that the closed-form assumption on the consumer-firm specific taste shocks (3) is not very restrictive, since in equilibrium consumers buy only from the attribute-adjusted maximum realization of $x_{i,j}$. Since the economy features a large number of firms, the distribution of this maxima converges to the Type I Extreme value function for a wide set of underlying distributions.[2]

2. Demand and Consumer Welfare

I next solve for a firm's demand and consumer welfare using the general distribution of valuations $F_v(v)$. Consumer i consumes the agricultural O good and the manufacturing composite

$$M_i \equiv \sum_{j \in J} q_{i,j} e^{x_{i,j} + a_j v_i}.$$

Before considering the choice among the single manufactured goods, consider first the decision of how much of the O good to consume. The first order conditions of the utility function (1) with respect to these two quantities and the budget constraint (2) imply that an agent with income 1 consumes

$$M_i = (1-\alpha) p_{M,i} \text{ and } O_i = \alpha p_O,$$

where $p_{M,i}$ is the price of the manufacturing composite for consumer i (which is NOT the same for all i). Irrespective of this price, the consumer always spends a fraction $1-\alpha$ of her income on manufactured goods.

Thus, the consumer spends the remainder fraction of $(1-\alpha)$ on the manufacturing composite. Within the manufacturing composite, since all goods are perfect substitutes, each consumer then chooses the variety that yields the highest ratio of effective quantity per unit divided by the price of the variety. Since

2 The preference structure at hand makes the model's results highly comparable to the work of BERNARD et al. (2003), who extend the EATON and KORTUM (2002) model of trade to allow for positive markups.

consumers with different valuation v_i differ in their average rate at which they substitute goods of different attributes a, demand is of a different shape for each v.

Proposition 1 (Demand). *The demand function $D(a_j, p_j)$ of a firm with attribute a_j and price p_j is equal to*

$$D(a_j, p_j) = (1-\alpha)\theta L \Gamma(1-\beta) p_j^{-(1+\beta)} \int_{v \in V} f_v(v) \frac{\exp[\beta v a_j]}{\overline{P(v)}^{-\beta}} dv, \tag{4}$$

where $\Gamma(\ldots)$ is the beta function and $\overline{P(v)}$ denotes the ideal price index for all consumers with $v_i = \tilde{v}$, which is given by

$$\overline{P(v)} \equiv \left(\sum_{n \in J} \left(\frac{p_n}{\exp[v a_n]} \right)^{-\beta} \right)^{-1\beta}. \tag{5}$$

Proof. see Auer (2009).

The proof of Proposition 1 follows previous research demonstrating how the love of variety motive can arise in a discrete choice setting: each consumer has a consumer-variety specific taste shock $x_{i,j}$. For equal prizes and good attributes, the consumer chooses the maximum realization of the taste shock, i.e., she chooses

$$j = \arg\max_{j \in J} x_{i,j}.$$

Owing to the functional form assumption that the idiosyncratic taste shocks are distributed Gumbel with shape parameter $1/\beta$, all firms face a constant elasticity of demand equal to $-(1+\beta)$.

Compared to the existing literature, the novel ingredient in the derivation of (4) is that the probability of consumer i with valuation $v_i = v$ buying from firm j with attribute $a_j = a$ depends on the match of v and a, as well as on how well the other goods in the economy match with the consumer's taste, i.e., the ideal price index of consumers with $v_i = v$. First, sales are shifted by the match between the consumer's taste and the firm's attribute, i.e., in (4), demand is shifted by $\exp[\beta v_i a_j]$. Second, it is not only the match between firm j and consumer i with $v_i = v$ that determines sales, but also how well the competition's output matches

with the consumers preferences, i.e., the ideal price index of each consumer type is a function of the attribute composition of the economy. The latter average match is summarized in the ideal price index $\overline{P(v)}$.

The ratio of these two matchings generate the key difference between the preference structure of this paper and the existing literature. In existing frameworks, due to the constant elasticity demand structure, entry of new competitors hurts the sales of all existing firms in the same proportion. In the preferences at hand, the effect of such an increase in competition on a firm's sales will be different for different types of firms.

Last, there is not one type of consumer, but a distribution of consumers with varying valuations. Total demand for a firm equals the sum of demand from all possible valuations, hence explaining the outer integral over all possible realizations of v in (4).

Since the expected maximum draw is increasing in the number of draws, consumers prefer having a larger number of varieties to choose from, i.e., they love variety. A key feature of the preferences developed here is that consumer welfare is highly comparable to the one in DIXIT and STIGLITZ (1977).

Corollary 1. (Consumer Welfare) *Denote the* expected *welfare of consumer i with* $v_i = v$ *and income* θ_i *by* $E(U_i|\mathrm{v},\theta_i)$. *If* $p_O = 1$,

$$E(U_i) = (1-\alpha)^{1-\alpha}\alpha^{\alpha}\Gamma\left(1-\frac{\beta}{\alpha}\right)\left(\overline{P(v)}\right)^{-\alpha}\theta_i$$

where the ideal price index $\overline{P(v)}$ *is as defined in* (5) *and* $\Gamma(\ldots)$ *is the gamma function*.

Proof. see AUER (2009).

Corollary 1 is very convenient: the developed preference structure allows to directly map changes in the toughness of competition for all consumers with $v_i = v$ into welfare changes for this group of consumers. As I document below, with open markets, the interplay of the free entry conditions at Home and abroad pins down the ideal relative price indices for different v's uniquely, hence leading to very sharp prediction regarding the welfare effects of trade.

Since both demand is CES-shaped and consumer welfare (up to some constants) coincides with the one in the DIXIT and STIGLITZ (1977) framework, one can directly relate the findings of this paper to the existing literature. In the case where all firms produce the same good ($a_n = a_j = a$), the valuation-attribute match in (4) cancels out and the demand curve is the same as in DIXIT and STIGLITZ

(1977). The model at hand, therefore, includes the Krugman (1980) model as a special case without product heterogeneity, which is convenient since it allows clearly highlighting the impact of such heterogeneity.[3]

3. Supply and Domestic Equilibrium

In each country and at each moment in time, potential entrepreneurs can enter the *M* industry by paying a fixed cost of *F* labor units. When entering the industry, each entrepreneur can choose with what type of attribute to enter the industry. After paying the entry cost *F* and deciding with what kind of good to enter the industry, the entrepreneur *j* receives the blueprint to produce a new variety of the manufacturing good with attribute a_j. While a_j can be chosen at the moment of entry, it cannot be changed thereafter. The entrepreneur has a perpetual monopoly over that specific variety from the moment of entry onwards and faces an exogenous probability of firm death of $\delta > 0$ per unit of time.

For expositional clarity, I restrict the universe of potential levels the attribute can take and assume that $a_j \in \{a_L, a_H\}$, where $0 < a_L < a_H$. I refer to the two attribute levels as the *H*-attribute or *L*-attribute "good", "firm", or "variety" in the remained of the paper. While alive, each firm can produce any quantity of its good at constant marginal costs (in units of labor) equal to $c_j = e^{ca_j}$. The outside good *O* is produced in a competitive sector at a marginal cost of one unit of labor. In total, the home economy thus has to satisfy the resource constraint that domestic production of the *O* and *M* sector and entry into the *M* sector do not use more than θL units of home labor.

I next solve the closed economy equilibrium. To better convey the model's intuitions, I solve the two attribute/two valuation case and assume that $v_i \in \{\tilde{v}_L, \tilde{v}_H\}$ where $\tilde{v}_L < \tilde{v}_H$. Note that when $\tilde{v}_L > 0$, all consumers value higher attribute goods and one can speak of good "quality" as in Auer and Chaney (2007 and 2009), Auer and Saurè (2009), and Fajgelbaum et al. (2009). In this paper, I however, do not necessarily assume that $\tilde{v}_L > 0$, so that the

3 The welfare gains from trade in the presented model are also comparable to the welfare gains in the literature on firm heterogeneity. Arkolakis et al. (2009) evaluate the welfare effects of trade for several such models with heterogeneous firms, demonstrating that one can calculate the welfare gains from trade on the basis of knowing only the share of expenditure on domestic goods and the elasticity of demand. In the model of Auer (2009), the same holds true in the long run when the industry composition has adjusted to the need structure of the globalized economy..

analysis also extends to product characteristics that are not strictly preferred by all consumers. I denote the fraction of the population that has a valuation draw of $v_i = \tilde{v}_H$ by $0 \leq \pi_H \leq 1$.
Firms face a constant price elasticity of $(1+\beta)$ and thus charge a price of

$$p_j = (1+\beta/\beta)c_j = (1+\beta/\beta)e^{ca_j}.$$

For each type of consumer, (4) thus simplifies to

$$\frac{e^{\beta(v_i-c)a_j}}{\sum_{n\in J} e^{\beta(v_i-c)a_n}},$$

i.e., valuations v_i can simply be adjusted by the fact that also costs vary with a. Thus, in the remainder of the analysis, I will only evaluate the cost adjusted H-valuations and L-valuations v_H and v_L satisfying

$$v_L \equiv (\tilde{v}_L - c) \quad \text{and} \quad v_H \equiv (\tilde{v}_H - c).$$

Throughout the analysis, let N denote the total number of active firms in the industry at Home and let n_H denote the fraction these firms producing a good with $a_j = a_H$. Normalizing $\Gamma(1-\beta)\theta(1-\alpha) \equiv 1$, revenue $\Pi(a_j)$ in the home market economy is equal to

$$\begin{aligned}\Pi\left(a_j\right) = L\pi_H \frac{e^{\beta v_H a_j}}{N(n_H e^{\beta v_H a_H} + (1-n_H)e^{\beta v_H a_L})} \\ + L(1-\pi_H)\frac{e^{\beta v_L a_j}}{N(n_H e^{\beta v_L a_H} + (1-n_H)e^{\beta v_L a_L})}.\end{aligned} \tag{6}$$

Given the constant markup-pricing, firm profits are proportional to revenue. In the closed economy, this revenue depends on the distribution of consumer valuations. For any given attribute, a higher proportion of H-valuation consumers implies a larger market size for H-attribute firms.

Similarly, the revenue (6) of a firm reacts more to entry of firms producing a similar good than to entry of firms producing a dissimilar good, i.e., $\left|\partial\Pi(a_H)/\partial N_H\right| > \left|\partial\Pi(a_L)/\partial N_H\right|$ and $\left|\partial\Pi(a_H)/\partial N_L\right| < \left|\partial\Pi(a_L)/\partial N_L\right|$. The latter feature implies that industries are partially segmented: for example, the sales of BMW depend much more on the product strategy of Mercedes rather than the one of Toyota, which caters to a slightly different set of consumers. Similarly,

Armani's sales depend much more on the success of the latest collections by Prada than they do depend on the success of the collections Luis Vuitton or Hermes.

Since cost differences and attribute differences can be reduced to one dimension only the cost-adjusted valuations $v_L = (\tilde{v}_L - c)$ and $v_H = (\tilde{v}_H - c)$ enter the equilibrium demand function (6). A necessary condition for an equilibrium with positive entry of both type of firms is that

$$e^{\beta v_H a_H} > e^{\beta v_H a_L} \text{ and } e^{\beta v_L a_L} > e^{\beta v_L a_H},$$

i.e., that no type of good, when adjusted for its relative cost of production, is preferred by both types of consumers. Throughout the rest of this paper, I assume this to hold.

With demand being pinned down, it is straightforward to derive entry in the closed economy. Denote by N^A the total number of firms in autarky equilibrium and by $n_H^A \in [0,1]$ the autarky equilibrium fraction of entrepreneurs choosing to produce the H-attribute good. Since firms are free to enter with an H or L good, an equilibrium with positive entry of both types of firms requires that the flow of revenues are equal for both types of firms, or that $\Pi(a_L) = \Pi(a_H)$. Reformulating $\Pi(a_L) = \Pi(a_H)$ as the difference in sales to H-valuation and L-valuation consumers yields

$$\frac{\pi_H}{1-\pi_H} \frac{e^{\beta v_H a_H} - e^{\beta v_H a_L}}{n_H e^{\beta v_H a_H} + (1-n_H) e^{\beta v_H a_L}} = \frac{e^{\beta v_L a_L} - e^{\beta v_L a_H}}{n_H e^{\beta v_L a_H} + (1-n_H) e^{\beta v_L a_L}}. \tag{7}$$

Since $e^{\beta v_H a_H} > e^{\beta v_H a_L}$, the LHS of (7) is increasing in relative entry of H firms n_H. Since $e^{\beta v_L a_L} > e^{\beta v_L a_H}$, the RHS is decreasing in n_H. Thus, n_H is uniquely determined. N^A depends on the flow of instantaneous profits which have to be discounted at rate δ and pin down the number of firms by the free entry condition $F = L/\beta\delta N^A$. There exists a unique autarky equilibrium featuring $N = L/\beta\delta F$ and

$$n_H^A = \begin{cases} 0 \text{ if } \pi_H < e^{\beta v_L a_H} \dfrac{e^{\beta v_H a_H} - e^{\beta v_H a_L}}{e^{\beta v_H a_H} e^{\beta v_L a_L} - e^{\beta v_H a_L} e^{\beta v_L a_H}} \\ \dfrac{e^{\beta v_L a_L}}{e^{\beta v_L a_L} - e^{\beta v_L a_H}} \pi_H - (1-\pi_H) \dfrac{e^{\beta v_H a_L}}{e^{\beta v_H a_H} - e^{\beta v_H a_L}} \quad \text{otherwise.} \\ 1 \text{ if } \pi_H > e^{\beta v_H a_H} \dfrac{e^{\beta v_L a_L} - e^{\beta v_L a_H}}{e^{\beta v_H a_H} e^{\beta v_L a_L} - e^{\beta v_H a_L} e^{\beta v_L a_H}} \end{cases} \tag{8}$$

H-attribute firms sell more to *H*-valuation consumers than do *L*-valuation firms. Similarly, *L*-attribute firms sell more to *L*-valuation consumers. Sales to each group are proportional to the number of consumers (there are $L\pi_H$ *H*-valuation consumers) and increasing in the ideal price indices $P(v_H)$ and $P(v_L)$.

The equilibrium in the closed economy has the following properties. First, a necessary condition for an equilibrium featuring both kind of firms is that $e^{\beta v_L a_L} > e^{\beta v_L a_H}$ and $e^{\beta v_H a_H} > e^{\beta v_H a_L}$, i.e., that there exists both a group of consumers that prefers *L* goods as well as a group that prefers *H* goods. Second, in an equilibrium featuring positive entry of both types of firms, the fraction of *H*-attribute firms is increasing in the number of *H*-valuation consumers. The fraction of such firms is also increasing in v_H and v_L, since an increase in either valuation leads to higher relative expenditures on *H*-attribute goods. Third, in equilibrium, owing to the free entry condition, all firms have the same revenue and profit flows.

4. The Impact of Trade Liberalization

In AUER (2009), I nest the above described preferences in a model of the international economy featuring iceberg transportation costs and two countries that differ in the distribution of consumer tastes. The model comprises the economy described in KRUGMAN (1980) as a special case without product or taste heterogeneity. Therefore, I can directly evaluate the effect of such heterogeneity on trade flows, industrial composition dynamics, and the welfare effects of trade. The model has three novel main predictions.

The first novel prediction is the within-industry extension of KRUGMAN's (1980) "home market effect". In Krugman's model, a country with a larger home market has more entry of firms producing manufactured goods for the domestic market and, with open markets, is also the net exporter of these goods. This prediction has been extended to the many-industry case by HANSON and XIANG (2004), who predict that a relative home market effect can arise across industries with different transportation costs or demand structures. Moreover, as FAJGELBAUM et al. (2009) demonstrate, a home market effect can arise along the dimension of good quality when consumer preferences are non-homothetic: since richer countries have a relatively larger domestic market for high quality goods, in equilibrium, they also tend to export of such goods.

The intuition of the within-industry home market effect of this paper is closely related to the relative notion in HANSON and XIANG (2004) and FAJGELBAUM et al. (2009). Even if two countries, say Germany and France, are characterized by

an equal domestic market size for cars in general, a home market effect can arise in the type of cars these countries produce. For example, if the French consumers put relatively more emphasis on fuel efficiency, while the German consumers tend to emphasize top-speed, in general equilibrium, each country's industry is adapted to the needs of the local population.Immediately after trade liberalization, France thus becomes a net exporter of fuel-efficient cars, while Germany becomes a net exporter of fast cars. Neither of the two economies, however, need to become a net exporter of cars.[4]

The model's second prediction is that in the short run after a trade liberalization, consumption is home-biased in the sense that the volume of trade is lower than what would be expected on the basis of transportation costs and the elasticity of demand.[5] Consider the moment just after opening markets to trade were each country's industry is optimized for the tastes of domestic consumers only. While the few German producers of fuel-efficient cars experience high demand in France, this is more than offset by the many producers of fast cars that experience low demand in France. Overall, the volume of trade is reduced by product heterogeneity since the German industry, which is optimized for the fast car-loving German consumer, is inappropriate for the average French consumer, who is characterized by a love for fuel efficiency. In the short run, the model thus supports Linder's conjecture that taste differences across nations impede trade.[6]

The third prediction is that after trade liberalization, the within-industry home market effect intensifies, while the home bias of consumption disappears. When markets are opened to trade, French firms experience relatively more import competition in the segment for fast cars than in the segment for fuel-efficient cars. Thus, domestic sales and profits are relatively higher for the makers of fuel-efficient cars. The latter effect is only partly offset by export possibilities being relatively better for the French makers of fast cars and the country thus

4 In Auer (2009), I assume that the two countries differ in their distribution of consumer valuations. Atkin (2009) shows how such a difference in tastes can arise endogenously in a model of habit formation.

5 There is ample empirical evidence that the volume of trade is far lower than what theory suggests. For example, trade Anderson and Van Wincoop (2003) estimate that conditional on distance, country size, and other observable factors, a border reduces trade flows in the order of 30–40%.

6 Foellmi et al. (2008) document how the non-divisibility of goods can impede the volume of trade. In their setup, richer individuals demand a larger variety of goods and richer nations thus offer a market for a wide set of different varieties. Many of these varieties cannot be exported to poorer nations, however, because consumers in such poorer nations can afford only a narrow set of varieties.

specializes into the fuel-efficient market segment. In contrast, the German car industry specializes into producing fast cars. In the long run, countries end up with more specialized industrial structures and the within-industry home market effect intensifies.

An intriguing result of AUER (2009) is that the home bias of consumption prevailing immediately after trade liberalization vanishes in the long run although (indeed: because) both economies specialize even more. Consider again the example of German and French cars. At the moment of opening to trade, the composition of French industry is tailored exactly to the demand of French consumers, while the additional import supply from Germany is concentrated in the fast-car segment. Immediately after trade liberalization, competition in France is tougher in the segment where German exports are concentrated in, thus impeding trade.

Dynamically, however, German exporters crowd out French producers of fast cars. This raises the volume of trade since it makes competition in France weaker in the segment where Germans exports are concentrated in. Owing to this, the group of French consumers who do prefer fast cars are not well served by the domestic industry, leading to higher import demand for fast cars. As I demonstrate below, as long as specialization is incomplete, the latter effect is so strong that the home bias of consumption disappears completely and the long-run volume of trade is exactly equal to the one that would prevail in the absence of across-country taste differences.

The dynamic response of industrial composition also has stark results for the welfare effects of trade: under incomplete specialization, the long run welfare gains from trade occur to all consumers in the same proportion irrespective of the foreign distribution of valuations. Again, this somewhat counter-intuitive result can be explained by how trade affects the composition of the domestic industry. For example, given that the French produce a large variety of fuel efficient cars, German consumers with a preference for fuel efficiency do gain more at the moment of liberalization than do the German consumers with a preference for speed. Dynamically, however, trade induces German producers of fuel efficient cars to exit the industry, which favors the lovers of fast cars. In general equilibrium the these two effects exactly offset each other and all consumers benefit from trade in the same proportion irrespective of the distribution of tastes in the other nation.

These findings document that endogeninzing how a nation's industrial composition responds to trade liberalization is of first order importance for understanding trade patterns and the welfare gains from open markets. For example, LINDER's (1961) often-cited hypothesis hinges on the intuitive idea that a lower fraction of consumers who value a certain attribute is associated with a lower

volume of imports embodying the attribute. While the latter statement is true for a given domestic industry structure, the reverse holds true in general equilibrium: under trade, lower domestic valuation for an attribute is associated with an over-proportional reduction in domestic production of goods embodying the attribute, and consequently, a higher import volume of such goods.

Modeling the dynamic response of industrial composition to trade liberalization and the subsequent increase in trade volumes can also contribute to our understanding of why trade grows very sluggish after liberalization (see Yi (2003), Ruhl (2008), and Hummels (2007)). After such liberalization, each country's industrial composition has to adapt, which requires firm exit and entry and, thus, time. It is also noteworthy that the model predicts a substantial amount of new trade due to the extensive margin as documented by Kehoe and Ruhl (2006). In contrast to the existing literature (Arkolakis (2008), Baldwin and Harrigan (2007), Bernard et al. (2003), Chaney (2008), Kugler and Verhoogen (2008), Johnson (2007), Melitz (2003), and Verhoogen (2008)), this is not driven by the trade-induced shift towards ex-ante more profitable entities, but rather, by the adaptation of a country's industrial composition to the taste structure of a globalized economy.[7]

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7 Cunat and Maffezzoli (forthcoming) model a similar structural transition process in which trade-induced factor accumulation slowly transforms a country's industrial structure, leading to a sluggish response of trade volume to liberalization.

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SUMMARY

Starting with the seminal work of Krugman (1979, 1980, and 1981), increasing returns that arise from consumer's "love of variety" have been regarded as the major motive for international trade. Due to their intuitive appeal and analytical tractability, the preferences of Dixit and Stiglitz (1977) that Krugman's analysis is based upon have become the workhorse of international trade theory.

While trade theorists continue to gain important insights from using these preferences, they also mask significant aspects of product demand. For example, the classical Armington (1969) assumption that consumption is differentiated by the location of production is often needed to match aggregate trade patterns (Trefler, 1995), yet it remains somewhat unclear why this is the case and why the expenditure share on foreign goods is generally rather small. Also more recent findings that there are pronounced systematic patterns in the quality composition of production, trade, and consumption (Schott, 2004; Hummels and Klenow, 2005; Hallak, 2006 and forthcoming; Hallak and Schott, 2009) or that intra-industry trade volume can best be explained by factors that are specific to country-pairs (Hummels and Levinson, 1995) are not easily rationalized in frameworks based on the Dixit and Stiglitz preference framework.

It is worthwhile to examine which underlying preference structure of rational agents can explain these patterns of trade and to then analyze how trade liberalization affects the aggregate economy once these preference are properly modeled. For example, as famously conjectured by Linder (1961, p. 94), it is likely that "[t]he more similar is the demand structure of two countries, the more intensive, potentially, is the trade between these two countries". Implicit in Linder's hypothesis is the argument that domestic firms tend to produce goods that are optimized for the local taste and less for the taste of foreign consumers. Consequently, differences in the tastes and products impede trade and reduce the welfare gains from trade liberalization.